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Productivity Gap

FINAL REPORT

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EU Integration and the Prospects for Catch-Up Development in CEECs — The Determinants of the Productivity Gap

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Final report

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Preface

Within the Fifth Community RTD Framework Programme of the European Union (1998–2002), the Key Action 'Improving the Socio-economic Knowledge Base' had broad and ambitious objectives, namely: to improve our understanding of the structural changes taking place in European society, to identify ways of managing these changes and to promote the active involvement of European citizens in shaping their own futures. A further important aim was to mobilise the research communities in the social sciences and humanities at the European level and to provide scientific support to policies at various levels, with particular attention to EU policy fields.

This Key Action had a total budget of EUR 155 million and was implemented through three Calls for proposals. As a result, 185 projects involving more than 1 600 research teams from 38 countries have been selected for funding and have started their research between 1999 and 2002.

Most of these projects are now finalised and results are systematically published in the form of a Final Report.

The calls have addressed different but interrelated research themes which have contributed to the objectives outlined above. These themes can be grouped under a certain number of areas of policy relevance, each of which are addressed by a significant number of projects from a variety of perspectives.

These areas are the following:

- ***Societal trends and structural change***

16 projects, total investment of EUR 14.6 million, 164 teams

- ***Quality of life of European citizens***

5 projects, total investment of EUR 6.4 million, 36 teams

- ***European socio-economic models and challenges***

9 projects, total investment of EUR 9.3 million, 91 teams

- ***Social cohesion, migration and welfare***

30 projects, total investment of EUR 28 million, 249 teams

- ***Employment and changes in work***

18 projects, total investment of EUR 17.5 million, 149 teams

- ***Gender, participation and quality of life***

13 projects, total investment of EUR 12.3 million, 97 teams

- ***Dynamics of knowledge, generation and use***

8 projects, total investment of EUR 6.1 million, 77 teams

- ***Education, training and new forms of learning***

14 projects, total investment of EUR 12.9 million, 105 teams

- ***Economic development and dynamics***

22 projects, total investment of EUR 15.3 million, 134 teams

- ***Governance, democracy and citizenship***

28 projects; total investment of EUR 25.5 million, 233 teams

- ***Challenges from European enlargement***

13 projects, total investment of EUR 12.8 million, 116 teams

- ***Infrastructures to build the European research area***

9 projects, total investment of EUR 15.4 million, 74 teams

This publication contains the final report of the project 'EU Integration and the Prospects for Catch-Up Development in CEECs -The Determinants of the Productivity Gap', whose work has primarily contributed to the area 'The challenge of EU enlargement'.

The report contains information about the main scientific findings of 'Productivity Gap' and their policy implications. The research was carried out by 12 teams over a period of 36 months, starting in September 2001.

The abstract and executive summary presented in this edition offer the reader an overview of the main scientific and policy conclusions, before the main body of the research provided in the other chapters of this report.

As the results of the projects financed under the Key Action become available to the scientific and policy communities, Priority 7 'Citizens and Governance in a knowledge based society' of the Sixth Framework Programme is building on the progress already made and aims at making a further contribution to the development of a European Research Area in the social sciences and the humanities.

I hope readers find the information in this publication both interesting and useful as well as clear evidence of the importance attached by the European Union to fostering research in the field of social sciences and the humanities.

J.-M. BAER,

Director

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Acknowkledgements

Thanks go out to the numerous anonymous referees in conference selection committees and associated to journals for reviewing our research results; to the numerous commentators at conferences and workshops for commenting on our research; and to the Commission for the financial support and administrative help in numerous occasions.

The members and activities of the PROJECT EVALUATION GROUP

The PROJECT EVALUATION GROUP is still evolving with project results being discussed in the scientific community. Hence, the institution of EVALUATION EXPERTS serves as one of the quality assurance methods. It is an informal institution made up of a group of researchers with a proven record of expertise in the common fields of interest. The idea is to incorporate some of the rich expertise in our fields of research which is external to the project: our research consortium is of a high academic standard and wants to submit its research and results to the rigor of an external refereeing process. The group of EVALUATION EXPERTS institutionalise in an informal and dynamic form. The list of Experts in the group is permanently evolving with new members joining as they are invited to comment on research results. The members are active only when they choose to take an interest in a certain research result and offer to provide a report and/or discussion. Experts can choose to take an active interest in any material presented by the project consortium or material sent to them directly. The main communication platform is the project internet site, where newly emerging research material is constantly been presented. If the Expert wishes to comment on the material, he is invited to contact the researcher directly or to prepare an anonymous report which he can send to the project co-ordinator. Evaluation Experts were also invited to participate in our annual project workshops. The list of members and their activities are recorded and published on the internet web-site in an own section (http://www.iwh-halle.de/projects/productivity-gap/project_personnel/Evaluation.htm) (see Annex 4. for this list).

Abstract

The project 'EU Integration and the Prospects for Catch-Up Development in CEECs - The Determinants of the Productivity Gap' was concerned with establishing knowledge about determinants of lower levels of productivity in the new member states of Central East Europe (CEE). This knowledge pertains to the most important determinants of aggregate (labour) productivities: sectoral structures of specialisation both in domestic production and in foreign trade; conditions within National Innovation Systems of CEECs; potentials for technology transfer via foreign direct investment in the regions; deficiencies of manufacturing firms in the new member states of Estonia, Poland, the Czech and Slovak Republics, Hungary and Slovenia. This knowledge is comparative in nature (between CEECs and with the EU). The project generated in particular two unique databases by way of field work, the 'CEE subsidiary database' focussed on the relationship between parent, subsidiary, and host economy, and the 'CEE firm-specific productivity determinants database' focussed on machinery, cosmetics, electrotechnical, and furniture manufacturers. The knowledge and databases were generated with a view on providing the necessary knowledge to devise economic policy both at national and EU levels to assist swift catching up of CEECs to West European productivity levels.

The main findings of the project can be summarised in the following points: sectoral specialisation patterns explain some of the productivity gaps in the Slovak Republic, Hungary, and Poland; industrial sectors (*i.e.* a lower technological level in industry) are the most important sources of productivity gaps in all newly acceded countries; specialisation patterns in CEECs' manufacturing industries suggest very different potentials for future productivity growth rates (here, the best prospects are predicted for the Slovak Republic, Slovenia, and Hungary, the worst for Poland and Estonia); in foreign trade, a product-quality-cycle could be identified for vertical intra-industrial trade, where the EU exports products of higher quality and CEECs exports less sophisticated products (restricting catch-up but not technological upgrading); weaknesses in CEEC's national systems of innovation lie mainly in 'broad' (macro-institutional context of innovation) rather than 'narrow' (institutions involved in R&D) systems, and are barriers to future sustainable (*i.e.* technology-led) growth; whilst foreign direct investment plays an important role in technological development in CEECs, the existence of a variety of different kinds of subsidiaries in the region (with respect to the relationship between parent, subsidiary, and host economy) suggests very different potentials for technology transfer, with Hungary and the Slovak Republic containing the largest potentials (albeit due to different reasons), and Slovenia and Poland the lowest potentials; whilst social adaptive capabilities in CEECs in terms of technology transfer have not turned out to be a

critical problem (mainly because it was seriously addressed by foreign investors through training), the domestic firms (as *e.g.* suppliers) in CEECs are considered rather second and third-tier and hence cannot benefit to a large extent unless taken over by a foreign investor; at the firm-level, the most important determinants of lower productivity levels are related to management expertise, in particular networking and strategic planning, and investment intensities; in terms of economic policy, the results suggest that swift productivity catch-up is most efficiently assisted by a rather classical policy-mix of increasing competition (long tail of weak firms), increasing flexibility for intra and inter-sectoral migration, some form of support for investment, in particular into infrastructure, and (management) training programmes with a focus on marketing and strategic management in a modern competitive market economy.

I. EXECUTIVE SUMMARY

Since the demise of socialism, the economies in Central East Europe (CEE) have by-and-large experienced higher income and productivity growth rates as compared to the average of the current EU-15. However, upon integration into the Union, the new members still exhibit sizeable gaps in competitiveness. Measured in terms of average national labour productivity, the gaps in end 2002 range from about 80 *per cent* of the EU-15 average in the Baltic countries, to around 70 *per cent* in Poland, the Czech Republic and Hungary, and to 55 *per cent* Slovenia (value added at current prices per employment and annual average market exchange rates).

CEE countries have been gradually integrated into the European market (Europe agreements), and with their Union membership in May 2004 have been granted full single market status. Additionally, the new EU members received pre-accession financial support in the framework of PHARE, ISPA, and SAPARD before actual membership. Whilst those were largely governed by the EU Commission and mainly geared at institutional integration, the inclusion of CEE economies into EU industrial policy and EU cohesion policy in particular is more devolved to the competence of the member states and has a more pronounced focus on increasing competitiveness and assisting real economy catching up.

The project **'EU Integration and the Prospects for Catch-Up Development in CEECs - The Determinants of the Productivity Gap'** was concerned with establishing knowledge about determinants of lower levels of productivity in the new member states of Central East Europe (CEE).

This knowledge pertains to the most important determinants of aggregate (labour) productivities:

- sectoral structures of specialisation both in domestic production (WP1) and in foreign trade (WP2);
- conditions within National Innovation Systems of CEECs (WP3);
- potentials for technology transfer via foreign direct investment in the regions (WP4);
- absorptive capacities with respect to the transfer of technology via foreign direct investment (WP5);

- deficiencies of manufacturing firms (WP6) in the new member states of Estonia, Poland, the Czech and Slovak Republics, Hungary and Slovenia.

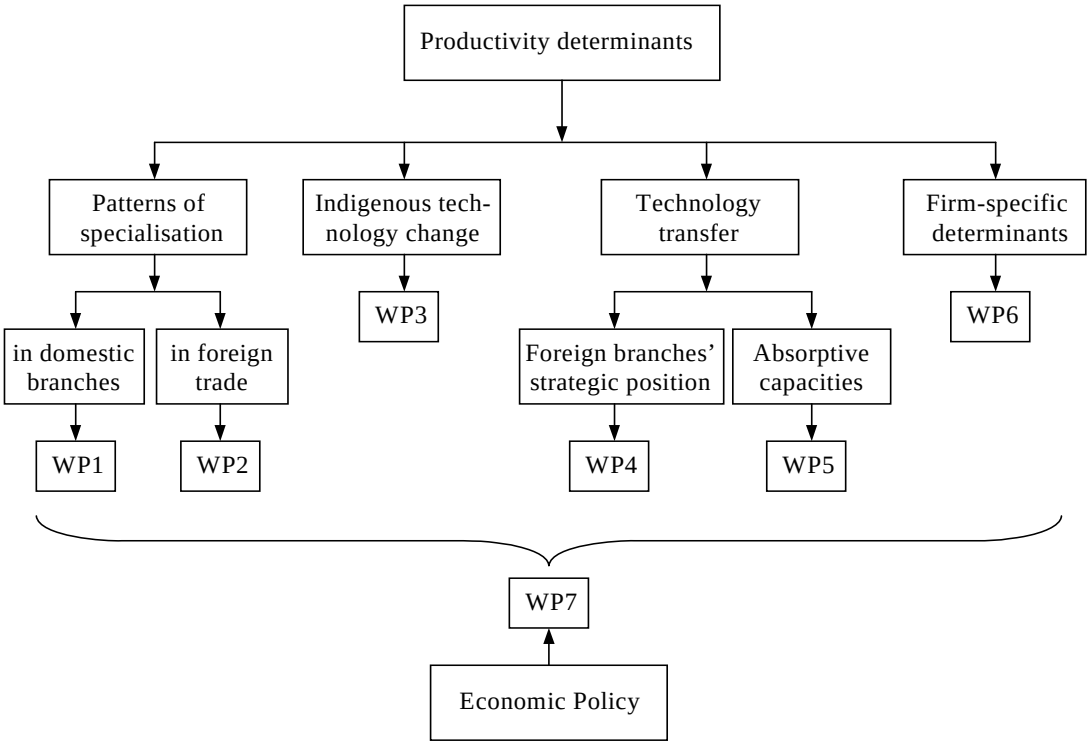
This knowledge is comparative in nature (between CEECs and with EU), *i.e.* in a comparison of newly acceded states with the average EU-15, and in a comparison between the new member states.

The knowledge and databases were generated with a view on providing the necessary knowledge to devise economic policy both at national and EU levels to assist swift catching up of CEECs to West European productivity levels (WP7).

The project generated in particular two unique databases by way of field work, the 'CEE subsidiary database' focussed on the relationship between parent, subsidiary, and host economy (in WP4), and the 'CEE firm-specific productivity determinants database' focussed on machinery, cosmetics, electrotechnical, and furniture manufacturers (in WP6).

The structure of the project along these fields of knowledge is depicted in figure 1.

Figure 1. The workpackage (WP)-structure of the project



Our analysis in the project was able to identify a large set of determinants of productivity gaps *vis-à-vis* West Europe. In terms of economic policy assisting a swift catching up and

closure of the productivity gap, focussing on such determinants would assure efficient policy targeted at the particular conditions prevailing in CEE. The main findings of the project with a bearing on efficient economic policy formulation for CEECs include:

1. Specialisation patterns in domestic production

Research in workpackage 1, conducted by Johannes Stephan, is focussed on establishing the role that sectoral specialisation patterns play in explaining productivity levels (both at the national level and at the level of industry) and their role for future prospects of closing national productivity gaps. The main research questions raised include: (1) What is the role of differing sectoral structures in the new member states in explaining the gaps in national productivity levels *vis-à-vis* the average EU? (2) Do these sectoral differences inhibit catching up of CEECs? (3) What are the prospects for productivity growth in manufacturing industry, if patterns of specialisation are assumed to determine potentials?

Results of analysis into emerging sectoral specialisation patterns suggest that for some new member states, market forces through integration and liberalisation might turn out to produce conditions which are not conducive to swift economic catching up.[1] Political support or intervention could hence be desirable, however, not in the form of enforcing a 'more desirable' sectoral structure. Policy-measures could rather be geared towards assisting sectoral flexibility and change, and could become important determinants in some of the countries' prospects for catching up.

Political intervention supporting flexibility of employment and capital allocation with a view on sectoral change (as called for in the EU's second cohesion report) could prove to be a decisive factor in the cases of the Slovak Republic, Slovenia, and possibly Poland. Those countries' patterns of sectoral structures increasingly imply a limit to the prospects for real convergence (if some degree of path dependency of sectoral structures is assumed at least for the short to medium term). In the case of Hungary, sectoral structures explain a large share of the national productivity gap, yet at variance with the afore-mentioned countries, the country's sectoral content did not increase in recent past. Sectoral patterns appear to be indifferent with respect to catching up prospects in the cases of Estonia and the Czech Republic.

In this respect, CAP, and in particular where this policy takes the form of direct income-support, is most detrimental to the countries' prospects of catching up: we could expect

[1] This has been the result of analysis of effects of specialisation patterns on catch-up prospects and is not an argument of infant industry at the micro or mezzo level.

CAP to retard employment shifts from agriculture to other sectors, mainly (relatively smaller) enterprise-related services. In a scenario where the agricultural sectors remain relatively larger on a long-term basis due to comparative advantages, the method of direct income-support would also be ill-advised: in the new member states where the agricultural sector plays an important role in explaining the national productivity gap (as in the Slovak Republic and Estonia, and possibly Poland), this is paralleled by above-average productivity gaps in this sector. A support of technological advancement could be expected to produce more sustainable comparative advantages as compared to income subsidies.

The industrial sector proved to be the one sector most responsible for national productivity gaps. Hence economic policy could be most efficient if focussed on the qualitative development of industries in the new member states. Industrial support need not however target the relative sizes of industrial sectors in terms of employment, as the new member states typically still have some degree of overmanning in industry. Qualitative development could either support structural change between industrial branches of different technological intensities, or target directly technological and organisational upgrading within industries.[2]

Analysis into industrial specialisation patterns evolving in the course of intensifying integration generated a model projecting future potentials for productivity growth. According to the results, the industrial structures of the Slovak Republic, Slovenia and Hungary are predicted to contain the most favourable prospects for swift productivity growth, whereas Estonia and Poland are ranked at the bottom of the list. Prospected for the Czech Republic are rather ambiguous. In general, however, our analysis leads to expect sectoral adjustment within this sector to actually accelerate productivity catch up: if past trends in sectoral adjustment persist, then adjustment itself will have a positive statistical effect on productivity growth. This however, crucially depends on whether sectoral adjustment will actually benefit those sectors that are associated with above-average productivity growth potentials. If sectoral patterns were rather to evolve to resemble patterns in southern EU cohesion countries, then productivity growth and eventually catch up would be prolonged. This, however, does not suggest that economic policy should step in and promote the growth of particular sectors: first, structures develop according to market interaction and additional supply would not necessarily meet additional demand; second, in terms of the theoretical background, the direction of

[2] Incidentally, such policies can also increase the flexibility of production factors between broad sectors to promote the kind of sectoral change in the countries, for which analysis pointed out the desirability of political intervention for productivity catch-up.

causality runs from technology to sectoral structures: whilst patterns determine prospects, an autonomous change in patterns is unlikely to change technology, that is, only if the emerging structures are sustainable - and this depends on technology advance. So, even faced with an 'unfavourable' development of sectoral structures, economic policy would only be efficient if targeted at the determinants of sectoral change. In the situation of already fully liberalised trade, such an objective could only be met by polices in support of technological development (*e.g.* R&D), technology transfer (*e.g.* FDI), education and training programmes.

2. Specialisation patterns in foreign trade

Research in workpackage 2 is focussed on the relation between trade structures and productivity differences. The perspective is here the increasing dominance of intra-industrial trade (IIT), and particularly, of its both components horizontal (HIIT) and vertical (VIIT) trade. The research was conducted in collaboration between Hubert Gabrisch and Maria-Luigia Segnana.

According to the literature, vertical intra-industrial trade reflects productivity gaps between the same industries, and is explained by the comparative advantages of one side in producing a higher quality of a differentiated good by using advanced technology, physical and human capital. Workpackage 2 tests a model of a product-quality-cycle to assess determinants of vertical and horizontal intra-industrial trade structures.

Analysis of foreign trade identified the prevalence of a quality-product-cycle between the current EU and the new member states: the quality advantage of the EU in mutual trade is overwhelming and appears to still grow as of lately. The main advantage of the new member states was found in costs. Pure reliance on (wage) costs might have been amongst the causal factors or a driving engine behind the emergence of the quality-product-cycle via vertical intra-industrial trade. Such patterns do support technological upgrading. However, catch-up will only occur if technological upgrading in the new member states is in fact faster than in the EU which is not a typical feature of product-cycle patterns. In particular, analysis suggests that strengthening the role of technology policy in the new member states might be more efficient as compared to attracting FDI to overcome this pattern in trade between the integrating partners.

3. National innovation systems and capacities

Specialisation-related analysis in the project identified country-specific factors which might prevent or even hinder productivity and income catch-up. Analysis of workpackage 3 into national innovation systems and their effects on the conditions of the new member states to close the productivity gap follow a different logic. Rather than looking out for conditions possibly detrimental to catching up, analysis searches for the most important factors driving productivity growth through national innovation systems.

The objective of research in this workpackage is to determine and compare the role of R&D in CEECs for productivity levels and growth. The research was conducted by Slavo Radoševic from the UCL. To achieve these objectives, analysis focuses on two separate fields: first, assessment of the determinants of levels of R&D expenditure and employment in individual CEECs. Second, assessment and comparison of the levels of efficiency of R&D in individual CEECs.

The analysis into national innovation systems (NSIs) in CEECs distinguished between 'broad' and 'narrow' NSIs. The results and their interpretation in terms of economic policy also differ between the two distinct systems. The analysis has resulted in several suggestions to change the orientation of economic policy.

The radical reduction of public funding for entrepreneurial and institutional R&D might have been a necessity of transformational recession. However, the identified lack of a coherent long-term policy in restructuring S&T and in particular R&D systems led to insufficient restructuring of industrial R&D. Only the Europeanization process provided some guidance on the reforming of the individual countries' broad NSIs. In fact, the Europeanization process might have had a greater effect on the building of NSIs in CEECs than public policy itself. This opens the opportunity to couple the reinventing of NSIs with the formulation of EU policies for the new member states.

Notwithstanding country-specific differences, the analysis of determinants of broad NSI-development suggests an order of priority for economic policy from demand-determinants, to R&D-incentives, and to technology-diffusion-determinants. In this respect, *e.g.* Slovenia has a smaller gap in R&D and absorptive capacities, whereas Estonia's main strengths lie in demand and diffusion-determinants and weaknesses in R&D. It is important to notice, however, that policy should not follow an exclusive focus on only a sub-sample of these determinants: analysis clearly suggests that innovation is a multidimensional and a multilevel activity. Still, in general, absorptive capacities are currently relatively better than R&D capacities in CEECs. Today, with the demand-

determinants having improved markedly in CEECs, the latter can be considered a particular bottleneck to be targeted by economic policy.

The analysis furthermore established that CEECs have lost some of their advantages in terms of size of R&D which they inherited from the socialist period. In addition, production capabilities (indicated in the analysis by ISO9000 certification) in combination with technological capabilities (size of R&D employment) proved to the most influential determinants of GNP per capita on a macroeconomic level.

Distinguishing between technology-using and technology-developing perspectives in the narrow NSIs, the analysis hence suggests that production capabilities (*i.e.* determinants of firm-specific productivities, hence non-R&D activities) play a dominant role in today's development of CEE-NSIs. At the firm level, improving absorptive capabilities today can accelerate firms' technology adoptive ability. In other words, firms need to make the transition from 'mastery of production' to improved technological capabilities.

In terms of policy, this would require a re-orientation of R&D systems from the current exclusive orientation on knowledge-generation to one that is more focussed on knowledge diffusion as well as absorptive capacities.

Finally, the results suggest that economic recovery in terms of growth did not automatically trigger a likewise recovery of demand for domestic R&D and innovation. Rather, a further condition for improvements in the latter lies with a sound restructuring of both narrow and broad NSIs, functioning financial systems, efficient mediation between supply and demand for R&D and innovation, and with the emergence of public-private and local-global interfaces and interactions.

In conclusion, our analysis points to a gap between production and technology determinants of productivity in CEECs on the one side and innovation policy to support the closure of this gap on the other. Policies that can assist in closing this gap cannot be confined only on narrow NSIs and oriented only towards the generation of new knowledge but also have to embrace knowledge absorption and diffusion functions of R&D systems and could better assist integration of narrow and broad NSIs through effective demand-oriented measures. Due to differing 'innovation constituencies' in each CEEC, NICs reforms, however, cannot follow a simple benchmarking methods in the design of policies. Rather, country-specific gaps and weaknesses need to guide economic policy. Those differences include the share of large enterprises (active in business R&D), MNCs being either active as innovators or more confined to low-cost operations. In terms of causality, the analysis would suggest that a positive role and attitude of the state may facilitate the establishment of innovation policies ahead of the current level of demand

for innovation policy, *i.e.* despite a weak 'innovation constituency'. Equally, the level of innovation policy may be behind the actual or latent demand from enterprises and other organisations.

4. Technology transfer via foreign direct investment

Research in workpackage 4 featured concept-guided field work and analysis of data generated in the 'CEE subsidiary database'. The field work and analysis was conducted individually and yet in a 'concerted action' by the country teams of Estonia, Poland, the Slovak Republic, Hungary, and Slovenia. The field work was conducted by use of an identical questionnaire, translated into the respective languages.

The conceptual framework for the field work was developed by the workpackage consultant Slavo Radoševic, and evolves around the relationship between parent companies, subsidiaries, and the host economy as determinant of the intensity of technology and knowledge transfer. This conceptualisation is derived from the latest additions to the literature on effects of FDI. Each team used their own ideas and comparative strengths to analyse the same database with different questions and hypothesis in mind.

Three preparatory efforts were invested before we started with the analysis of the data generated: first, each country compiled data for a comparative description of the role of FDI in its own country of origin. This was meant to set the agenda for our subsequent analysis; second, the workpackage consultant and Slovenian team, consisting of Boris Majcen and Matija Rojec, assessed the data generated in the form of a descriptive, comparative analysis to serve as an overview over the most important results of the field work; third, the Slovak team, consisting of Tomas Sabol and Vincent Soltes, performed Knowledge Discovery Techniques on the data generated to determine what the pure data can tell us, *i.e.* without imposing any assumptions or theoretical concepts.

The representation of these contribution-summaries starts with the results from the analysis by use of Knowledge Discovery Techniques to analyse the database without imposing any theory or assumptions. This important exercise allows a 'pure' view on the data generated. Following this, the next contribution-summary represents the first analysis of the data generated that actually involves the conceptual framework dedicated to this workpackage. It analyses the relationship between subsidiaries and parents with a view on technology transfer, and maps out particular country, industry, and firm-size effects. The following part invests a more focused view on the autonomy issue and how it relates to other subsidiary-specific determinants of subsidiary development. The description of the Hungarian and German teams try to solve the open issue in the

literature, namely whether autonomy from the patent improves of hinders technology transfer: the analysis of the Hungarian team adds a second dimension (adaptive ability) to the autonomy issue, and the German team classifies the subsidiaries so that an unambiguous answer to the open issue of autonomy and technology transfer can be established. The final representation revisits the autonomy-issue by assessing the largest country-sub-panel in the database: the Polish FIEs.

The Slovak team, consisting of Tomas Sabol and Vincent Soltes, came to the conclusion that the use of data mining techniques in this type of application is a complementary rather than an alternative method to the statistical approach. A combined approach (*i.e.* data mining plus statistical methods), however, bears several benefits. The potential advantages of the data mining approach result from differences between association rules and correlation coefficients:

Correlation coefficients define dependency between variables, association rules define dependencies among concrete values of variables, that means association rules provide more detailed information.

Correlation coefficients are symmetrical, association rules are in general asymmetrical. Association rules can thus provide more insight about how variables influence each other, especially if the relationship is highly asymmetrical, *i.e.* if the confidence for the rule X $\Rightarrow$ Y is significantly different from the confidence for the vice-versa rule Y $\Rightarrow$ X.

Association rules in general associate two or more variables (or strictly speaking between their values), correlation coefficients define relationship only between two variables.

But differences among these approaches can also be evaluated on a more general level: traditional approaches are deductive *i.e.* the researcher formulates a hypothesis (*e.g.* "FIEs where foreign owners have a majority in equity share exhibit higher increases in productivity"). It is then tested whether the collected data are in harmony with the formulated hypothesis or not. However, data mining techniques can support also an inductive approach – one would specify the required minimum confidence and the data mining tool would generate all the association rules with confidence higher than the specify minimum confidence.

In any case, the application of this approach on the CEE subsidiary database would warrant further research, including the testing of other data mining techniques (*i.e.* other than the Apriori algorithm), additional cross-country analysis of the results of data mining, and other statistical methods.

The Estonian team, consisting of consisting of Helena Hannula, Katrin Männik, and Urmas Varblane, conclude that, from the perspective of technology and knowledge transfer through FDI and the innovation potential, neither excessive dependence and/or control by the headquarter nor excessive independence or autonomy from the headquarter is good, especially in CEE countries today. Excessive dependence impedes the potential for increasing the subsidiary's own absorptive capacity and excessive independence might leave the local unit in a circle of "internationally uncompetitive" knowledge. It is even supposed to be good to lose some autonomy and in return being granted access to the kind of knowledge and technology that was missing and parent company-specific. However, today, subsidiaries have to move from knowledge and technology adaptations towards knowledge and technology development. Having own capabilities, the subsidiary could get more mandates over individual business functions and engage into technology and product development co-operation with the parent companies (reverse technology transfer) and the local or host economy. Therefore, being constrained by a shortage of knowledge and technology, subsidiary-managers should strive be more active in their relationship with their headquarters. The relatively low technology autonomy of subsidiaries in CEECs is expected, at this stage of development, to contribute to the intensity of the transfer of knowledge and technology.

From their analysis, the team concludes for economic policy:

The government should provide systematic analysis of the development of foreign subsidiaries, inclusive knowledge and technology level, and should target subsidiary-managers to embrace more active international co-operation in specific business fields.

The government should systematically increase the absorptive and technological capacity of domestic firms and foreign subsidiaries, *e.g.* through human resource, and management capabilities development. This could prove to be decisive especially in specific industrial sectors. Economic policy could additionally target firms' managers to intensify their co-operation (*e.g.* in product and process development) with related industries (this suggestion is related to existing industries);

The government could induce the creation of knowledge and production clusters (indirect effects from more value-giving industries/firms are expected).

The Slovenian team, consisting of Boris Majcen and Matija Rojec, and is focussed on the determinants of productivity growth at the subsidiary level. Their empirical analysis shows that industrial integration through FDI led to considerable increases in productivity, technology and quality, as well as in sales and exports. The regression

models suggest the following conclusions about the productivity growth and control in foreign subsidiaries:

The level of foreign parent companies' overall control and the level of their control of marketing and strategic functions seem to be the most important determinants of productivity growth in foreign subsidiaries in the Slovenian manufacturing. The higher the foreign parent's control overall, as well as of marketing and especially of strategic functions, the higher the productivity growth in subsidiaries. Foreign parent companies seem to seek control of strategic and marketing business functions and leave operational control to subsidiaries themselves.

The pattern of control and productivity growth holds regardless of the inclusion of foreign equity share dummy in the model or not. The level of foreign equity share as such is not a determinant of productivity growth, and foreign equity share does not seem to be an alternative for foreign parent companies' control of marketing and strategic business functions. The control of marketing and strategic business functions is obviously important *per se* and is probably based on factors like technology, marketing and supply channels *etc.* Foreign parent companies are eager to exercise control over marketing and strategic functions, regardless of whether they hold majority or minority equity share. In other words, the level and mechanisms of control of individual business functions seem not to be related to the level of foreign equity share.

The model points to some other determinants of subsidiaries' productivity growth. The first is subsidiary size; large subsidiaries have significantly higher average change in productivity compared to small and medium sized subsidiaries. The second is the proportion of sales to foreign parent company; subsidiaries with higher proportion of sales to foreign parent companies or to other foreign buyers experience higher changes in productivity level. The third is that, in two variants of the model, subsidiaries in high technology intensity sectors exhibit significantly lower change in productivity than subsidiaries in other sectors.

All in all, the more subsidiaries are integrated into foreign parent companies' - marketing and strategic management, and export flows wise - the higher productivity growth they experience. To keep marketing and strategic control in the hands of foreign parent companies seems to be the main determinant of subsidiaries productivity growth. Foreign parent companies are eager to keep marketing and strategic control regardless of the equity share they have.

The results of research by the Slovenian team point to the some policy conclusions:

Industrial integration through FDI led to considerable increases in productivity, technology and quality, as well as in sales and exports. The new EU member states should apply an active policy of FDI inflows promotion, because this will speed up their catching-up process. This policy comprises all the standard FDI promotion tools, as used by the most successful FDI host countries, *e.g.* Ireland, Portugal, Netherlands, Belgium, Czech Republic, Hungary *etc.*

The higher the foreign parent's control overall, as well as of marketing and especially of strategic functions, the higher the productivity growth in subsidiaries. Foreign parent companies seek control of strategic and marketing business functions and leave operational control to subsidiaries. Any attempt of a host country to legally influence the level of foreign parent's strategic and marketing control and/or of foreign equity in foreign subsidiaries may have an adverse effect on the productivity growth of these subsidiaries. None of the analysed countries, however, have or intend to have any restrictions in this regard.

Large subsidiaries have significantly higher average growth in productivity levels compared to small and medium sized subsidiaries. There seems to be a rationale for giving some specific incentives to FDI projects above certain size.

Subsidiaries with a higher proportion of sales to foreign parent companies or to other foreign buyers experience higher productivity growth. Obviously, higher export orientation of subsidiaries and their more intensive integration into foreign parent companies' network bring additional productivity gains. This speaks in favour of stimulating efficiency-seeking (vertical) FDI, *i.e.* FDI projects which are part of foreign parent company's integrated international production strategy.

Subsidiaries in high technology intensity sectors exhibit significantly lower productivity growth than subsidiaries in other sectors. The fact that it is FDI in high-tech industries, which experience the lowest productivity growth, shows that the new member states still lack the necessary elements and appropriate environment for a competitive involvement in high tech industries. Even when it comes to FDI in high tech industries, foreign investors are mostly engaged in the lower-end segments and transfer less than up-to-date technologies, which reduces the impact on productivity growth. It seems that the new EU member states could not rely to a major extent on FDI when attempting to catch-up in technologically advanced industries. Here, endogenous efforts are indispensable. The policy of specific stimulation of FDI in high tech sectors could only be partially successful. The real policy advice would be reform and development in the fields

of education/human resource creation, R&D, innovation *etc.* This would efficiently create a preferable environment for more high-tech FDI in these countries.

All the above policy suggestions should be combined with a policy of strengthening the so-called spillover effects of FDI, *i.e.* of linkages between foreign subsidiaries and domestic enterprises.

The Hungarian team, consisting of Judit Hamar, Attila Béres, and Ádám Mészáros, and in cooperation with Johannes Stephan, developed an innovative taxonomy of subsidiaries in respect to the level of autonomy from parents and the extent of abilities to adapt the foreign technology received from parents to function efficiently in the environment of the host economy. The analysis distinguishes between internal (between parent and subsidiary) and external (between subsidiary and the host economy) technology and knowledge transfer. The analysis of potentials for internal and external technology and knowledge transfer focussed on country-specific differences.

The taxonomy would suggest that the Hungarian FIEs contain quite large potentials for internal technology transfer and display relatively intense adaptation of foreign technology received from their parents. Hence, our Hungarian FIEs are well endowed with conditions for an intense internal dynamic technology transfer between parent and subsidiary (including reverse technology transfer). In our analysis of external technology transfer potentials, however, we established that both material and non-material vertical links to the host economy rather suggest limited potentials for external technology transfer. Only with respect to the sources for finance did our analysis suggest an intense role of the host economy in the operations of foreign investment subsidiaries in Hungary. This could be interpreted to signify what is typically termed a dual economy: well developed and mature subsidiaries, however with little contact to the host economy. Additionally, the share of OPT-kind FIEs appears to be significant in Hungary.

The Estonian and Polish FIEs of the database play a comparatively important role in their host economy, both in forward linking business and the latter country-FIEs also in supplying areas of competitiveness and serving as sources of finance. In the taxonomy, however, both country's FIEs rather featured 'premature autonomy' and inability to adapt the foreign technology to their own needs. In the case of Poland, this is mainly due to the strong market-orientation of FIEs. Therefore, the potentials for external technology transfer would be significant in both countries, if only our FIEs would signal to us larger potentials for internal technology transfer - in their current situation, potentials for technology transfer via FDI subsidiaries are rather low for both countries.

In the case of the Slovenian FIEs, the analysis both suggests rather low potentials for internal technology transfer mainly rooted in the lack in adaptive abilities. At the same time, vertical linkages with the host economy for sales and procurement are comparatively less intense. Only with respect to the non-material linkages supplying areas of competitiveness and FIE-finance could we establish an above-average roles for the country's respective host economies. In total, however, our analysis suggests rather limited potentials for technology and knowledge to diffuse from parent to subsidiary and further on to the host economy.

In the case of the Slovak FIEs, potentials for technology transfer today appear low according to our taxonomy, yet with FIEs maturing, a brighter future might lie ahead. In particular, the conditions for intense dynamic technology transfer between parent and subsidiary in the future are well in place and await their exploitation. In regard to the conditions for high potentials for external technology transfer were results rather mixed: in our analysis of backward and forward linking activities, we established intense networking activities, but also a high share of FIEs fulfilling our criteria for OPT-kind of subsidiaries. The intensity of non-material linkages are likewise rather average across our country-samples. In sum, we have to conclude rather small potentials at this point of time whereas we expect the potentials to rather increase in the future.

For technology transfer via FDI to be particularly intense, advanced foreign technology first has to be installed in the foreign investors' subsidiaries. Only then can technology flow into the rest of the host economy. Hence, in a first step, economic policy can strive to assist subsidiaries to learn how to adapt foreign technology (*e.g.* in programmes matching up networking partners). A high level of adaptive ability turned out to be the most decisive factor for the subsidiary developing along the FIE learning curve. Once up this curve, the subsidiary is then apt to engage into the dynamic form of technology transfer in a two-way interaction between the investor and its local subsidiary.

In the second step, economic policy can try to increase the intensity of technology flowing from foreign subsidiaries to the local economy. Motivating foreign subsidiaries to increase local content could serve this objective. Restricting foreign direct investment below a threshold level of local content, however, works against the market and is hence not efficient: foreign investors can only be successful if allowed to follow the kind of strategy they derive from their analysis of the market. Policies could be targeted at assisting local firms with the kind of networking, technological, and managerial upgrading necessary in business with foreign investors. Additionally, local content need not consist of procurement of semi-finished products, material, or personnel (in particular in the higher qualification bracket), but just as well of business services supplying those areas

of subsidiary-competitiveness, our analysis identified as particularly important across the whole sample of subsidiaries interrogated. Finally, local banks supplying sources of finance could learn from foreign subsidiaries in terms of business plan management and risk assessment strategies. In some cases, this could consist of management education programmes, as potentials are often not sufficiently perceived.

The German team, consisting of Björn Jindra and Johannes Stephan, added another taxonomy-related analysis to allow country-independent analysis of potentials for technology transfer. They conclude:

MNC strategy matters: Subsidiary strategy is a significant determinant of technology transfer independent from country effects. The results show that highly integrated and export oriented FIEs (type III and II) are more likely to achieve productivity growth, and production technology upgrades and to a lesser extent quality improvements. Medium integrated and domestic market oriented subsidiaries (type I) show significant probability to benefit from increased levels of quality. Autonomous subsidiary (type IV) strategy has no positive significant impact on technology transfer. Within group estimations showed that coefficients of the other variables have different significance levels and/or signs depending from the strategy.

Trade as Technology Transfer Channels: Given the general trade patterns of subsidiary type II and III it can be argued that intra-MNC trade has a decisively positive impact on technology transfer. Furthermore, a higher export share for receptive subsidiaries increases productivity as well as quality. Whereas, a higher share of imports increases the likelihood of productivity and technology improvements for type II subsidiaries. Given the fact that Type II and III FIEs have also on average the highest foreign equity shares, it can be argued, that FDI and international trade are complementary rather than substitutes for technology transfer.

Explicit channels for technology transfer via inward FDI or FIE initiative: The evidence shows that all areas of business functions and initiative can work as explicit channels of direct technology transfer. However, most frequently and significant is the direct technology transfer via marketing business functions and questions related to product scope. On the other hand FIE initiative with regard to the general organisation of business functions and technical product development pushes forward FIE development in terms of technology. However, there are significant differences depending on respective subsidiary strategy adopted. For type I subsidiaries marketing business functions are explicit channels for positive technology transfer. The more closely integrated type II subsidiaries benefit in addition to from foreign parents initiative in

product and market scope. The difference might be explained by the export orientation of type II subsidiaries. Interestingly, for the most integrated subsidiaries (type III) dependency has a negative impact on productivity growth and technology upgrades. Low integrated type IV subsidiaries benefit from technology transfer via operational and strategic business functions as well as from parent initiative with regard to product scope.

Dynamics of FIE development: From the perspective of FIE development and somehow simplified stronger foreign parent initiative and co-ordination is required for the group of autonomous subsidiaries. There is still room for stronger foreign parent engagement in medium integrated/export oriented FIEs. On the other hand higher subsidiary initiative and autonomy pays off for receptive FIEs and medium integrated and domestic market oriented subsidiaries (see Figure 9.). Our evidence shows that a differentiated approach to further FIE development depends on the current adopted subsidiary strategy (degree of integration reached), market orientation (export vs. domestic market) and the particular business function and/or area of initiative in question.

The Polish team, including Romuald Niedzielski, Maria Kania, and Krzysztof Malik, conclude that:

A large degree of dependence is observed in the case of investment finance, product price, process engineering and product development. The overall conclusion is that the prices affect the cash flow between the parent and subsidiary. Investment finance is an area included in a range of strategic areas of managing international concerns and is not transferred to subsidiaries.

This confirms the proposition that the dependence on the foreign owner decreases after the period of development of subsidiaries utilised for learning. In conclusion, the process of maturation of subsidiaries is accompanied by the growth of their autonomy and results in the rise of headquarters confidence in the management boards of local subsidiaries. An argument for confirmation of the statement is the fact that subsidiaries of foreign investment enterprises in Poland rarely employ foreign citizens in managerial positions. One fifth of interrogated enterprises declare employment of foreigners as managers or technical specialists.

The rise of areas of enterprise operation imposes the process of delegation of authority, which is indispensable for the effectiveness of the enterprise and is confirmed by the gathered empirical material. The enterprises with more than 10 business lines indicate a relatively higher level of autonomy in all business functions (with the exception of

marketing research). In conclusion, the growth of the number of business lines affects the growth of the autonomy level, which is quite normal.

The participation of national partner produces the need for taking their objectives into consideration. The smaller influence is indicated by the enterprises with minority share of the foreign investor. In this case a form of holding management is encountered, which results in the rise of the range of decentralization. A relatively large participation of local partners encourages the spread of authority to the local environment as the result of spillover effects. In contrast, in the case of subsidiaries with 100 *per cent* foreign ownership, the prospects of know-how diffusion are distinctly limited. Along with the rise of the share of foreign investor ownership in subsidiaries, a possibility of unrestrained control increases. In the conditions of transformation in Poland's circumstances, the partner for foreign investors takes the form of the State Treasury in a majority of cases. The role of the treasury is however restricted to holding shares in FIEs (even if substantial) and to controlling the fulfilment of obligations agreed between the investor and the FIE. In the prospect of five to ten years to follow, depending on conditions of the contract, the Treasury shares are to be sold to the strategic investor. Nevertheless, the presence of national shareholders restricts the autonomy of foreign investors.

Greenfield investment is characterized by larger convergence of structures and behaviours in relation to the parent enterprise, which could be associated with the stronger dependence of subsidiaries on foreign investors in terms of decision making. The Polish group includes a large number of enterprises with 100 *per cent* foreign ownership in capital. The development of greenfield investments is slow due to their character. The headquarters cautiously select local partners in terms of the adaptation to the culture of the corporation. This is later reflected in the submission of subsidiaries in relation to the foreign partner.

Within the group of medium-high technology FIEs, the planning of the majority of business functions is fulfilled by foreign headquarters, in particular in production planning. This results from the protection of investor-specific know-how, the necessity to preserve the investor's technological regime (refer to Ozawa 1979 and Wells 1983), and the centralisation of research activities within the structures of multinational enterprise. The observed phenomenon is associated with a particular disadvantageous feature of capital inflows in the case of the Polish economy, namely the character of FDI for investment. In vestment under the control of foreign investors imposes ready-made solutions with regard to technology and shows strong reluctance to establish more independent research centres in Poland.

5. Productivity and capability in the transition countries

Whilst the previous workpackage used a large-scale field study by sending out questionnaires to a large number of subsidiaries, workpackage 5, concerned with absorptive capacities, used deep-level interviewing techniques on a number of foreign investment parents. This did serve to complement our view on subsidiaries and their development generated in the previous workpackage. Additionally, the research team applied a triangulation technique reviewing results generated in other workpackages and in the wider literature on the topic with their own results. The research team around David Dyker, Katie Higginbottom, Leonardo Iacovone, Niels Kofoed, and Cordula Stolberg, conclude from their analysis of transcripts of interviews and their triangulation exercise:

The experience of FDI in Eastern Europe, as documented through our interviews, provides strong evidence that the East-West productivity gap on main production lines is relatively small, and can be closed quite quickly. That means that, as long as wages in the host countries remain well below West European levels there should be ample scope for further, profitable investments. The triangulation process has thrown up nothing to contradict this conclusion.

The implication is that social capability and technological congruence have not been critical problems on these main production lines.

It should be stressed that these strong conclusions emerge from a set of interviews involving exclusively West-Central European investor-firms and largely East-Central European host countries. It would be dangerous to extend them to the whole transition region. Our global triangulation exercise reinforces this caveat.

Investor companies have invested massive resources in training programmes, ranging from full-time secondments to on-the-job training, sometimes on site in the host country, sometimes back at headquarters. These programmes have covered blue-collar as well as white-collar workers. This suggests that one of the reasons why social capability has not been a critical problem is simply that it has been seriously addressed by the companies involved. This conclusion is generally confirmed by intra-project triangulation, though other WPs do raise doubts as to whether training is a factor which significantly differentiates one firm from another.

The positive experience with main-production-line productivity is not matched by performance in relation to ancillary sectors. Investor-firms have generally struggled to build adequate supply networks in the host countries. Where they have persevered, they

have done so in the face of a stubborn productivity deficit. Given that lead-company programmes for building social capability have been largely restricted to the in-house dimension this is, perhaps, hardly surprising. There is also a hint that technological congruence problems may be much more stubborn once we move beyond the sphere of Fordist and post-Fordist production lines. Whether that is primarily an effect of fear of technological incongruity on the part of investing firms, or of more objective technological factors, remains unclear. The global literature suggests that the latter factor may be the most important, with the impact of FDI on growth in developing countries strongly and inversely correlated with the size of the 'objective' technology gap between home and host country. Comparison with other work packages within the project confirms our overall conclusion here, but urges caution in relation to its generality. Individual country studies reveal wide differences in precise patterns of linkage, possibly related to differences in underlying resource endowments and related differences in corporate strategy.

Investor companies have been eager to exploit local training and R&D facilities, but have done so on an essentially casual basis. Teaching of foreign languages and software development are the only two areas where local educational/research expertise is brought in systematically. The implication is that local human capital formation organisations are not playing the role they ought to be playing in the solution of social capability problems in CEE. This is confirmed by intra-project triangulation.

While investor companies have shown great willingness to help local suppliers to raise their game, they have been short of ideas as to how to actually do it. In practice, help often reduces to simply helping the local supplier to be taken over by another foreign company. This pattern is strongly confirmed by the global literature.

With strong FDI impacts on productivity trends in FIEs and weak impacts elsewhere, the overall effect of FDI on productivity convergence is likely to be mixed. In FDI target sectors, the tendency to convergence, East-West and inter-country, will be strong. Elsewhere, convergence to West European levels will be slow and difficult, and significant differences between individual East European countries will survive into the long term. This mirrors the global experience.

The pattern of supply hierarchy in CEE whereby local companies are largely relegated to the status of second- and third-tier suppliers, with first-tier suppliers usually wholly or partly foreign-owned, is not universally reflected in global experience. Indeed, in China the problem is exactly the opposite – domestically owned first-tier suppliers (in this case to the auto industry) are strong, but second- and third-tier suppliers are weak. This in no

way invalidates our conclusion on CEE, which is strongly supported by other research on CEE. But it does suggest that patterns of strength and weakness in supply hierarchies may be as much a function of specificities in development paths as of any universal developmental tendency. It is noteworthy that the pattern in Portugal has been more like the East European than the Chinese experience.

The global experience strongly confirms the case-study results on the importance of two-way technology transfer, or rather on the reverse technology transfer element within that. It does, however, raise serious questions as to whether reverse technology transfer is a positive factor of host country development.

These conclusions are, in a sense, not surprising. It is not surprising that Czech and Hungarian production-line workers can quite easily be brought up to the standards of German workers, and it is not surprising that companies with shareholders to keep happy are not prepared to take on the job of retraining whole nations. There are, nevertheless, critical problems and gaps in the FDI-driven process of catch-up in Eastern Europe. These problems are as much a function of weaknesses in local infrastructure (especially R&D) as of any shortcomings in the management of major foreign investments. The fact remains that, in the outcome, the countries of Eastern Europe may experience uneven, dualistic development, rather than the smooth convergence to West European levels of development which catch-up theory (in principle) predicts. It is now common in Eastern Europe for levels of productivity and real wages in related sectors to vary by a factor of 2:1 and above, depending on whether the companies in question are foreign- or domestically-owned. This is clearly sub-optimal for the host countries themselves. To the extent that it generates social tensions and ultimately impacts on political stability, it could also significantly change the outlook for further foreign direct investment in this critically important area of the 'new' Europe in ways wholly beyond the control of the firms concerned.

Finally, let us return to the main 'unexpected' result of our interviews. The strategies of the companies we talked to are predominantly global strategies. This does not prove that global strategies are generally dominant among firms investing in CEE, but it does suggest that the global outlook is significantly represented among them. Intra-project triangulation strongly confirms that conclusion.

How is this likely to affect the impact of EU accession on the CEECs? To the extent that multinational investments in the region are cost-driven, and to the extent that enlargement tends to increase real wages in CEE, it will tend to mean a higher degree of onward mobility of investment, which means less FDI in the region. To the extent that

the investments are network-building (if, in principle, on a global scale), the removal of frontier barriers and the (putative) improvement of infrastructure, particularly transport, in the new member-states may swing the balance of effectiveness towards pan-European strategies. To the extent that eastwards enlargement unleashes rapid growth in GDP and a boom in consumption in CEE, and to the extent that the new member-states retain significant peculiarities of taste, specifically CEE strategies may emerge – for the first time – in the case of some consumer-oriented companies. In a word, the net impact on levels of FDI could go either way. In that context, we should be that much more cautious about our assessments of the likely overall impact of FDI on productivity in the new member states.

6. Firm-specific determinants of productivity gap

Workpackage 6 also involved large-scale field work and targeted comparable firms in West and East Germany, Poland, the Czech Republic, and Hungary. The objective of this workpackage is to pinpoint the most important determinants of labour productivity gaps between Central East European firms and West German firms as a benchmark, *i.e.* we assess firm-specific determinants. West German firms are natural benchmarks for CEE firms: showing on average higher levels of labour productivity, they sell on the same integrated European market and have access to the same technology (in as far as this technology is not firm-specific). In Central East Europe, we focussed on Polish, Hungarian and Czech firms. Additionally, we included East German firms in our panel, because the comparison of CEE firms with firms in East Germany yields a picture of what adjustments and developments would have taken place, if CEE firms would have endured a comparable shock-therapy of instant and complete integration of their markets with the West (in our summaries, we use 'country' as a connotation for East and West Germany to simplify the description of analyses and results). Because the data needed to follow our research-objectives is not available in the necessary form, we had to compile an own firm-specific dataset by way of field study.

The analysis of the data generated was organised in a way that each participant applied a different method using the data from each sub-panel. The comparison of results of each participant hence provides more insight than if all partners would have followed the same method.

The representation of contribution-summaries starts with the analysis of the Czech team: here, methods of firm-performance measurement are tested on our dataset. This analysis yields the identification of efficient firms within each country, size, and industry group. This analysis represents the most aggregate analysis of the four teams, and can

serve the workpackage by providing a test of our underlying assumption that we can use the West German firms as a benchmark. Having found sufficient support for this assumption, the second representation of results is that of Johannes Stephan. This analysis applies the method of matching pairs with West German firms as benchmark in the same model specifications across all country, size, and industry groups. Whilst testing all firm-specific determinants of observed productivity gaps and whilst it is able to provide an indication of their relative weight in explaining productivity gaps, this analysis is rather restrictive in terms of implying the same structures in all industry, and size-panels. Hence, part three steps back from the explicit use of West German firms as benchmark and focuses its matching analysis to a comparison between the 'best' performing and the 'worst' performing firms of the industry, and size-panels (*i.e.* irrespective of their country of origin). The description of results of workpackage 6 closes with the analysis of the Hungarian team. In a very comprehensive research, their analysis uses a large variety of different multivariate methods including principle component, factor, discriminant, and regression analysis. The team places some particular additional effort in assessing the role and determinant of process and product innovations. In comparison to the benchmark-version of the matched-pair approach, the latter two analyses provides a more general picture of firm-specific determinants of productivity levels amongst the firms we interrogated, and can hence claim more generality.

The analysis of the **Czech team**, consisting of Petr Fiala and Josef Jablonský, used a Data Envelopment analysis (DEA) several multiple criteria decision making framework. The DEA models compare several usually desired outputs with several inputs that influence the productivity in the negative way. In the first wave of analysis of returned questionnaires (machinery manufacturing and furniture industries) there were taking into account four inputs: total costs, the number of workers, labour costs and floor space available for production processes, and two outputs: turnover of the firm and market share of the most important product of the firm. In the second wave of the survey, cosmetics and electrotechnical industries were analysed. We took into account one output (turnover) and several sets of inputs. In the first set four inputs were considered: total costs, labour costs, the number of workers and the number of management. In the second set we added to the first four inputs another four ones: market share, the value share of the most important product, intensity of networking with customers and suppliers and the intensity of use of modern communication technologies. The correlation coefficients between all the used characteristics and the efficiency scores given by two different DEA models with four and eight inputs are presented in the table below. These coefficients show very weak correlation between the input factors and given efficiency

scores. The turnover is explained mostly by total and labour costs and by the number of people of different categories. The results does not show definitely the impact of used factors on the DEA efficiency score.

Our analyses got a broad spectrum of results according to applied models, analyzed countries, branches and sizes of firms. Specific results generate specific policy implications, but it is not so easy to derive from the results general policy implications. In this report we will interpret only some evident general results. The results from different models evidently demonstrate the productivity gap between the West Germany and the Central and Eastern European countries. In the new EU countries there is also the problem of underinvestment. The new EU countries in comparison with the West Germany have very low relative fixed capital intensity. From applied models result dependencies between the number of workers, qualification of workers and unit labour costs. The policy implications for productivity improvement are expressed by the tendency to replace the quantity by qualification of workers and modernisation of fixed assets. The applied models also confirm the positive impact of modern instruments (networking, Internet, e-business) on productivity in firms.

The analysis by **Johannes Stephan** identified that investment was amongst the most important firm-specific determinant of productivity gaps. Hence, economic policy which would focus on assisting firms by stimulating the propping up and modernisation of their fixed assets would certainly be effective. This becomes particularly important when considering that only in a few cases, we were able to establish a significant role of labour-capital substitution.

Amongst the other firm-specific determinants, we established that weaknesses in the management of firms, so-called 'soft factors', *i.e.* differences in the organisation of production processes and differences in the management of firms (marketing, inadequate market position, networking, *etc.*) account for a large fraction of the productivity gap (see *e.g.* Bellmann/Brussig, 1998; Ragnitz *et al.*, 2000). Whilst economic policy cannot directly influence the management of firms, policy-support for management training can help managers to learn the kind of know-how that is decisive for competitiveness and success at the firm level and to appreciate the benefits associated with a market-oriented management.

In particular, we established that managers in the East on average spend less time on strategic planning. Our experience with previous in-depths case studies in East Germany suggests that the management of manufacturing firms in East Germany is often devoted more to the technical solutions leading up to a project rather than the additionally

decisive determination of the medium to long-term goals of the firm. Hence, strategic planning involving market analysis, process organisation, marketing in general, *etc.* perhaps receive not sufficient consideration.

Other important fields within the 'soft factors' pertain to the intensity of networking and the use of modern technology for communication to assist networking with existing partners and to find and attach new partners to the firm. Whilst these functions can be expected to improve in quantity and quality over time along the typical learning curve of managers in less mature market economies, clearly focussed management training programmes could help to overcome those deficiencies. Networking between firms certainly was an important part of economic life under the planned system, however with a different focus. Today, networking involves more long-term contractual ties that allow managers and investors to overcome some of the uncertainty they are confronted with in an economic system governed by competition on markets with their price mechanisms serving as indicators for demand and supply. Amongst the different networking partners, it is in particular the regular contact with stake-holders other than long-term customers or suppliers that contains large explanatory power. In terms of economic policy this is not only a field for management trainee programmes but rather also points to deficiencies in the supply of enterprise-related services. The low level of development and small size of this sector of the economies in the East could be targeted by economic policy. Next to networking with stake-holders, the intensity of regular and long-term contracting with customers and suppliers is a reflection of management quality and can only be targeted by economic policy in the form of management training programmes.

The use of modern communication technologies might be rather new for managers, yet those technologies are in place and their benefits await to be exploited. Here again, training programmes can be focussed on the use of those technologies to work the market and to bind customers, suppliers and in particular stake-holders to the own firm. Large-scale accessibility of the internet, however, is additionally the responsibility of the national telecommunication firms which as public-goods utility suppliers often remain in some state-control even if only in terms of a state-regulator. Infrastructure-building is additionally an important field for EU structural fund policy which could make an important difference in terms of productivity catch-up at the firm level. Both Email and e-business are internet-based.

When asked about the preferred strategies to weather intensifying competition, firms reacted quite differently across countries: firms in both parts of Germany clearly favoured the cost-reducing strategy related to labour costs. In CEECs, more weight was

attached to introducing new products, and firms have in fact been quite successful in this.

In terms of different strategies to increase productivity levels, firms unambiguously favoured internal, more long-term oriented means like R&D, process and product innovations and externally related means like marketing and networking activities. Surprisingly, finding a foreign investor turned out to be at the bottom of the list.

The analysis of the **Polish team**, consisting of Malgorzata Jakubiak and Anna Wziątek-Kubiak, centres around the matched-pair method. It divides the size, and industry panels into the 'better' performing and the 'worse' performing firms (with the criterion being firms' apparent productivity levels), irrespective of their country of origin. From their analysis, they conclude in terms of economic policy on four distinct fields.

Investment policy: The role of investment in productivity improvement, especially of low productive firms, is crucial. The very low relative fixed capital intensity of the new member states, which is accompanied by low unit labour costs, high intensity of work and exhaustion of the potential to reduce employment are the main arguments supporting the urgent need to stimulate investment in the new member states. This is a prerequisite for moving up the quality ladder and maintaining comparative advantages of lower costs of labour in these countries. Given the hypothesis that the lower the productivity the higher the role of fixed capital intensity in productivity improvement, there is an urgent need to create the environment which will support the increase in the investment rates in these countries.

SME policy: Very low productivity of SMEs of the new member states compared to Germany, as well as very low fixed capital intensity and investment rates, low share of employees improving qualifications, as well as unstable business environments are the main arguments for improvements in SME policy in the new member states. Since most production in the analysed branches is of a labour-intensive character and low labour costs are still a key advantage of the new member states, the low mark-up on wages (especially social security contributions) is of special importance. Another argument for the improvement in SME policy is extremely high differentiation in productivity levels among the SMEs in the samples, suggesting a broad process of squeezing them out of the market in the nearest future.[3]

[3] This hypothesis is based on the assumption that the small firms in the samples produce the same products. However, it is very possible that small firms serve completely different market segments.

Education and training policy: Differences between 'better' and 'worse' firms' sub-samples in the share of employees improving qualifications, reinforce the selection process on the market and have important macroeconomic implications. The lower the level of productivity the smaller the share of personnel upgrading skills. Thus, trainings as a determinant of productivity level influences and will continue to influence the process of selection of firms. If 'better' firms push out 'worse' firms from the market, the problem of unemployed, which does not act to raise qualifications, will grow. Without further training people will, furthermore, stay unemployed, adding to already large structural unemployment in some of the new member states (especially in Poland). The issue of government policy in education and training, especially of workers who are, as our research results reveals, much less involved in education and training than managers, is therefore being pushed high up the agenda. The problem is also related to the Lisbon Strategy.

Regional policy: The differences in productivity levels of rural and urban firms create the need for a policy supporting investment in infrastructure and the development of rural areas.

The **Hungarian team**, consisting of Ilona Cserháti and Tibor Takács, examined the collected data on the selected industries by a variety of different multivariate statistical methods. The objective of this analysis is to identify the areas in which firms in the new member countries still have some way to go in terms of catching up. Their results led them to conclude in terms of economic policy:

The productivity highly depends on the innovation, but the qualification of the employees is an important factor from this point of view. A little bit astonishingly it is even more important among the examined countries than the networking or the application if the ICT, although their importance have also been underlined by the results. It is a remarkable result that in all cases the qualification of the physical workers has a higher importance than that of the management. This means that support for the improvement of qualification is needed in the phase of catch-up. In our opinion both the state and the corporate sector has to provide support and sources for it.

Our examination supported the fact that there is still a definite gap between companies of the earlier East and West Germany, and the productivity gap between the West Germany and the Central and Eastern European countries are even apparent. There is however an exception, namely the cosmetics industry, where the large Polish companies reached, furthermore exceeded the Western productivity level. It is also typical that there are huge differences within the new EU countries. This is explained by the

ownership structure. Large multinational companies have already reached high productivity level, while national companies lagged behind, and this may not change in the future. This has been supported by many other research in the past years. This suggests that the governments of the new EU countries should encourage and stimulate the better co-operation of multinational companies with national ones. This would lead to the raising of the technological level and of the productivity, and this will diminish the dual character of the national economies.

The main factors of the productivity in the presently examined industries are the ULC, the qualification, the accessibility and quality of the railway transport and the IT use. This was also supported by our previous research concerning the furniture industry and the investment goods production. The result suggest that there should be more emphasis on the railway system in the development of the infrastructure, although in Hungary for example the governments consider normally the development of the highway system as a priority.

It is also important that the ICT should be accessible also for smaller companies, and they should be encourage to use it in their business. Although there are several governmental programs for it, the ICT in general not so widespread than in the developed market economies. One of the causes is the relatively high costs and the lack of accessibility of good quality communication lines.

7. Economic policy in the EU and its compatibility with the particular conditions in CEECs

The interpretation of policy implications deducted from research in the project in the framework of a coherent policy approach to the new member states both shortly before and immediately after accession has been the task of workpackage 7. The workpackage was led by Peter Holmes, Xavier Lopez-Gonzalez, Johannes Stephan, and Cordula Stolberg. This task was achieved by assessing EU policies toward the new member states in the light of the results generated by other researchers in the project.

At the most general level, the assessment of EU policies and the results generated in the project suggests that swift productivity catch-up is most efficiently assisted (1) by a rather classical policy-mix of increasing competition (with a view on the long tail of weak firms in CEECs); (2) by increasing flexibility for intra and inter-sectoral migration; (3) by some form of support for investment, in particular into infrastructure; (4) by support, possibly organisation, of (management) training programmes with a focus on marketing and strategic management in a modern competitive market economy.

The general picture emerging from the discussion of horizontal vs sector-specific state aid in CEECs seems to be that in general terms the CEECs have adapted well to the state aid system required by the EU and should not face any major challenges in light of EU accession. Some CEECs however, seem yet to be under-performing in some areas and will have to initiate the necessary changes.

The somewhat technological bias of horizontal EU industrial policy means that lock-in of CEE economies into low-wage comparative advantage is not an issue. Rather on the contrary, technology-oriented bias might -in the worst case- not correspond to existing or (short-term emerging) abilities/capabilities in CEE economies and hence remain less effective than elsewhere or than another kind of policy-bias more in tune with specific CEE-comparative advantages.

This positive evaluation of instruments of EU industrial policy for CEE economies could be complemented with an analysis into the efficiency of deployed resources: what we were able to assess here was whether the instruments as such meet the specific needs in CEE economies, not however, whether alternative uses of resources for those policies could potentially yield larger impacts. Such a policy-evaluation exercise, however, would be beyond the means of this research.

With respect to the individual fields of economic policy, we conclude:

Competition: The new network opens possibilities for using full flexibility of existing EU policies within CEECs (*e.g.* priority for SMEs referred to in treaty but not in Arts 81/82 directly.) What is less clear is whether the decentralisation of enforcement will actually allow this discretion to be used effectively in practice, and the implications are of national courts as well as national agencies being more involved.

The general picture emerging from the discussion of horizontal vs sector-specific state aid in CEECs seems to be that in general terms the CEECs have adapted well to the state aid system required by the EU and should not face any major challenges in light of EU accession. Some CEECs however, seem yet to be under-performing in some areas and will have to initiate the necessary changes.

Industrial Policy: The CEECs are currently mostly subject to the EU rules, and it seems likely that it is the rule based system that has the most to contribute to convergence.

There is little evidence, from CEECs and existing EU, that policy tools that are current available and will lost were major factors for example, in Irish catch up - nor that EU funds were prime cause there: most analysis (including work done at Sussex) suggests that Irish catch up was due to national horizontal policies.

Certainly in the EU-15 a high level of state aids does not seems to be correlated with ability to pick winners, but rather with the political strength or social problems in certain sectors. It leads us to still feel state aids control should still be an aim. But an interesting we must be wary of private actions in this area for the attempting to tilt playing field towards those with ability to pay lawyers

One area where accession and a new policy framework could possibly have an impact relates to technical norms. Accession occurs at a time when the EU is trying to adopt a slightly more devolved approach to for example food safety standards. There is a real risk for CEEC firms and consumers having to pay extra to reduce risk levels below those deemed acceptable. Accession will mean that for the first time the new member states get a vote on the relevant regulations, and will be able to defend national measures before the ECJ. But in practice it seems likely that most tolerated derogations will be upwards

Trade Policy: The candidates will now be inside the EU net. Steel safeguard measures could not longer be applied against them for example. But it is not entirely certain that this is in the long run interest of productivity catch up. EU rules risk leading to (slightly) more protectionism but on the other hand, because measures can only be introduced at EU level, pay off to investing in rent seeking likely to be limited.

The result will be that firms cannot relax on productivity improvement merely by hoping for protection.

Does any of this suggest that enlargement should bring about major changes in EU policy towards industry, whether in terms of what can be done nationally or what should be done at a community level? In terms of the constraints on national policies we would still argue that the virtue of the EU system is that it provides a rule-based framework for economic actors: predictability for investors may well be worth more than discretionary policy powers when political actors are weak, financially constrained or inexperienced. Seabright and Holmes 2000 following Krugman 1987 argue that the tying of hands may be a powerful benefit of EU rules.

At the EU level the introduction of new policies towards industry was subject to unanimity by the Maastricht Treaty. The Community's record in micro economic intervention is not really such as to suggest that its programmes really are the best instruments for promoting catch up.

In total, we conclude that that the biggest contribution to catching up of CEECs is likely to be accession itself, in as much as it will make the consolidation of policy credibility due to the direct effect of EU law and the binding nature of EU law on its members.

II. BACKGROUND AND OBJECTIVES OF THE PROJECT

1. Setting the agenda - the productivity gap

Since the demise of socialism, the Central East European states on which the project focuses (namely Estonia, Poland, the Czech and Slovak Republics, Hungary and Slovenia) have by-and-large experienced higher income and productivity growth rates as compared to the average of the current EU-15, *i.e.* some real convergence can be observed for all countries of our sample.

However, upon integration into the Union, the new members still exhibit sizeable gaps in competitiveness. Measured in terms of average national labour productivity, the gaps in end 2002 range from about 80 *per cent* of the EU-15 average in the Baltic countries, to around 70 *per cent* in Poland, the Czech Republic and Hungary, and to 55 *per cent* Slovenia (value added at current prices per employment and annual average market exchange rates).

Table 1. National labour productivity levels of CEECs in comparison to the average EU-15

	1999		2000		2001		2002	
	in 1000 €	in % of EU-15	in 1000 €	in % of EU-15	in 1000 €	in % of EU-15	in 1000 €	in % of EU-15
Estonia	19.7	47.0	22.1	52.0	24.1	54.5	25.4	51.0
Poland	18.1	40.2	19.8	41.9	21.3	44.1	22.3	44.9
Czech Republic	24.1	53.6	25.5	54.1	27.0	55.8	28.0	56.2
Slovak Republic	23.9	53.1	25.5	54.0	26.9	55.6	28.8	57.8
Hungary	23.7	52.7	25.1	53.2	26.9	55.6	28.3	56.8
Slovenia	27.6	61.3	29.4	62.4	30.9	64.0	32.7	65.6

Notes:PPP-corrected productivity levels, calculated as value added *per* average number of employment.

Sources: EUROSTAT (CRONOS), WIIW, National Statistical Offices.

However, the speed of real convergence was still rather low: (labour) productivity growth

in the average of the six new member states together exceeded the growth rate of the average EU-15 by a mere 2.8 percentage points between 1999 and 2001. This is still much too low to expect the gap to close in the medium term: were the convergence speed to remain constant, the averaged group of new member states would catch up to 100% of the EU-15 level in only 20-25 years. This result, however, is mainly driven by the sheer size and large gap of Poland (Slovenia would in this scenario be able to catch up in less than 10 years, Poland in nearly 30 years). Slow convergence in productivity restrains catch up in wages and earnings.[4]

Those disappointing prospects underscore the role that economic policy assistance can potentially play in those the new member states. To create the necessary knowledge base for the formulation of coherent and effective policy assistance is the overarching objective for research in this project.

Since the early 1990s, CEE countries have been gradually integrated into the European market (Europe agreements), and with their Union membership in May 2004 have been granted full single market status. Additionally, the new EU members received pre-accession financial support in the framework of PHARE, ISPA, and SAPARD before actual membership. Whilst those were largely governed by the EU Commission and mainly geared at institutional integration, the inclusion of CEE economies into EU industrial policy and EU cohesion policy in particular is more devolved to the competence of the member states and has a more pronounced focus on increasing competitiveness and assisting real economy catching up.

2. Specific objectives of the project

The overarching objective of the project is to create the necessary knowledge base for the formulation of coherent and effective policy assistance with a view on the swift closure of productivity gaps.

The research project aims to assess the most important determinants of the gap between levels of productivity between individual new member states in CEECs and the average of the EU (the 'productivity gap'). On the basis of that, the project aims to assess the current approaches to accession and integration policies in terms of their effectiveness.

The overarching objective of the project is the generation of a unique knowledge base on the various determinants of lower levels of productivity in the new member states. The

[4] Needless to say that the results of such a scenario can easily be refuted by empirical evidence: in the right economic framework and with the help of well-targeted economic policies, convergence time can fall drastically as the example of Ireland in the 1990s shows.

determinants assessed comprise macro, meso and even firm-level explanations for the productivity gap.

This newly generated knowledge was compiled with a view on the management of the accession process. Accession policy, negotiations, pre-accession strategies and EU financial and technical assistance to the candidate countries was based on a knowledge base which was heavily biased towards the issues of institutional integration. Implicitly, this approach assumed that a complete closure of the gap is possible. The unique sets of data generated in this project enabled us not only to understand much better the relevant factors which generate and which may reduce productivity gaps between individual CEECs and the EU, but also the restricting factors for a complete closure of the gap. This allowed us to suggest new weights and objectives for policy-interventions that take into account the need to address sources of productivity gap next to the institutional integration *per se*.

The objectives directly relate to the demands specified in the second call for the key action 'Improving the socio-economic knowledge base', task 7 'The challenge of EU Enlargement' and specify what the call text names in general terms "a better understanding of the dynamics of the enlargement process to create a sound basis for policy making" as the overriding objective of this research task.

3. Specific benefits of the project

The benefits that arises from the availability of the newly generated knowledge base in this research project and the assessment of the accession process are twofold. The first benefit lies in the improvement in understanding of the conditions pertaining, and changes taking place in the new member economies. This applies in particular to the determinants of the productivity gap, as well as their influence on the prospects for a closure of this productivity gap in each new member state. Second, the knowledge base generated in the project is essential for designing effective economic policy assisting swift catch-up.

Additional benefits of the project can arise from mainly two aspects: first, inclusion of participants from the new member states supported the mobilisation of the European social science research community and the enlargement of research networks towards the East. The project achieved this by granting a particular weight (in terms of personnel and finance) to co-operation partners in the new member states and by involving all participants in the proceedings of all topics of research. The second benefit was expected to arise from the establishment of the system of a User Panel for the project. This group in fact involves representatives of policy decision makers in the new members and West

Europe, of industry and of their associations. Whilst we were able to engage in a dialogue between the research and policy community, this dialogue was rather infrequent and discontinuous. Mainly, this is the result of most candidates for the User Panel expressing their reservations against being associated with a research community and their policy-relevant suggestions over which they naturally have no control. The most influential contacts with Users was established with the Estonian and French governments. Those contacts led to official publications using, listing, discussing.

4. Strategic impacts in terms of key challenges of the EU

One of the key challenges of the EU in respect of EU Eastern enlargement and economic cohesion between East and West is the formulation of a coherent integration, development and accession strategy. In terms of the EU-goal of 'economic cohesion', integration of these new member states will eventually have to result in their catching up to levels of economic development predominant in existing EU members. Significant differences amongst existing members exist, and it remains unclear today not only whether the majority of newly acceded countries will persistently stagnate at low levels. It is also likely that some new member states will experience swifter progress in comparison to others. It proved to be of particular importance to the aims of the project to be able to assess the factors behind existing and possibly emerging country differences. Whilst some differences between the EU and individual new member states might always remain, the EU will only be able to profit from enlargement in terms of economic benefits, if the new members can actively participate in competition within the enlarged new market. In the adverse case, considerable transfer-costs (*e.g.* Common Agricultural Policy and structural and cohesion funds) will question the viability of the latest round of enlargement and possible future enlargements (Bulgaria, Romania, Croatia, Turkey).

Due to the focus on the aim of generation of relevant knowledge on conditions prevailing and emerging in the new members states, this research project produce most relevant results to this key challenge of the EU. Such insights increased our understanding of the dynamics of the integration process and created the necessary sound basis for policy making and policy evaluation. The project therefore contributed to providing the necessary knowledge for an efficient and effective management of the enlargement and in particular the integration processes, indispensable for economic policy makers in both the EU and the new member states.

The project pinpointed areas where economic policy could be effective in terms of assisting the closure of the productivity gap. It also identified other areas of potential

intervention, where policy would have either been ineffective or even counter-productive with respect to the aim of a swift closure of the productivity gaps. Due to the high level of disaggregation of research, such policy suggestions have been sought at specific industries and branches; due to the comparative nature of the project whereby each new member states was analysed in a parallel manner with the same questions asked and the same models and methods applied, these policy suggestions were developed at national as well as European levels.

III. SCIENTIFIC DESCRIPTION OF PROJECT RESULTS AND METHODOLOGY

The following part is dedictated to the summaries of research produced in the project during it's three year duration. The extents to which results were 'cut to size' differ between workpackages: such involving research by a single team or researcher (WPs 1, 2, 3, 5) have been summarised on 10 to 15 pages. Research involving field work in a set of teams engaged in research within their own region (WPs 4 and 6) obviously assume more space with each team having been restricted to up to 10 pages. The summary of WP 4 is additionally preceeded with a 16 page summary of comparative description of the role of FDI each partner compiled for its own country of origin. The summary of workpackage 7, the policy-workpackage, is naturally more comprehensive, and due to its largely non-empirical nature, did not lend itself to a rigorous condensation. Its description hence assumes a larger part in this report.

The workpackage-summaries are presented here in the order of their consecutive numbering, and starts with specialisation patterns, national inovation systems, technology transfer via FDI, absorptive capacities, firms-specific determinants, and finally ends with the policy-workpackage.

1. Workpackage 1

Evolving patterns of specialisation and European division of labour - branch specialisation in domestic production

Research in **workpackage 1** is structured in two main parts, one on sectoral and one on industrial specialisation patterns. The method of analysis is empirical, we use available statistics to assess research questions relevant to the analysis of the determinants of the productivity gap. The research was conducted by Johannes Stephan from the IWH.

The main research questions raised include:

- What is the role of differing sectoral structures in the new member states in explaining the gaps in national productivity levels *vis-à-vis* the average EU?
- Do these sectoral differences inhibit catching up of CEECs?
- What are the prospects for productivity growth in manufacturing industry, if patterns of specialisation are assumed to determine potentials?

1.1. The sectoral contents of the national productivity gap

The idea guiding research into the role played by sectoral patterns for an explanation of the national productivity gap is two-fold: first, intuition would suggest that productivity differences are mainly rooted in the new member states' firms commanding less sophisticated technologies as compared to such in the EU. However, national productivities (as averages over all branches in the economies assessed) can differ between two countries even if technology, management and organisational expertise and other non-structural determinants are exactly alike in both countries: sectoral or branch-specific levels of productivity differ, so that average, economy-wide productivity levels depend on the relative weights of branches with above- and below-average sectoral or branch-specific productivity levels. We therefore expect some explanatory power for the productivity gaps to lie with sectoral structures as country-specific features.

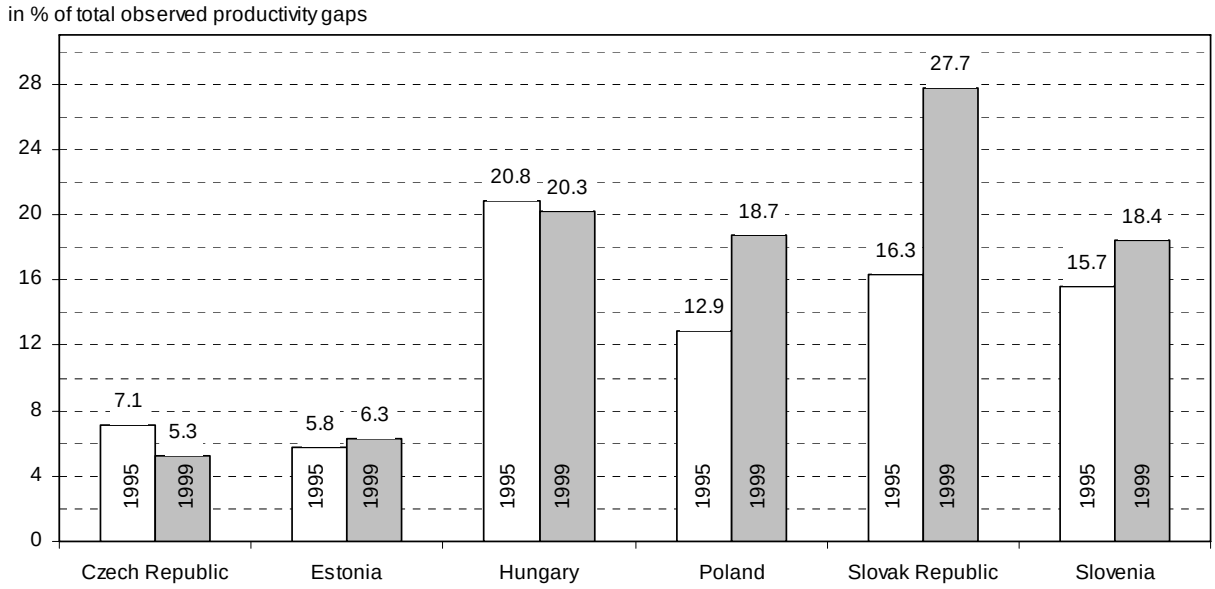
Second, assuming some degree of path dependency in sectoral patterns, the emerging international/European division of labour can limit the scope for complete catch-up: as integration deepens, technology and skills in CEECs will improve, institutions will be reformed to match the ones in the EU (via the *acquis communautaire*), but sectoral structures might well remain rigid and if weights of below-average productivity branches remain higher than in the EU-15, then this pattern can limit real economy convergence. In its second report on economic cohesion[5], the *EU Commission* takes the opinion that sectoral structures in candidate countries will prove to be decisive in a process of real economy convergence. The report suggests to target EU cohesion policies prominently towards the intermediate aim of structural change.

The first step of sectoral analysis attempts to determine the "sectoral contents" of productivity gaps between individual new member states and the average EU-15 levels in 1995 and 1999. Chart WP 1.1. depicts such sectoral contents in observed total productivity gaps for 1995 and 1999. The most prominent results are the following:

- The explanatory powers of sectoral structures for the sizes of productivity gaps are very different amongst the selection of transition economies and between the two years of observation (*e.g.* had the Slovak Republic had the same sectoral employment pattern as the economic region of the EU-15 in end 1999, then the productivity gap would have amounted to some 14 percentage points lower than is the case with the current pattern).

[5] EU (2001), Second report on Economic and Social Cohesion: Unity, solidarity, diversity for Europe, its people and its territory, EU Commission, Brussels.

Chart 1. The sectoral content of the national productivity gaps of CEECs *vis-à-vis* the EU-15



Sources: EUROSTAT (CRONOS), WIIW database, National Statistical Offices of new member states and EU member states, own calculations.

- In 1999, the sectoral content is highest in the Slovak Republic and amounts to a share of nearly 28% in the observed productivity gap. The gaps of Hungary, Poland and Slovenia in 1999 can also be explained to a large extent (around 20%) by their respective sectoral patterns whilst the sectoral determinant does not contribute significantly to explaining the productivity gaps of Estonia and the Czech Republic *vis-à-vis* the EU (some 5-6%). The result for the latter countries incidentally corresponds to the sectoral content of the productivity gap between East and West Germany.

- In the case of Poland, the results have to be interpreted with caution: most of the sectoral content calculated might be due to a particular empirical distortion in the agricultural employment share of nearly 28%. When assuming an agricultural employment share comparable to the methodology applied in other transition economies, *i.e.* a much lower share yet still significantly higher than in other transition economies, then the sectoral content would become negligible. Poland would then rank amongst the group with Estonia and the Czech Republic. The high sectoral content therefore is driven overwhelmingly by the large employment share in the agricultural sector.

What are the main driving sources of the sectoral contents of the other countries?

In the Slovak Republic, enterprise-related services employ only one third of the level for the EU-15 average. This sector, however, has a particularly high level of intrinsic productivity: here, it is, on average, nearly 4 times the national average. The comparatively high growth of the sectoral content between 1995 and 1999 cannot be explained by employment shifts between sectors only, employment shares did not change that much. Rather, sectoral productivities grew particularly fast in enterprise-related services, *i.e.* the sectors which drive the high level of the sectoral content.

- In the case of Hungary, the high share of the sectoral determinant of the productivity gap can be explained by, again a low share in enterprise-related services, and additionally much higher employment shares in the agriculture and industrial sectors. In particular the former sector exhibits well below-average productivities in Hungary. Since 1995, employment shares of enterprise-related services have grown slightly at the expense of the sector of public administration.

- Also in Slovenia can the high sectoral determinant mainly be accounted for by a low share of employment in enterprise-related services and a comparatively higher share in industry. This share however, has been falling slightly while the employment share of public administration has grown.

Where those sectoral contents are significant in size, do the associated sectoral differences inhibit catching up of CEECs? Are the differences disadvantageous?

Integration theory remains undetermined in respect to evolving structural patterns and their effects on the conditions of economic development (Clark[6] *versus* path dependency). The Clark-concept is typically a very long-term effect of sectoral convergence of gradually maturing market economies and exceeds the time-scope of analysis in this assessment. In the shorter term, more relevant for the analysis here, the theory of comparative advantages predicts international specialisation emerging according to patterns of comparative advantages. In this case, evolving structures will persist for some time, giving rise to path dependency in the process of catch-up development.

The assumption underlying this analysis is that sectoral patterns in CEECs to some extent reflect country-specific features which might not vanish swiftly or might even develop some hysteresis during the adjustment process. Given this assumption, the analysis yields another dimension.

[6] C. Clark (1940), *The Conditions of Economic Progress*. London: Macmillan.

- In the cases of the Slovak Republic, Poland and to a minor extent in Slovenia, the sectoral contents of productivity gaps have increased significantly. If emerging sectoral patterns persist or even get more pronounced, then complete productivity convergence is inconceivable in those countries even after catch up of all other determinants of lower levels of productivity. Moreover, given her high level of unemployment, the country might not even be able to surpass the threshold of 75% of average EU-15 GDP *per capita* income in the medium term, this only due to her sectoral patterns. In such a scenario, EU Cohesion policy without consideration of sectoral structures would be inefficient for the objective of GDP *per capita* convergence. In the case of Hungary, a similar result may also apply due to the high value of the sectoral content. In those cases, the opinion taken by the *EU Commission* in its second cohesion report with respect to the necessity of employment shifts between sectors appears to be well founded.

- Only in the cases of the Czech Republic and Estonia do sectoral patterns not appear to be of a convergence-limiting kind.

1.2. The role of sectors in explaining the productivity gaps

So far, sectoral analysis was concerned with the sectoral content of the productivity gap across the whole economy. That is, analysis took into consideration sectoral specialisation patterns while not assessing levels of productivity of individual sectors. In the following, we try to assess: what role do individual sectors play in explaining national productivity gaps?

If CEECs apply in general less sophisticated technology in production, then one can expect that comparative sectors in CEECs exhibit lower levels of productivities than in the EU. Such sectoral productivity gaps are not only significantly different in size but also in their relative weights within each economy assessed. Table 2. WP 1.1 provides an account of explanatory powers of individual sectors as a source of national productivity gaps for the selection of CEECs at the end of the year 1999.

- The most obvious result of this analysis is that in all transformation economies assessed, the producing sectors of industry (C+D+E) are mainly responsible for national productivity gaps: they exhibit the highest values of the indicator (solely in the case of Poland, the agricultural sector is the quantitatively strongest source of the national productivity gap[7]).

[7] This result is driven by the above methodological difference of data on employment. Assuming again the corrected employment share, the agricultural sector would be placed behind household-related services (trade,

- The public administration sector (L - O)[8], the second most important source of national productivity gaps in this sample, will tend to be inflated in terms of employment in formerly socialist economies. This overmanning can, however, be expected to diminish gradually in the course of restructuring of these sectors. In the case of Hungary, nearly equal shares can be allocated to this sector as to the industrial sectors. In fact, the analysis would have ranked the public administration sector as the most important source for the national productivity gap up until 1997.

- The role played by household-related services (G+H+I) is probably more due to a price effect than a question of efficient allocation of resources. Typically, household-related services are not internationally tradable. With rising income and wealth, prices for such services will tend to increase, narrowing the sectoral productivity gap and the sector's role in the national productivity gap.

- Enterprise-related services (J+K) are to some extent tradable; in particular financial services are well integrated with the West. Intensity of competition is high, hence, productivity gaps are low. Prices for the non-tradable part of enterprise-related services (mainly to be found in real estate, renting and business activities, K) will tend to be lower due to the same reason as with household-related services and do not count as technology-intensive.

transport and communication) in the list. The industrial sectors would then advance to the top of the list just as in the other countries assessed.

[8] The calculation of levels of productivity in the services sectors in general and the state administration sector in particular is methodologically problematic due to the determination of prices and output. Results therefore have to be interpreted with due care.

Table 2. The ranking of most influential sectors as a source of the productivity gap, in end 1999

Estonia		Poland		Czech Republic		Slovak Republic		Hungary		Slovenia	
Sector	$\tilde{\pi}^i$	Sector	$\tilde{\pi}^i$	Sector	$\tilde{\pi}^i$	Sector	$\tilde{\pi}^i$	Sector	$\tilde{\pi}^i$	Sector	$\tilde{\pi}^i$
C+D+E	**31.9**	A+B	**40.6**	C+D+E	**39.2**	C+D+E	**38.1**	C+D+E	**34.5**	C+D+E	**51.5**
L - O	25.9	C+D+E	23.5	L - O	20.7	L - O	**29.2**	L - O	**32.1**	G+H+I	20.1
G+H+I	19.7	L - O	14.8	G+H+I	20.3	G+H+I	14.4	G+H+I	20.6	L - O	12.7
A+B	8.2	G+H+I	12.2	J+K	11.5	F	10.1	F	7.1	F	7.4
F	7.3	J+K	5.8	F	6.3	A+B	8.4	A+B	4.7	J+K	6.4
J+K	7.0	F	3.0	A+B	2.0	J+K	0.0	J+K	1.0	A+B	1.9

Notes: Share of sectoral productivity gaps, weighted by employment shares, as a fraction of the sum of all weighted sectoral productivity gaps.

Classification of sectors according to ISIC, rev. 3 nomenclature, with: A+B...Agriculture, hunting, forestry and fishing; C+D+E...industrial sectors; F...construction; G+H+I...household-related services; J+K...enterprise-related services; L - O...public administration sectors (defence; social security; education; health, social work; private households with employed persons).

Sources:EUROSTAT (CRONOS), WIIW database, National Statistical Offices of the new member states and EU member states, own calculations.

- Given this assessment of results, the analysis indicates that in the new member states, potentials for a closure of the productivity gap today predominantly lie with efficiency-improvements in industry. Indeed, industrial productivity gaps have been falling during the period of analysis in Slovenia, Estonia and Hungary but not significantly in the Czech and Slovak Republics and Poland. Given the demonstrated dominant role of industry in real economy convergence, this result suggests that the greatest shortcomings in the respective growth paths are to be found here. In the cases of Hungary and the Slovak Republic, and to a lesser extent in all other new member states, future productivity increases also depend to a high degree on a reduction of historical overmanning in public administration. Productivity gaps in

this sector diminished in all new member states; only in the case of the Czech Republic was this improvement negligible.

- Not in all sectors have levels of sectoral productivities converged: significant increases in sectoral productivity gaps mainly occurred in the agricultural sectors of Hungary (10 percentage points), Poland (4.7) and the Slovak Republic (3.9). In all those countries, the employment share of agriculture has been falling slightly and can be expected to continue to fall, so that the role of this sector in determining the national productivity gap might also diminish slowly.

- Economic policy in CEECs could in general be most efficient in closing the productivity gap, if focussed on industry. It however remains open whether industrial productivity growth can most efficiently be supported by structural change between industrial branches, or by technological and organisational upgrading. Foreign direct investment, closer ties in production, innovation and marketing networks spreading across the West and the member states, improvement of infrastructure as well as financial support and integration of firm-R&D and universities are the typical and well tested political measures in the latter field. Not least, such policies can also increase the flexibility of production factors to promote the kind of sectoral change in the countries, this analysis pointed out as necessary for complete productivity catch-up in a foreseeable time-frame. In respect to the structural change between industrial branches, the second part of analysis in workpackage 1 assesses the role of structural specialisation in industry for productivity catch-up.

1.3. The prospects for productivity catch-up in manufacturing industries

The second part of analysis in workpackage 1 focuses on specialisation structures in industry: what are the prospects for productivity growth in manufacturing industry, if patterns of specialisation are assumed to determine potentials?

The structural composition of manufacturing industry determines productivity growth during integration through two interactive channels: first, structures change in the course of economic integration. This is an aggregate effect of product or branch-differentiated firm entry and exit adjustment processes triggered by intensifying competition. This can be thought of as a Schumpeterian process of creative destruction. Second, average aggregate productivity growth from sources rooting in existing and efficiency-improving firms, like technology transfer and implementation, R&D, innovation and cost-rationalisation, also depends on structural patterns: the more firms in any given industry which belong to a class with typically high potentials for productivity growth, the larger is

the base for productivity growth, the wider the potential. This can be thought of as a process of technological advancement, in the case of CEECs predominantly technological catch-up.

The analysis inductively generates an empirical model of past productivity growth determined by specialisation-patterns and the respective productivity gaps. This model is then used to estimate future prospects for productivity growth and catch up in the countries assessed (out-of-sample predictions). The model uses industrial specialisation patterns, a source of productivity growth close to the neo-classical 'natural rate', and one derived from "advantages of backwardness" [9] to predict potentials. For the future development of specialisation patterns, several scenarios have been assessed, to test the robustness of the model.

The model attempts to determine a relationship between the branch-structure of manufacturing industries, the extend of backwardness and average industrial productivity growth. The theoretical model in formal form reads:

$$\pi^i = f\left(Specialisation\ patterns^i\right) * PG^{EU/i} \quad (1)$$

This relationship was determined inductively by way of a simple linear pooled least squares regression model (OLS). The empirical model reads:

$$\ln\left(\frac{\pi^i}{PG^{EU/i}}\right) = C^i + \beta_1 \ln class\,1^i + \beta_2 \ln class\,2^i + ... + \beta_n \ln class\,n^i + \varepsilon^i \quad (2)$$

The independent variables take the form of shares of employment in various manufacturing classes, namely a labour intensive class (LI), a capital intensive class (CI), a marketing intensive class (MI), a technology intensive class (TI), and two classes signified by their qualification intensity of personnel (low: lQI and high: hQI). The dependent variable is the backwardness-corrected manufacturing productivity growth.

All variables were included in a logarithmic form to allow interpretation of coefficients as elasticities. The results of this exercise were then used to estimate future potentials for productivity growth in new member states as projections. The estimations in four scenarios have now clearly become more robust, yet the results of the out-of-sample estimation of productivity growth potentials turned out to be quite similar to the ones generated by the first model-specification.

[9] Available technology can be implemented via imitation. Backward countries have the advantage of being able to improve their performance without having to invest into own innovations. See A. Gerschenkron (1962), *Economic Backwardness in Historical Perspective: a Book of Essays*, Cambridge (Mass.), Belknap Press of Harvard University Press, or product cycle theories.

Table 3. Results of the regression analysis

		Explanatory variables								
	N	ln LI	ln CI	ln MI	ln TI	ln lQI	ln hQI	constant	R^2	adjust. R^2
1	72	-1.30*	-0.64*	-2.23*	-0.21	-0.63*	-0.10	16.52*	0.82	0.81
		(-8.30)	(-7.17)	(-9.93)	(-1.56)	(-6.51)	(-1.26)	(9.40)		
2	72	-0.52*		-1.12*	0.31*	-0.50*	0.10	6.71*	0.68	0.65
		(-4.17)		(-6.30)	(2.45)	(-3.94)	(1.00)	(5.65)		
3	72	-0.59*		-1.11*	0.24*	-0.57*		7.46*	0.67	0.65
		(-6.30)		(-6.88)	(2.18)	(-5.77)		(11.09)		

Notes: Dependent variables in all regressions are the logs of backwardness-corrected manufacturing labour productivity growth.

Coefficients market * are significant at least at the 5 *per cent* error probability.

T-ratios are provided in subscripted parentheses.

Three regressions were conducted and are reported in table 3. The steps of regression exercises were conducted to arrive at an empirical model that matches our intuition and includes only those explanatory variables whose coefficients are statistically significant at least at the 5 *per cent* error probability. Regression no. 3 fulfilled those conditions and includes the variables of labour intensity, marketing intensity, technology-intensity, and low-qualification intensity branches. The explanatory power of the regression model reaches a comfortable level around 70 *per cent*, and when considering that the pool-regression was conducted between a sample of transition economies from Central East Europe and West European cohesion countries, the results seem robust enough to warrant further exploration.

Future structural patterns are calculated in four different scenarios. The first, scenario A, represents what the resource-based view on specialisation would suggest: past trends in structural change between the four classes are extrapolated into the future by way of a logarithmical trend analysis. This assumes that structural adjustment is more intense at the outset of integration and gradually abates with deepening real economy integration. Scenario B assumes that the patterns of specialisation as they have emerged nearly one decade after integration began represent final patterns - no further changes are made to

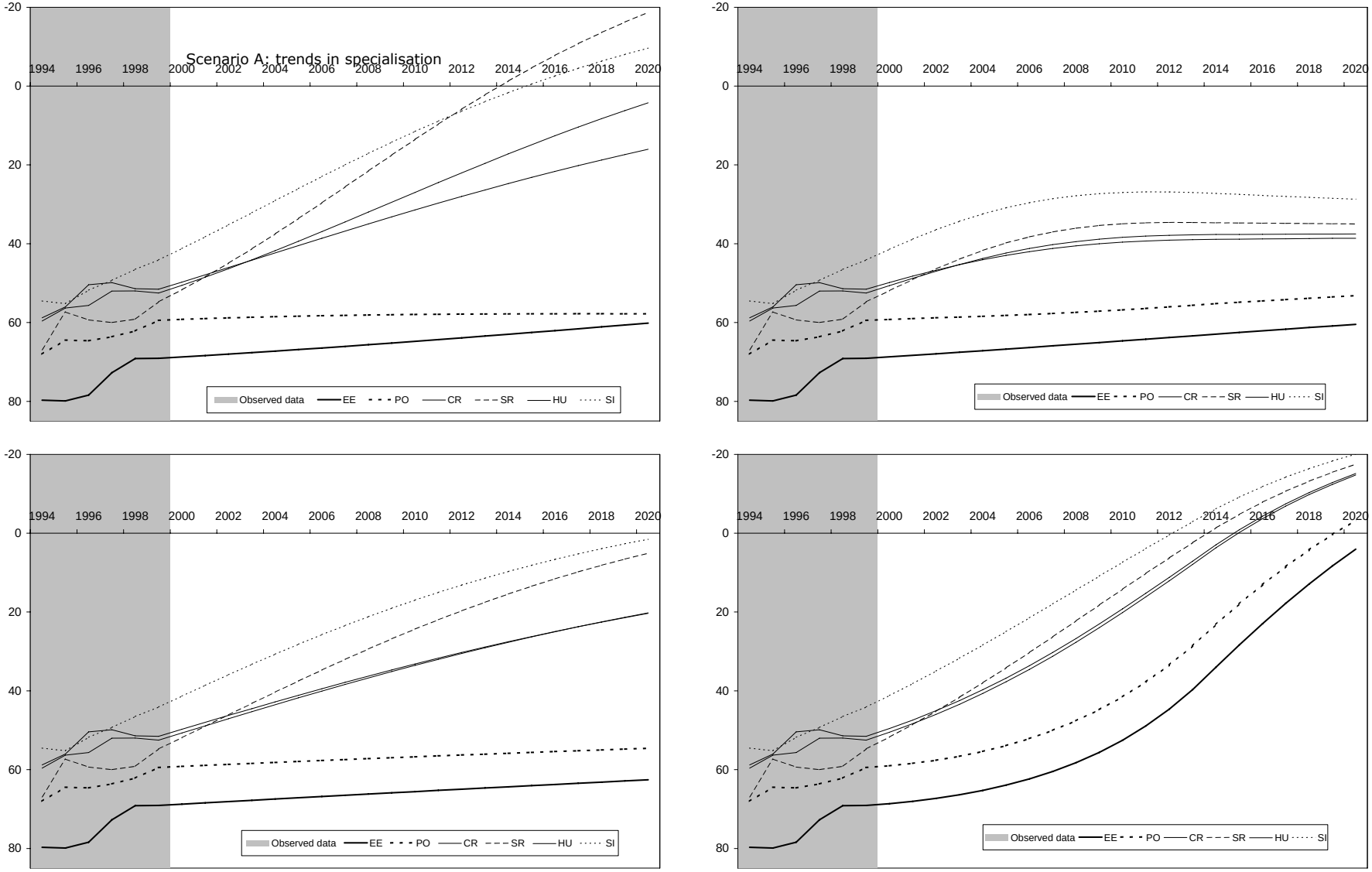
the sizes of class shares here. Scenarios C and D assume structural convergence scenarios: it is perceivable that in line with technological catching up, the industries of new member states will engage in the kind of intra-industrial trade typical for the industries of most member states. In scenario C, the structural patterns of new member states by 2014 converge to the patterns that prevailed in EU cohesion countries some decade after their own individual EU membership. This scenario is motivated by the fact that both groups of countries share common productivity gaps during their respective times of accession, they also share their main comparative advantage of lower labour (unit) costs. Finally, scenario D assumes that structural patterns in new member states will converge to patterns observed today in Germany. Despite the fact that this last version can be held to be the least realistic, it does help to put the results of the other scenarios into perspective. For both convergence scenarios, the convergence paths were estimated by use of a polynomic trend analysis to the power of three.

Charts 2.. plot the resulting developments of manufacturing productivity levels for each scenario in *per cent* levels of the EU-15 average (to estimate future EU-15 average manufacturing productivity levels, a constant annual rate of growth of 2.77 *per cent* was applied; this rate corresponds to the observed average growth rate in the period 1994 to 1999).

The most important results to be highlighted pertain to scenario A, because, according to the resource-based concept, this is the most likely outcome of structural adjustment. If structural trends of the past were to persist into the short to medium term future, then Poland and Estonia are projected to achieve the lowest manufacturing productivity growth, resulting in Poland in fact in near-stagnation of the productivity gap. The Slovak and Slovenian manufacturing sectors on the other extreme are projected to achieve the highest productivity growth rates, *i.e.* the fastest productivity convergence (by 2014 and 2015). Prospects in Hungary and the Czech Republic are slightly less favourable yet much better than for Estonia and Poland with productivity convergence to 75 *per cent* of the EU-15 average manufacturing productivity level as early as by the years of 2009 and 2011 respectively.

The results in scenario B are comparable to the ones of scenario A, albeit less pronounced: apparently, (or estimation of) the direction and intensity of future trends of sectoral change within the Slovak and Hungarian manufacturing sectors serve to improve the prospects of productivity catch up much more than is the case for Slovenian and Czech manufacturing respectively. The results for Poland remain unchanged, whereas the prospects for Estonia improve with future sectoral change.

Chart 2. Projections of future manufacturing productivity growth potentials, in gaps as *per cent* of average EU-15 levels



Between all scenarios, projected growth rates are highest in the 'convergence to Germany' scenario D. This is not surprising, because in particular technology-intensive branches exhibit much smaller shares in the new member states as compared to the German pattern: the shares of technology intensive branches would grow at the expense of all other branches, in particular low qualification branches. Only in the case of the Slovak Republic are rates for scenario D not higher than in other scenarios, which is of course due to the fact that past trends let structural patterns in the Slovak Republic come closer to the ones in Germany, extrapolation of past trends already describes a path of structural convergence. The countries that would benefit most in terms of our model here from structures converging to such in Germany would be Estonia and Poland. All countries assessed with the notable exception of Estonia are projected to catch up completely by 2020, Estonia only a couple of years later.

Also of little surprise are the results for scenario C, the 'convergence to cohesion countries' scenario: all countries (bar Poland) are projected less favourable prospects if structural patterns of today were to converge to patterns that prevailed in EU cohesion countries some decade after their own individual membership in the European Union. Apparently, structural patterns in the new member states are already, in terms of our model, more preferable than in EU cohesion countries after most profound structural adjustments via integration were complete there. Only in the case of Poland would a delinearisation of structural patterns to the ones in EU cohesion countries lead to slightly higher projected growth rates. The projected development of productivity gaps in chart 12 hence imply stagnation for all countries except for Estonia and Poland, where some moderate catching up could till take place.

The empirical model established significant differences in productivity growth prospects amongst the group of most advanced new member states: the prospects are clearly best for the Slovak Republic, and in particular even better than in Slovenia. Starting from a lower level as compared to Hungary, the Czech Republic and Poland, the Slovak Republic is predicted to surpass those countries in their catching up processes. This is especially pronounced in the first of the two scenarios, assuming the emergence of a distinct pattern of specialisation between the new member states and the old member states.

The worst productivity potentials and prospects are predicted for Estonia. Estonia not only starts from the lowest level of labour productivity in 1999, but its structural composition of manufacturing industries and the associated trends also grant the country the lowest estimated productivity growth rates. Poland also performs poorly in both

scenarios of the estimated model. The Czech Republic is predicted to perform better, however clearly worse than Hungary.

If patterns of sectoral structures in manufacturing determine potentials for industrial labour productivity growth and if structural patterns up until 1998 determine a trend of specialisation within the common integration area which can be extended into the future, *i.e.* if patterns, or more precise: trends, exhibit hysteresis, then the empirical model predicts that productivity catch-up in the new member states will take much longer than two decades. A productivity level of some 75 *per cent* of the EU-average is achieved in the case of Slovenia well before 2010, in the Slovak Republic, and Hungary slightly after 2010, and in the Czech Republic around 2018. The conditions prevailing in Estonia and Poland suggest that even a level of 75 *per cent* will not be reached in this kind of time-frame.

2. Workpackage 2

Evolving patterns of specialisation and European division of labour - vertical and horizontal patterns of intra-industrial trade

Research in workpackage 2 is focussed on the relation between trade structures and productivity differences. The perspective is here the increasing dominance of intra-industrial trade (IIT), and particularly, of its both components horizontal (HIIT) and vertical (VIIT) trade. The research was conducted in collaboration between Hubert Gabrisch and Maria-Luigia Segnana.

According to the literature, vertical intra-industrial trade reflects productivity gaps between the same industries, and is explained by the comparative advantages of one side in producing a higher quality of a differentiated good by using advanced technology, physical and human capital. Workpackage 2 tests a model of a product-quality-cycle to assess determinants of vertical and horizontal intra-industrial trade structures.

A new statistical approach is used. Because trade models assume free trade, the analysis is conducted in two panels, one with liberalised trade items (panel A) and one with goods to which some restrictions still applied (panel B). The Europe Agreements produced a clear divide between liberalised and non-liberalised tradeables (this distinction was most pronounced during the period 1993-1997).

The main research question focuses on: what potentials for productivity catch-up can be inferred from the analysis of trade structures emerging between the EU and her new member states? The first step in answering this question includes a descriptive analysis

of the emerging trade structures between 1993 and 1997. The most important results read as follows:

- Intra-industrial trade gained importance in industrial trade between the EU and CEECs (measured with adjusted *Grubel-Lloyd* indices). Intra-industrial trade appears to be most important in the Czech Republic with indices values of over 0.7 and the relatively least important in Poland and Slovakia with values of less than 0.4. In all countries, the importance of intra-industrial trade exhibits a increasing trend between 1993 and 1997 (table below).

Table 4. Adjusted *Grubel-Lloyd* indices of intra-industry trade between EU-15 and selected CEECs

		Panel A+B		**Panel A**		**Panel B**
Czech Republic	1993	0.584		0.823		0.565
	1997	0.711		0.848		0.567
Hungary	1993	0.377		0.648		0.375
	1997	0.438		0.772		0.377
Poland	1993	0.291		0.957		0.175
	1997	0.382		0.992		0.243
Slovakia	1993	0.312		0.890		0.264
	1997	0.376		0.875		0.270

Source: EUROSTAT, own calculations.

Note: Data for EU-15 1993 include data for Austria, Sweden and Finland from 1995.

- Intra-industrial trade shares turned out to be particularly high in liberalised trade of panel A. This is particularly pronounced in the cases of Poland and Slovakia, where trade in panel A is nearly completely between the same industries (at a 4-digit SITC-level) and the share of intra-industrial trade in panel B of goods with some restrictions still applying is below 30 *per cent*.

By decomposing intra-industrial trade into its horizontal and vertical components, and by comparing branch-specific trade balances with their respective shares of vertical trade, analysis can determine what kind of advantages trading partners make use of, *i.e.* either cost or quality advantage. The underlying assumption is that in vertical intra-industrial

trade, the produce of trading partner can be characterised by either quality or price advantages. The results of this analysis include:

- Whereas horizontal intra-industrial trade is dominant in trade between current EU member states, intra-industrial trade between the EU and new member states is largely of the vertical kind (table 4). In EU-CEEC trade and between 1993 and 2000, the share of vertical intra-industrial trade in fact increased, and the share of horizontal intra-industrial trade actually fell. The dominance of the vertical component is particularly pronounced in liberalised trade (panel A), a result that raises a question concerning the usual assessment of FDI and its structural effects.

- The EU enjoys a quality advantage in intra-industrial trade with the new member states, whereas CEECs mainly rely on cost advantages (derived from a model of relative unit values and industry-specific trade balances). In particular, these patterns have intensified, suggesting diverging specialisation structures within industries (chart 3).

The second step of the analysis explains what can be expected on the basis of the hitherto development. By use of a particular version of a vertical intra-industrial trade model, analysis attempts to explain emerging trade structures between the EU and CEECs in the two panels and to assess the weights of determinants of intra-industrial trade in its two components. Amongst the determinants, analysis considers in particular a set of country-specific determinants, amongst which are income gaps and income distribution differences between trading partners.

The basic assumption of analysis is that productivity differences between trading partners are a reflect of specialisation patterns in vertical intra-industrial trade, *i.e.* in trade between the same industries, but with goods of differing qualities. Analysis of determinants of vertical trade structures provides insights into the potentials for catch-up of income and productivity.

The model used in this analysis (Flam-Helpman, 1987) distinguishes between three determinants of vertical intra-industrial trade: the relative wage level of countries involved, reflecting differences in technology, factor endowment and human capital, income and income distribution. The idea of the model is that, if one country possesses an comparative advantage in producing a higher quality, a change of one of the three determinants mentioned above induces producers to transfer the production of the low-quality good to the other country and to focus on the production of the high-quality good (giving rise to a quality-product-cycle).

The results of several versions of regressions (including and excluding fixed effects, income distribution, GDP data according to exchange rates and purchasing power parities, adjusted and unadjusted *Grubel-Lloyd* indices) suggest:

- The product-quality-cycle model explains vertical intra-industrial trade, that is, the importance of relative income/wage differentials and overall demand differences. It cannot, however, sufficiently explain horizontal trade, as expected. These results are particularly pronounced for the liberalised part of industrial trade (panel A).

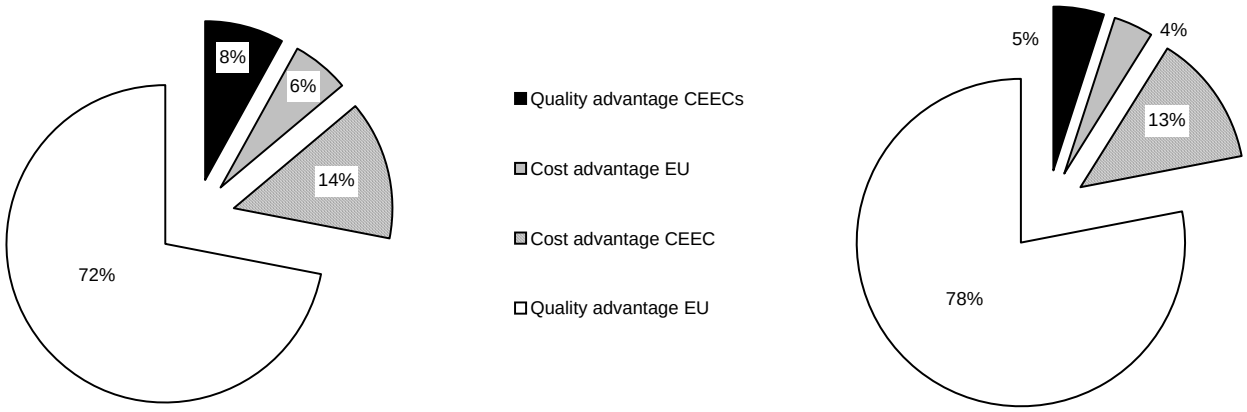
Table 5. Adjusted *Grubel-Lloyd* indices of vertical intra-industry trade between EU-15 and selected CEECs

		adjusted *Grubel-Lloyd* indices			**IIT = 100**		
		IIT	HIIT	VIIT	IIT	HIIT	VIIT
Intra - EU trade	2000	0.98	0.60	0.38	100	60.9	39.1
Trade EU - CEECs	1993	0.45	0.08	0.37	100	18.1	81.9
	2000	0.59	0.09	0.50	100	16.0	84.0

Note: IIT... intra-industrial trade, VIIT... its vertical component, and HIIT... its horizontal component.

- There is, however, no confirmation of a direct link between differences in income distribution and VIIT, neither in panel A nor in panel B. This result contradicts findings of empirical work on other parts of the world. However, the data set used requires some significant improvements that could yield better results in further tests.

Chart 3. Distribution of vertical intra-industrial trade on quality and cost elements in trade between the EU and CEECs and one group, 1993 and 2000



The concept of a 'quality-product-cycle' includes implicitly an evaluation of catch-up possibilities in terms of productivity and income. The product cycle includes a process through which the productivity gap may not be (completely) closed. Catching up may not be possible. However, the existence of a product-quality-cycle in trade between unequal partners does not exclude 'technological upgrading', as imported technology always implies higher levels as compared to indigenous technology. In this respect, it will be important to analyse the role of FDI and technology policy. It is a striking fact, that most FDI inflows into the EU candidate countries occurred in panel A, the fraction of intra-industrial trade where the product-cycle hypothesis has been tested most successfully. Then, FDI could contribute to an upgrade in terms of technology and income, but may not necessarily be sufficient for economic catching up.

In terms of economic policy, the main conclusion would be that strengthening the role of technology policy in the new member states could probably be more efficient as compared to attracting FDI. The assumed influence of income distribution did not play a relevant role in this analysis, hence re-distributive policies are predicted to not contribute significantly to improving catching up potentials. Finally, the analysis suggests that pure reliance on a cost comparative advantage (*e.g.* via wage costs) could effect an intensification of vertical intra-industrial trade structures, giving support to the persistent product-quality-cycle, already suggested in the analysis of the recent past.

WP 1+2 Amalgamation of workpackages 1 and 2

The amalgamation effort of results for workpackages 1 and 2 therefore proved to be much less straight forward than expected. Never-the-less, some interesting indication of how to read domestic specialisation patterns and foreign trade specialisation patterns in terms of potentials for productivity growth were found. In particular, the results of the simultaneous assessment of domestic and foreign trade specialisation was used to refine the results generated in WP1 on the potentials for future manufacturing productivity growth.

This analysis started from the assumption that small, less developed and open economies would typically experience their foreign trade sectors as engines for productivity growth as predicted in the development literature. This concept of export-led growth corresponds to the micro-level theory of "learning-by-exporting": here, firms accumulate experience from exporting which then lead to product and production improvements. The opposite alternative concept of "self-selection" would envisage firms maturing on the domestic market with the most competitive ones successfully exporting their domestically tested produce. This concept, however, appears less relevant for our new member states, mainly due to their typical export orientation which result from westward integration and their usually smaller domestic markets. The distinction underlying the two concepts is obviously the direction of causality.

If, in the export-led concept, technology transfer (from spread effects) is typically most pronounced between comparable (industrial) branches, then one could hypothesise that productivity growth is fastest, where the pattern of foreign trade specialisation closely mirrors the specialisation displayed by domestic production. This hypothesis was tested empirically.

Table 6. Differences in specialisation patterns between domestic production and foreign trade

	1995	1996	1997	1998
Estonia	14.0	13.8	13.5	13.3
Poland	22.0	22.1	22.3	22.4
Czech Republic	13.7	16.5	19.2	22.0
Slovak Republic	22.3	26.5	30.8	35.0
Hungary	21.3	23.0	24.8	26.5
Slovenia	24.7	24.3	23.8	23.4

Sources: EUROSTAT (CRONOS), WIIW, National Statistical Offices.

Notes: Difference indicators measured as EUCLID-deviation index. Original values for 1995 and 1998, values for 1996 and 1997 are extrapolated.

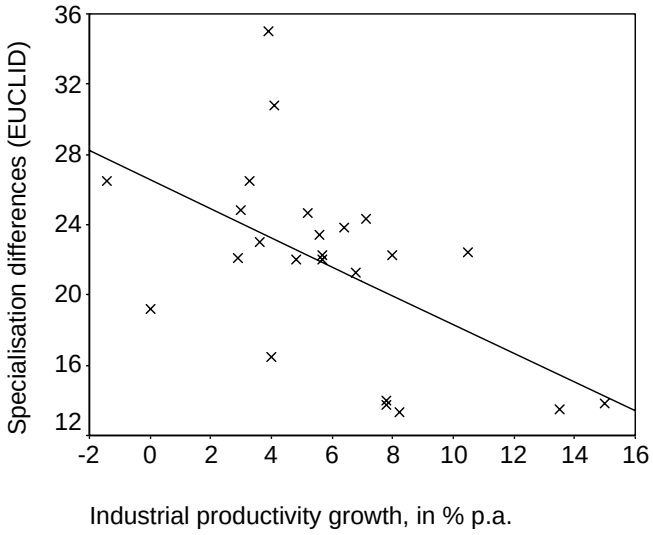
In a first step, the degree of correspondence between domestic and foreign trade structures was assessed by use of a standard deviation-measure (EUCLID) for each of the six new member states. Here, the focus was on manufacturing industries: most tradeables are in fact to be found in manufacturing, and trade in (unprocessed) agricultural produce can be expected to be heavily distorted by the effects of European Common Agricultural Policy on prices and volumes. Differences between specialisation patterns in domestic production and foreign trade are presented in table 6.. In the second step, the EUCLID-deviation indices are correlated with their corresponding industrial productivity growth rates (because normal distribution cannot be assumed, a non-parametric correlation analysis was conducted). The results of this correlation exercise suggest that there is a statistically significant negative and linear relationship between the EUCLID-indices and productivity growth with a coefficient of -0.55 (with an error probability of less than 1 *per cent*). Chart 1+2 provides a graphical account of this correlation.

The same test was conducted for a comparison of skill-intensity differences as an alternative to specialisation differences. The resulting correlation also turned out to be statistically significant and negative with a correlation of -0.60 (again with an error probability of less than 1 *per cent*), lending further support to the hypothesis.

The above hypothesis was therefore tested positively for our selection of the new member states for the years of 1995 to 1998: if manufacturing productivity growth in CEECs is in fact driven by exporting, then productivity growth is fastest, where the pattern of foreign trade specialisation closely mirrors the specialisation displayed by domestic production. From this follows that the higher the proximity between the structure of domestic production and of exports and the faster the convergence of those two structures, the better the prospects for future industrial productivity growth.

Returning to table 6., we could conclude that -in this analysis-, Estonia appears best suited for fast industrial productivity growth, displaying the lowest diversion indices and a (albeit weak) structural convergence trend. However, when considering that the Estonian manufacturing sector is highly concentrated on a small number of branches, this result becomes somewhat weaker. In the analysis of growth potentials by assessment of domestic specialisation patterns only, Estonia's potential was the weakest. This result can now carefully be corrected somewhat upwards.

Chart 4. Scatter diagramme between specialisation differences and industrial productivity growth in CEECs, 1995 - 1998



Sources: EUROSTAT (CRONOS), WIIW, National Statistical Offices, own calculations.

Poland was also assigned a weak potential for industrial productivity growth in the analysis of WP1. In this analysis, Poland's prospects appear slightly better: diversion indices are below average and have remained largely unchanged throughout the period of observation. However, Poland has large home market and hence our assumption of export-led growth and the implied direction of causality for productivity growth roots from foreign trade to domestic production is weaker. Still, we can conclude that

prospects for Polish manufacturing from WP1-analysis can also be corrected upwards slightly.

In the cases of the Czech and Slovak Republics, the structural differences between domestic production and foreign trade increased markedly between 1995 and 1998. In the Slovak Republic, the index is additionally much higher than in any other of the countries assessed. Those results would suggest a rather pessimistic assessment of future industrial productivity growth potentials for the Slovak Republic, and slightly better ones for the Czech Republic. However, the vast growth of the deviation indices are in both countries mainly due to increases in technology-driven industries. This is particularly pronounced for the Slovak Republic, shedding a more positive light on growth prospects for both countries in general and the Slovak Republic in particular.

In the analysis of WP1, the Slovak Republic achieved particularly high potentials for future productivity growth, the Czech Republic rather average potentials. The results of the latest analysis therefore suggests to correct the very positive assessment for the Slovak Republic somewhat downwards, and the assessment for the Czech Republic slightly upwards. Hungary displays slightly above-average deviation indices and a mild increase of those during the period of observation. This result corresponds well with the results from WP1. In both cases, Hungary's prospects for future industrial productivity growth are not spectacular, yet positive. Slovenia displays a weak structural convergence trend between domestic and foreign trade specialisation, and the deviation level is marginally below-average (also a small country, its manufacturing industry displays an only weak concentration). This would assign the country a slightly less preferable potential for future industrial productivity growth as compared to the analysis of WP1. The amalgamation effort can serve as a way to refine the potentials estimated in WP1. As a result of this, Estonia, Poland and the Czech Republic can be assessed slightly better than was the case in WP1, the Slovak Republic and Slovenia slightly worse. The new analysis does not suggest to alter the assessment for Hungary.

3. Workpackage 3

R&D inputs and outputs as determinants of productivity growth in CEECs

The objective of research in **workpackage** 3 is to determine and compare the role of R&D in CEECs for productivity levels and growth. The research was conducted by Slavo Radoševic from the UCL. To achieve these objectives, analysis focuses on two separate fields: first, assessment of the determinants of levels of R&D expenditure and employment in individual CEECs. Second, assessment and comparison of the levels of efficiency of R&D in individual CEECs.

Research undertaken within this workpackage has been substantial, especially given the overall volume of only 8 person months dedicated to this workpackage. We were able to answer fully the second research question. The first objective has been framed within the broader framework of national innovation capacity rather than within the narrow focus on only R&D. This corresponds to the latest research in the contemporary state-of-the-art.

3.1. R&D within 'broad' and 'narrow' national systems of innovation (NSIs) in CEE

Our first stage of research is broad, conceptual and based on an extensive literature review. At this stage, we analyse the prospects for science and technology (S&T) and economic growth in CEECs from a broad perspective, in which S&T is seen but a part of 'broad' national systems of innovation (NSIs). We hence distinguish between 'narrow' and 'broad' systems of innovation. The NSI in a narrow sense embraces those institutions which are directly involved in R&D and the dissemination of the results of R&D. The NSI in a broad sense embraces the social, economic and political context of technical and organisational innovation (Freeman, 1999, 2004). 'Narrow' and 'broad' national systems of innovation are interrelated but 'narrow' NSIs also has a certain degree of autonomy (Freeman, 1999). This distinction is an important one, as it explains why changes in 'narrow' NSIs are not immediately reflected in 'broad' NSIs and subsequently in economic growth and recovery and *vice versa*. In addition, the relationship between the narrow and broad systems is particularly specific in CEECs because of the considerable tension between the high 'catch-up' potential, indicated by the large sizes of R&D capacities and human capital, and the still sluggish outcomes in terms of growth and restructuring.

'Narrow' NSIs in CEECs are undergoing extensive functional, organisational, and financial restructuring (see Meske *et al.*, 1998 for evidence). However, despite these changes, the key weakness of the CEECs and of the other post-socialist systems remains the failure to reintegrate industrial institutes into enterprises [see several chapters in Meske, 2002]. Industrial enterprises that are short of long-term finance and that face fierce competition in foreign markets are not able to generate demand for more upstream activities like R&D. In such a situation R&D is perceived as a liability rather than an asset both at firm and macro level (Meske,2002). At firm level, it has been perceived as drain on cash flow without immediate direct benefits while at macro level support to industrial R&D has been perceived as breach of new role of state confined to market failure support.

During the 1990s, the main sources of technology were imports of capital goods and FDI. Endogenously generated R&D and technology then played a marginal role in the industrial upgrading of CEECs. The current patterns of industrial upgrading, which are

most often led by foreign enterprises, will eventually reach their limits without domestically generated R&D and technology. The lack of domestic in-house R&D cannot be fully offset by extra-mural or foreign R&D. The weaknesses in 'narrow' NSIs will become visible through inadequate in-house R&D, weak university - industry links and the lack of technological co-operation among enterprises. In order to grow, these economies will have to generate their own innovation dynamics in order to complement imported technologies. These innovation dynamics will have to be driven by local enterprises committed to R&D and innovation.

'Narrow' NSIs cannot be ignored if CEECs are to continue to grow and restructure. This might be possible for a limited period, as was the case during the transformational crisis of the 1990s. However, it is unlikely that CEECs can continue their industrial upgrading without restructuring their 'narrow' NSIs, which play a very important role in the development of technological capabilities in any economy. Its role cannot be reduced to the direct provision of technical information to industry. Research systems have several functions that are important for industrial upgrading, of which the provision of new and useful information is only one. Other functions include the creation of new instrumentation and methodologies, the provision of skills developed by engaging in research, participation in research networks, the resolution of complex technological problems and the establishment of spin-offs (Martin and Salter, 1996).

What we find today in CEE are fragments of the old R&D systems which are trying to adjust by adopting a variety of survival strategies, together with new pockets of innovation activities. We describe this system as the post-socialist or post-Soviet R&D system. Industrial research institutes have been left to their own devices and are slowly reinventing themselves as service firms or industrial enterprises. Academies of Sciences institutes, attracted by government funding as the only stable source, are shifting towards basic research. Universities are trying to build a new position based on the stability they derive from teaching and by reorienting towards research. Where they exist, in-house R&D departments are oriented towards their own needs and are trying to build up links with foreign sources of innovation. Domestic subsidiaries of foreign MNCs are entirely oriented towards the parent company in all the most important functions, including R&D, finance and marketing. Intra-organisational restructuring, that is the splitting of institutes into smaller organisations or the creation of spin-offs attached to institutes, has prevailed over inter-organisational restructuring involving several organisations from different sectors such as manufacturing industry, universities, academies, or industrial institutes.

In terms of the institutional superstructure, all CEECs have a developed S&T system with a large number of R&D institutes. In terms of organisational structure, however, their S&T systems are far from fully developed. However, the extensive institutional infrastructure in CEE still has to contend with very low demand for its activities due to weaknesses at the enterprise level. Weakness in the reconstitution of enterprises as the main network organizers of innovation processes is hindering the restructuring and development of 'narrow' NSIs. The building of future NSIs will depend on how this process progresses in the various countries. The increasing divergence in terms of growth and restructuring between 'western' (central Europe and Baltic) and 'eastern' CEECs (Bulgaria, Romania and European CIS) suggests that the reconstitution of enterprises as the main actors in the innovation process may lead to a faster emergence of NSIs in central Europe. The reason for that is partly historical, as these countries, especially Hungary, the Czech Republic and Slovakia, have inherited a larger share of enterprises with in-house R&D activities from the socialist period. Moreover, 'in-house' R&D in some large enterprises survived the period of drastic cuts in R&D activities at the start of the transition process. Another reason is that these economies have experienced significantly higher levels of FDI and the process of Europeanization is far more advanced in their R&D systems and in their economies in general, as a result of the pre-accession process.

The establishment of a conducive environment by putting in place the necessary elements of 'broad' NSIs (privatization, finance, legal protection, communication infrastructure *etc.*) strongly influences enterprises' innovation activities. In the transition period, they were actually more decisive in this respect than 'narrow' NSIs. On the other hand, the new NSIs is also likely to be shaped by the way enterprises embody innovation activities. However, this process is not entirely micro or macro-driven. As Nelson (1997) argues, it is a mistake to ask whether it is national factors or strong firms that create comparative advantages, since in those cases where the national institutional environment or legal structures, or specific policies, seem to have made a big difference, one also sees firms effectively taking advantage of the potential. While firms take advantage of favourable national factors they themselves also upgrade national factors. This explains why it is difficult to foresee which countries among the CEECs will catch up and which will fall behind.

It is not yet clear what national systems of innovation are emerging in the CEECs. These systems are far from being fully formed and it would be more appropriate to search first for signs of the emergence of sectoral innovation systems. Sectoral innovation systems are groupings of enterprises and their related networks of public and private institutions that are involved in the development, diffusion and utilization of innovation. These

systems will strongly shape the character of NSIs in CEE. Based on the current patterns of production networks in CEECs it seems that these systems will be very heterogeneous. In some countries, such as Hungary, NSIs may be based more on foreign enterprises. In Russia, they may be formed around large domestic industrial groups (Freinkman, 1995; Perotti and Gelfer, 1999; Popova, 1998). In countries like Estonia, they may be formed around small enterprises. In other countries, the NSIs could be dualistic in character, with sub sectors of small and large firms being unrelated to each other or with weak links between domestic and foreign firms. In some cases, they may be based on a few strong regions which are the drivers of growth. In these cases, the NSIs could be strongly shaped by a few regional systems of innovation. Alternatively, NSIs could be formed around one or two sectors in which the innovation process is developed on a collective basis, while in the rest of the economy the innovation links are very weak. For the time being, the innovation dynamic is strongest among foreign enterprises. Our conclusion is that this is the greatest strength but also, potentially, the greatest long-term weakness of the CEECs that have attracted large volumes of FDI. The way CEECs integrate into international production and innovation networks will strongly shape their NSIs.

During the 1990s, the integration process evolved between the two extremes of strongly foreign and strongly domestically-led technical modernization. Long-term growth can be achieved only when there is balance and complementarity between these two modes of modernization. This balance has been and will continue to be influenced by the way the state influences the interaction between domestic firms and Multi-national companies (MNCs) in 'narrow' NSIs, especially in sectors where regulations are important (pharmaceuticals, telecoms, energy). At present, it is foreign enterprises that are exerting the strongest influence on the shaping of production networks in almost all CEECs. Moreover, innovation activities are emerging through various forms of alliances with foreign firms. However, this process of interaction between domestic and foreign capital is mediated by the state. This introduces an important political or control dimension to the process of technical modernization, which will have implications for the nature of the emerging NSIs in CEECs (Kuznetsova and Kuznetsov, 1999; Hayri and McDermott, 1998).

Transition policies have been far from sufficient for building 'narrow' NSIs, which in all countries are hybrid systems and require public-private cooperation. So far, the dominant response in most of the CEECs has been to radically reduce public funding but without any clear idea of what the new public R&D system should look like. The lack of active restructuring and the inability to formulate a coherent long-term policy in R&D could have been justified in the early years of transition, when a sharp decline in funding made orderly restructuring impossible. However, a wait-and-see policy on 'narrow' NSIs,

especially in relation to industrial R&D, has become counterproductive because of the costs incurred.

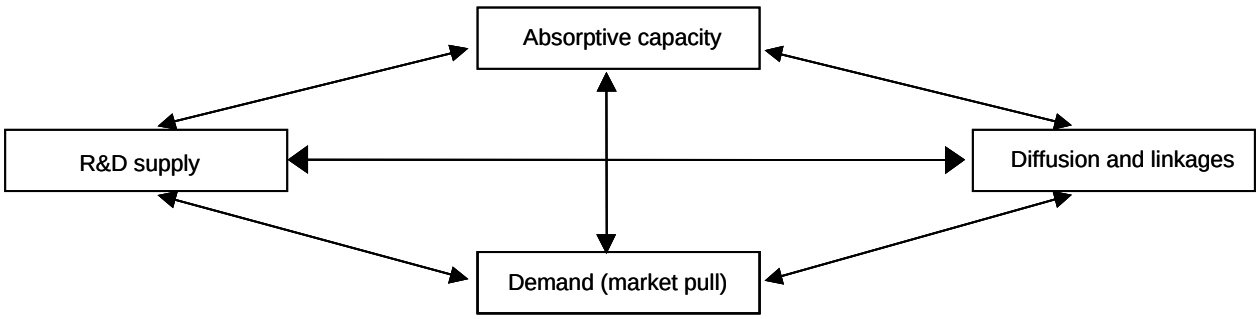
In all CEECs, the responses to restructuring are still weak although they vary greatly from country to country. In CEECs, Europeanization is the major component of the restructuring process. It has already reinvigorated S&T and innovation policy in these countries and is likely to have significant positive effects on the restructuring of their S&T systems. In that respect, Europeanization may have a greater effect on the building of NSIs in CEECs than public policy.

After 10 years of pursuing the transition policy agenda, CEECs are now searching for alternative policy solutions that will also address the problem of their technological competitiveness. In that respect, Europeanization comes as a time when the reinvigoration of policy under EU influence can be effectively coupled with the endogenous search for new policy solutions that try to address technology and innovation.

3.2. Measuring R&D and national innovation capacity in the enlarged Europe

In the second stage we move from broad, conceptual, and exploratory to a more detailed statistical examination of national innovation capacities of CEECs, and within that in particular of R&D capacities.

Figure 2. National innovation capacity (NIC) framework



We have developed a new concept, national innovation capacity, which represents a robust conceptual framework for understanding the factors that determine productivity and technical change. National innovation capacity (NIC) consists of absorptive, R&D, diffusion, and demand capacity. This concept is proxied by 25 indicators which assess the capacity for growth based on S&T and innovation.

This intermediate line in research falls in-between overly aggregate approaches of new and neo-classical growth theory on one hand, and case studies and exclusively micro-approaches on the other. By using a large number of indicators derived from the perspective of national systems of innovation, the conceptual framework for national innovation capacities is able to reflect the multi-dimensional nature of innovation capacities while retaining analysis at macro level. Following the national innovation system approach we organize indicators into four groups (R&D supply, absorptive capacity, diffusion, and demand). What underpins this grouping is the assumption that growth and innovation capacities of any given economy depends not only on the supply of R&D but also on the capability to absorb and diffuse technology and on demand for its generation and utilisation.

As a conceptual framework, the NIC carries significant power in explaining variations in labour productivity across different economies. Individual components of NIC also carry significant explanatory power in relation to labour productivity. However, regression results become poor when individual components of NIC are grouped together. This suggests that there is intense interaction between the different dimensions of NIC.

Pooling together CEECs with EU-15 countries lets the NIC index shift downwards. However, the range of values of NIC-coefficients is higher amongst the EU-15 members than between CEECs. The large range across the EU-15 suggests that we will find an even more complex pattern of innovation capacities within the enlarged EU. The ranking of countries does not follow a simple 'East-West' divide. In terms of NICs, the enlarged European space can be structured into three groups, of which CEECs are members of two. Those are incidentally the less and medium developed countries of Western Europe. The less advanced CEECs exhibit NIC-values that belong to a cluster which includes the EU cohesion countries, while the four most advanced CEECs are more similar to the group of medium developed West European countries.

Our clustering exercise of capacities for demand for innovation shows that here, CEECs are the most homogeneous but also the weakest: demand conditions for innovation are unfavourable across the entire region. South European countries (Greece, Portugal, Spain, and Italy) are located somewhere within the CEE range of countries. This ranking raises interesting issues regarding the differences between income per capita levels and NICs, and raises interesting issues regarding the potentials of advanced CEECs for catching up to the income levels of the Western cohesion countries.

What distinguishes the advanced from less advanced CEECs are better absorptive capacities and R&D capabilities, while in terms of diffusion and particularly demand,

capacity differences are much smaller. Potentials for catch-up to the cohesion EU levels of income is very high for the four top CEECs in terms of NIC (Estonia, Slovenia, Czech Republic, and Hungary). The clustering analysis shows that in terms of NICs, the four advanced CEECs are actually more similar to the 'average EU' group than to the cohesion EU group. Here, relatively advanced absorptive and diffusion capacities, but not R&D (except Slovenia) and demand capacities seem to be decisive for their clustering close to medium level EU countries in terms of NICs. Less advanced CEECs are more similar to the cohesion EU than the cohesion EU countries NICs' are similar to medium and developed EU. However, in terms of levels of individual indicators most of the less advanced CEECs are behind the cohesion EU.

CEECs are relatively well placed within the wider Europe in terms of absorptive capacities which is the combined result of education and training indicators and the high share of employment in high tech sectors. If we take similarity to the EU-NICs as the main criteria, then the policy priorities for the CEE in order of priority would be: demand, R&D and diffusion. However, analytically based policy-prescriptions have to be country-specific: the points of departure for respective national policies are their own gaps in individual dimensions of NIC. For example, Slovenia is relatively better in R&D and absorptive capacities than in diffusion and demand capacities; Estonia is the only CEEC with positive demand and diffusion coefficients; although its weakness is in R&D, Estonia has the best potential for catching up if we take NICs as the criteria, because her strengths correspond best to the order of priority listed above.

From a policy perspective, the NIC framework hence suggests that innovation is a multidimensional and a multilevel activity. Policy should hence focus on all four dimensions simultaneously. For example, it would be undesirable to focus on absorption to the extent that the overall R&D stock is reduced. The assumption is that countries that spend more on R&D can make better use of foreign technology. Our analysis suggests that the CEECs' absorptive capacities are currently relatively better than their R&D capacities. The latter has become a bottleneck for improving NIC in CEECs after some 10 years of weak demand for R&D.

Countries that are further behind the technology frontier have more to gain from increasing their R&D efforts since these efforts are more likely to result in capturing international spillovers from technologically advanced countries. In the context of CEE, this would mean that weak R&D should be strengthened much more than is currently perceived by policy makers in these countries. However, weak demand for innovation is the key obstacle to increased R&D. This means the problem cannot be solved by

increasing public R&D spending without increased demand for innovation from business sector.

As research above has shown that demand capacity is the weakest dimension of CEECs' NICs, and additionally the only one where the East-West dichotomy is present, we explore the demand issue further in the following.

Our analysis points to a gap between local demand and supply for R&D and innovation as one of the key issues for long-term growth of the region. Economists are usually concerned with the issues of aggregate (mis)match between market demand and supply, or supply and demand for products. However, demand and supply for products are not identical to demand and supply for technology (R&D and innovation). Technology is an intermediate input and/or output in the economic process. In an increasingly knowledge intensive economy it has become essential to understand economic growth and its structural problems.

The latest data suggests that there is a clear improvement in demand side conditions in CEECs. The problems for innovators and entrepreneurs have now shifted to the supply side, especially to issues of access to credit, own funds, and liquidity of clients, despite indications by companies that clients are now less financially constrained. This may suggest that the problem is not the general lack of liquidity but the mismatch between liquid supply and demand. In addition, firms are increasingly facing other supply side problems like a shortage of trained workforce, and a lack of technology. This is a quite new phenomenon and suggests that the CEECs are entering into a new stage of entrepreneurship where requirements for growth have become more variegated and related less to finance by itself but increasingly to the quality of supply and matching of supply and demand. From a policy perspective, this points to weak financial systems, insufficient mediation between supply and demand, and to the importance of national innovation systems.

Recovery and growth will be not automatically followed by recovery of demand for domestic R&D and innovation. In fact, some CEE countries may exhaust sources of growth which come from reallocations, closures, and lays offs, and face structural problems of further upgrading. This new threshold level for upgrading will be not exclusively related to the institutional system of market economy which has been addressed through transition-related policies but will be related to the weaknesses of national systems of innovation and their integration with FDI. Any national system of innovation is a system based on public-private and local-global interfaces and

interactions. It is the challenge for policy makers to facilitate the emergence of public-private interfaces, which are essential to any market economy.

3.3 Efficiency of R&D systems in CEE

In the second part of analysis in this workpackage we explore the relationship between R&D and productivity in CEECs. We again approach the issue of productivity and R&D through the perspective of NSI and again distinguish between 'narrow' and 'broad' systems of innovation. In particular, we distinguish between inefficiencies within narrow and broad innovation systems. Inefficiencies of narrow NSIs emerge in the process of conversion of innovation inputs into innovation outputs. Inefficiencies of broad NSIs are rooted in the conversion process of production and technology inputs into productivity growth.

The issue of 'inefficiencies' in NSIs in CEE is controversial as productivity increases during the 1990s in these economies have been accompanied by declining R&D. This suggests that productivity growth has been generated by non-R&D factors. Naturally, there is a plethora of factors that affect productivity but we are particularly interested in the impact of production and technology capabilities on productivity in these economies. Our analysis is based on OLS econometric testing of productivity-related variables combined with descriptive statistics. In addition to R&D data, we use data on resident patents and ISO 9000 certification as output indicators of technological and production capability respectively. By using these two indicators we generate new insights on the relationships between productivity, production and technological capability in CEE.

Our analysis shows that CEECs have lost some of their advantages in terms of size of R&D which they inherited from the socialist period. The main problem for policy has now reversed as the EC (2004) recommendations point to low R&D investments in most of the countries, low efficiency of R&D systems (Czech Republic, Slovenia) and of education and vocational training systems.

In our regression analysis, productivity differences across OECD and CEE countries are satisfactorily explained by production capabilities in combination with technological capabilities. In this way, our results point to the importance of quality and intra-firm productivity enhancing activities for growth and catch-up.

CEECs have lower levels of productivity than would be expected given their R&D capacities, innovation, and production capabilities. This may point to possible inefficiencies in the conversion of R&D and innovation outputs into productivity. We find that these inefficiencies cannot be identified within the 'narrow' national system of

innovation but more likely within 'broad' national system of innovation: the problems are not rooted in the narrow S&T systems but in the broader issues of demand for technology. This particularly applies to the relationship between small and large firms and integration of foreign firms into their local economy.

Table 7. Regression results

Variable	Const.	BESRD PRSN	RDPR SN	RESP AT	ISOFDI	CEE-DUMMY	Adj. R-sq.	F-stat.	Prob (F-stat)
Coefficient	8.89	0.44		0.07			0.598	21.120	0.000
t-stat	39.99	2.82		0.67					
Probability	0.000	0.009		0.51					
Coefficient	9.06	0.46		0.00		-1.07	0.844	49.509	0.000
t-stat	64.14	4.70		0.01		-6.34			
Probability	0.000	0.000		0.991		0.000			
Coefficient	8.45		0.46	0.19			0.408	10.994	0.000
t-stat	13.47		1.47	1.53					
Probability	0.000		0.152	0.139					
Coefficient	8.63		0.53	0.09		-1.33	0.777	34.602	0.000
t-stat	22.97		2.76	1.18		-0.61			
Probability	0.000		0.011	0.249		0.000			
Coefficient	8.79	0.52			0.00		0.591	20.533	0.000
t-stat	36.99	6.12			0.00				
Probability	0.000	0.000			0.997				
Coefficient	9.04	0.45			0.01	-1.07	0.844	49.550	0.000
t-stat	59.44	8.39			0.13	-6.43			
Probability	0.000	0.000			0.897	0.000			
Coefficient	7.83		0.11		0.27		0.471	13.914	0.000
t-stat	22.66		3.06		3.06				
Probability	0.000		0.000		0.005				
Coefficient	8.05		0.67		0.13	-1.27	0.808	41.579	0.000
t-stat	29.47		6.16		2.41	-6.91			
Probability	0.000		0.000		0.023	0.000			
Coefficient	8.96			0.31	0.16		0.437	13.028	0.000
Std. Error	0.25			0.07	0.09				

Probability	0.000			0.000	0.107				
Coefficient	9.40			0.24	0.10	-1.21	0.745	31.189	0.000
t-stat	51.16			4.72	1.61	-6.00			
Probability	0.000			0.000	0.118	0.000			

Sources: For GNI pc, World Bank Development Indicators 2003; for RDPRSN pe and BESRDPRSN pe, OECD Main S&T Indicators Data Base, 2003; for RESPAT pc, WIPO CD ROM; for ISO9000 pc, ISO CD ROM; for FDI, UNCTAD World Investment Report.

Notes: Dependent variable is gross national income per capita in $PPP (2002). The explanatory variables include BESRDPRSN... business R&D personnel per 1000 employment (alternatively: RDPRSN...R&D personnel per 1000 employment) (2002 or nearest available year); RESPAT...resident patents per capita (2000); ISOFDI... number of ISO9000 certificates per capita (2002) corrected by share of FDI/GDP (2002 or nearest available year); CEEDUMMY...dummy variable for CEE countries.

Our sample includes 33 OECD/CEE countries (7) with the full model data available for 28 countries.

The exploration of the most robust of the regression models explaining different levels of productivity generates some interesting conclusions (see table above):

i) The only satisfactory model is the one where productivity is determined by overall R&D employment and the number of ISO9000 certificates. Both variables are significant at the 1 *per cent* error probability level and the model explains 47 *per cent* of the variations in levels of productivity. This result confirms our conceptual model which points to the importance of technological and production capability for explaining levels of productivity.

ii) The inclusion of a CEEC-dummy greatly improves the overall robustness of the model, although the coefficient for quality certificates then becomes less significant, now only at the 5 *per cent* error probability level. Yet this model explains 80 *per cent* of the variation in levels of productivity across the countries of our analysis.

iii) All models including CEEC-dummies significantly improve the overall robustness of the models (which is confirmed by F-tests). This result was already indicated by the simple regression analysis and it suggests that CEECs contain an important specificity which could be related to 'inefficiencies' or unused potentials within 'broad' or 'narrow' NSIs. This we explored in the later analysis.

iv) The use of R&D personnel exclusively employed in business enterprises plus the number of ISO9000 certificates yields a negative coefficient for the ISO certificates. Partly, this may reflect problems in the Business Enterprise Sector (BES) data for the CEECs due to particularly high shares of extra-mural R&D there. This is inconsistently recorded as business or government R&D in the regression analysis.

However, we think that this also reflects different functions of the overall R&D as compared to BES R&D, as well as nature of quality indicators. Namely, ISO Certificates are registered in a large number of non-industry sectors while BES R&D is to a great extent confined to industry, in particular in less developed OECD and CEECs. Overall R&D systems could be used as a proxy for the overall absorptive capability while BES R&D seems to be a better proxy for innovation activities.

v) The model with BES R&D and resident patents shows that these indicators are capturing similar parts of variance in productivity levels which generates high collinearity between these variables. As a result of this we get a high coefficient of determination and insignificant results for resident patents. As the majority of patents are still generated within industry, the high significance of BES R&D employment may be expected. When patent data are used in combination with the overall R&D employment, the size and significance of coefficients for patents improves though they still remain insignificant.

vi) The combined use of output proxies – patents and ISO certificates – generates similar problems of multicollinearity.

In conclusion, the reduced model which explains differences in levels of productivity by differences in technological (R&D employment) and production (ISO9000) capabilities generate satisfactory results. This model points to the need to expand our understanding of determinants of productivity to non-innovation areas, i.e. issues of production capabilities. In addition, our analysis points to problems of the CEECs to generate levels of productivity which would be expected given their levels of investments in R&D and given their levels of production capability-related activities. This suggests that problems may root in 'broad' rather than 'narrow' systems of innovation.

Our analysis suggests that the narrow NSIs of CEECs do not seem to be 'inefficient' in terms of conversion of BES employment into patents. Inefficiencies do not seem to exist within 'narrow' national system of innovation but within 'broad' national innovation system. CEECs have not yet achieved levels of productivity which would be expected given their technological and production capabilities. Inefficiency of broad national

systems of innovation is however a complex issue which cannot be handled properly even through much more sophisticated econometrics and data sets are available than the ones we have used here. Nevertheless, our analysis has identified several issues which are of importance in improving 'efficiencies' of both broad and narrow NSIs and which we discuss in the last section.

These findings, when interpreted from the perspective of technology-using *versus* technology-developing conceptual models and from the perspective of national systems of innovation, have several policy implications:

i) They point to the importance of production capability, i.e. intra-firm productivity or non-R&D activities. This aspect of policy, which is addressed only through vocational training, is essential for improving absorptive capabilities of the CEECs. By improving absorptive or technology using capabilities, firms can move to technology adopting and developing activities.

ii) The key productivity challenge of CEECs at the firm level is how firms can make the transition from mastery of production to technological capabilities. This process is not automatic and linear, and requires not only changes within firms but also changes in narrow NSIs or innovation infrastructure.

iii) This requires re-orientation of R&D systems from the current exclusive knowledge generation orientation to knowledge diffusion and absorption orientation. The capacity to diffuse knowledge throughout the economy becomes essential for catching-up in a knowledge based economy. By embracing additional functions of knowledge diffusion, (supply side) R&D systems could better match the changing demand requirements for innovation and technology which are generated through broad NSIs.

The issue is to what extent innovation policies of the CEECs have embodied these factors into their policy instruments. Table 8. summarize the state of innovation policy mechanisms in CEECs by classifying individual instruments according to the aspects of innovation/production capability they address. We group individual instruments according to four components of innovative capacity: absorptive capacity, R&D, diffusion and demand capacities.

This summary illustrates a variety of policy mechanisms across the CEECs. It does not tell us anything about the financial weight of individual instruments. For that, we would have to find the optimal number of instruments by some measure of their financial weight. Nevertheless, data gathered in this form correspond conceptually to our

distinction between production (absorptive, diffusion oriented instruments) and technology (R&D) capabilities and it includes demand-oriented instruments which operate as signals for R&D and innovation within broad NSIs.

The assessment of the data in the tables indicate:

iv) Policy is much more focused on the generation of new knowledge and diffusion (networking) than on absorptive capacities. The largest number of instruments are oriented towards R&D through traditional R&D programs. They focus on scientific excellence. Instruments oriented towards diffusion of knowledge and networking most often include support to different bridging institutions, like science and innovation parks, whose effectiveness is however still unclear.

Table 8. Summary of innovation policy mechanisms in CEECs (as of end 2003)

	Absorptive capacity and human capital	Generation of new knowledge (R&D)	Diffusion of knowledge and networking	Demand for innovation
Bulgaria		National R&D programme; National Council for applied studies funding	Support for 6 incubators	Profit tax rate reduced
Czech Republic		National R&D Programme; Programmes Technos; Pokrok; Impulse; Tandem	Programmes: Park; Transfer, Counselling, Konsorcia	Programmes Credit, Start, Guarantee
Hungary		National R&D Programme; Program TechStart; Support for R&D job creation in SMEs	Network of Cooperative Research Centres; Programme Integrator; Support for patenting abroad	Several R&D and ICT tax credit schemes (4)
Estonia	(Action Plan for Vocational Training System; 20010-04)	R&D Programme of Estonian Science Foundation; ESTAG financing scheme for innovative enterprises and R&D institutes; Co-funding of Eureka projects	Spinno programme; Competence Centres programme; Tiger's Leap programme and Village Road project; Estonian Quality Award project.	Zero profit tax if profit reinvested
Latvia		R&D Programme of Latvian S&T Council	Funding of Latvian Technology Centre and of Electronics Industry Business Centre	Gradual reduction in corporate income tax
Lithuania	Training of entrepreneurs linked to innovation	National R&D programme; Subsidised participation in Eureka program	Support to Lithuanian Innovation centres, Business Innovation centres and Innovation centre of Kaunas Technology University	Reduced profit tax rate
Poland	National systems of support for life long learning	R&D Programme of Ministry for Scientific Research and IT; Funding of Centres of Excellence; FIRE Foundation support for support to	ISO subsidies to SMEs	Financial Support to Investments; Loans for investment and implementation of new technologies by

		commercialisation of R&D		Technology Agency; Reduction of corporate income tax
Romania		National plan for R&D – Relansin; National Fund for technology development for R&D in SMEs	Support for business incubators and SW parks	R&D organisations exempt from VAT; Tax support for innovation – import duties, VAT postponement. Salaries of IT specialists are exempt from taxation; Grant support for SME start-ups
Slovakia		Innovation Fund for applied R&D projects; R&D programme of Academy of Sciences	Support for establishing industrial zones and parks; Support for quality management system	Corporate income tax rate reduction
Slovenia	Programme education for entrepreneurship; Program to increase productivity in large enterprises (20 key business areas); Young Researchers Programme	R&D programme of Ministry for S&T; Co-financing of investments in new technologies; Stimulation of FDI to carry out R&D in companies; Support for the purchase of equipment by private companies to be used at universities for common purposes	Development of spin off incubators at the Universities; Program for encouragement of clustering; Technology centres' support; Promotion of linking enterprises in production chains; Stimulation of internationalisation of SMEs; Co-financing of improvements in technology processes by demonstration	Support for the establishment and growth of young companies; Support for investments in SMEs

Source: Author's compilation based on national Trendchart reports (www.cordis.lu/trendchart) accessed in April 2004.

v) Second, if we rank countries based on the scope of their operating policy mechanisms i.e. in terms of coverage of all four components, then Slovenia, the Czech Republic, Hungary, and Estonia are situated at the top of the list. In the middle of the range we find the rest of the CEECs with Bulgaria clearly at the bottom end. This shows very differing degrees of development and orientation of innovation policies among CEECs. Slovenia has the most diversified innovation policy in terms of mechanisms that address different components of innovation policy. Hungary, the Czech Republic and Estonia belong to the group with a relatively large number of policy mechanisms. Bulgaria has a very limited number of innovation policy mechanisms.

Table 9. Number of innovation policy mechanisms in CEECs (as of end 2003)

	Absorptive capacity and human capital	Generation of new knowledge (R&D)	Diffusion of knowledge and networking	Demand for innovation	Total
Bulgaria		1	1	1	3
Czech Republic		4	4	3	11
Hungary		3	3	4	10
Estonia	1	3	5	1	10
Latvia		1	2	1	4
Lithuania	1	2	1	1	5
Poland	1	3	1	3	8
Romania		2	2	4	8
Slovakia		2	2	1	5
Slovenia	3	4	5	2	14
Total	6	25	26	21	78

Source: Author's compilation, based on table 8..

vi) Third, demand oriented instruments are surprisingly quite numerous in CEECs. These are mainly tax incentives which currently seem redundant and with limited effects given the sharp reductions in corporate tax rates in the run-up to EU accession. Hungary and Romania have the largest number of tax measures which try to induce demand for innovation.

vii) Fourth, absorptive capacity is the area which is the least often addressed by innovation policy. Yet, innovation studies suggest that the production capability or capability to efficiently use existing technologies is the key first step in closing productivity gaps. Slovenia is the only country which has more than just one policy measure to promote absorptive capacities.

3.4. Assessing innovation policy in CEECs

We tried to assess whether current innovation policies in the CEECs are able to meet the challenges of growth based on innovation and knowledge based activities. Evaluations of national innovation policies are an inherently difficult exercise. An undeveloped theoretical basis of innovation policy and its multi-dimensional character makes this task quite challenging. Hence, our analysis should be taken as very preliminary and tentative but nevertheless revealing.

Recovery and growth of the CEECs has not led to an automatic recovery of demand for R&D and technology. European Innovation Scoreboard indicators for 2002 show that there has not been a sufficiently strong catching up in innovation based activities. The technology effort in the CEECs is still very much concentrated on mastery of production capabilities. This raises important policy implications.

An overview of innovation policy mechanisms of CEECs shows a variety of levels of developments of CEECs' innovation policies (see table 8. and 9.). These differences reflect different national situations and traditions, as well as different political commitments towards innovation policies. Yest, tables 8. and 9 suggest that among innovation policy mechanisms, R&D and diffusion (networking) are areas which are most frequently addressed. Absorptive capacity is the area the least often addressed by innovation policy. Hungary and Romania have the biggest number of tax measures which try to induce demand for innovation. Slovenia and Estonia have the highest number of policy mechanisms which address diffusion and networking. The Czech Republic and Slovenia have the highest number of policy mechanisms for supporting R&D. Slovenia is the only country which has more than one measure promoting absorptive capacities.

Based on a comparative assessment of innovation polices, we point out to innovation policy challenges which these countries are facing in early 21st century.

A limitation of our analysis is that we still cannot explain differences in innovation policies among CEECs. Should causes of differences in the levels of development of innovation policies be sought only in differences in the orientation of innovation policies? Each institutional model is context-dependent and if we want to understand these differences,

we would have to take into account also differences in the development, organisation and self-organisation of 'innovation constituencies' (enterprises, associations, public organisations). How strong are organisations that form NSIs, how strongly do they operate in favour of innovation and how successful are they in aligning their interests? These can be important features when trying to explain the level of development of innovation policy. For example, the existence of large enterprises active in business R&D reduces the need for governments and S&T infrastructure to compensate for weak in-house R&D and thus reduces the pressure for innovation policy. An economy dominated by a large number of SMEs raises demand for innovation policy to complement their technology activities.

During the 1990s, the pressure for innovation policies in the CEECs has increased as the average size of enterprises has decreased and is now below the EU average. An economy dominated by FDI requires different types of innovation policies in dependence of whether foreign MNCs are active as innovators or are primarily confined to low-cost operations. These differences in 'innovation constituency' strongly determine the nature of demand for innovation policy. Hence, benchmarking of innovation policies would ideally have to take into account differences in 'innovation constituencies' when assessing the levels and effectiveness of different innovation policies.

Whether countries have separate or merged departments for science and technology, whether they have separate 'design' from 'delivery' bodies, whether they have adopted innovation policy documents or not; all these features seem to be secondary to the degree of development of 'innovation constituency'. A common feature of CEECs is their very weak and disorganized constituency in favour of innovation policy and innovation activities. Innovation policy is of inter-sectoral and multi-dimensional nature. Its constituency is dispersed and difficult to self-organize. Thus, despite potential demand, innovation policy may not be established due to difficulties of the constituency to articulate its interests and reach a 'critical mass'.

We would expect, given this structural problem shared by all CEECs, that differences in innovation policy would arise primarily due to:

viii) differences in the state of development of 'innovation constituency', and

ix) differences in the activism and attitude of the state.

Differences in the degree to which innovative firms can self-organize may be idiosyncratic, long-term features of different countries. This is less the case with those states where we could observe changes in state orientation regarding innovation. The

positive role and attitude of the state may facilitate the establishment of innovation policies ahead of the current level of demand for innovation policy, i.e. despite a weak 'innovation constituency'. Equally, the level of innovation policy may be behind the actual or latent demand from enterprises and other organisations.

3.5. Analysis of R&D capacities based on national patent data - work in progress

As we pointed out in several progress reports, we have spent a substantial amount of time to adapt to CEECs concordance between WIPO and industry classification which has been developed on the pilot basis by Statistics Canada. This means that we have been able to collect data on resident and non-resident patents (WIPO) and we group them based on ISIC classification. Slavo Radoševic has been working on this in cooperation with Djuro Kutlaca, director of S&T Policy (Institute M. Pupin) group from Belgrade, who is one of the leading specialists in patent statistics, on these data. Now that we have produced a data set we have been struggling to resolve and interpret some puzzles in these data. The most puzzling detail is the very strong similarity across CEECs in industry structure of resident patents. We are not sure whether these puzzles are possibly due to our methodology or due to strong regional specificity of patenting trends during the 1990s. We have work on several draft papers but those will not be released before we are not fully sure on the methodological issues related to the data.

If data do not suffer from methodological weaknesses, this would point to a dominant role of demand for technology as resident patenting data have been falling at very similar rates across industries in all countries. This sharply contrasts with the recovery of product demand and would point to a strong detachment of demand for technology from demand for products.

4. Workpackage 4

Mapping the technology structure of branch plants and technology integration of CEECs

The objective of **workpackage 4** is to determine the extent to which multinational companies (MNC) and other foreign investors into CEE actually support the transfer of foreign technology and its implementation in their subsidiaries in CEE. In the workpackage, the starting positions of MNC's subsidiaries in production networks are mapped and possible improvements in their mandates, productivity, technology and local networking are traced. The field work involved in this workpackage highlights the sectors, branches and countries in which integration into international production and

technological networks features technological integration and in which it rather features technological marginalisation.

The field work and analysis was conducted by five country-teams with the involvement of Slavo Radoševic as consultant to the workpackage. From his own knowledge and experience in this topic, he largely determined the conceptual framework that guided both the analysis and design of field work.

The summaries of the contributions from each participant in this workpackage are confined to the most important results including a brief description of methods and concepts applied. In the project, the country-teams have each produced a comparable 'country-report' outlining the most important features of FDI in their own countries. These contributions served as guidance for the analysis and were used in the interpretation of results from analysis.

The representation of these contribution-summaries starts with an introductory chapter outlining the conceptual framework, introducing the main features of the questionnaire, and finally of the database generated, the CEE subsidiary database. Preceded by a very brief summary of the main features of the 'country-reports', the first summary of analysis features a comparative view of the data in the CEE subsidiary database: all comparisons are between the different countries assessed and provide a sound overview of the data generated. The fourth part of this chapter in the final report uses Knowledge Discovery Techniques to analyse the database without imposing any theory or assumptions. This important exercise allows a 'pure' view on the data generated. Following these preparatory analysis setting the agenda for further analysis of the database, the fifth part represents the first analysis of the data generated that actually involves the conceptual framework dedicated to this workpackage. It analyses the relationship between subsidiaries and parents with a view on technology transfer, and maps out particular country, industry, and firm-size effects. The following part invests a more focused view on the autonomy issue and how it relates to other subsidiary-specific determinants of subsidiary development. Parts seven and eight try to solve the open issue in the literature, namely whether autonomy from the patent improves of hinders technology transfer: part seven adds a second dimension (adaptive ability) to the autonomy issue, and part eight classifies the subsidiaries so that an unambiguous answer to the open issue can be established. The final part nine revisits the autonomy-issue by assessing the largest country-sub-panel in the database: the Polish FIEs.

4.1. The conceptual framework

Empirical attempts to assess technology and knowledge transfer (in short: technology transfer) predominant in the literature either use econometric methods at highly aggregated levels to directly measure the extent of technology transfer (quantitative studies). Other analyses alternatively use deep-level interviewing techniques to identify the relevant channels of technology transfer. The quality of macroeconomic or industry-level studies hinges on the selection of proxies, in as much as technology proxies have to be able to indicate technology and technological development via transfer from foreign investor, and on the other hand has to be available from a reliable statistical source. Those studies typically treat channels of technology transfer as black boxes, unable to shed light on the mechanisms within those channels. The advantage of qualitative studies is that they focus on uncovering exactly the mechanisms within channels of technology transfer, yet their results are typically not representative and hence lack generality. Their main insight remains within the case they studied.

In our own analysis, we apply a method that combines qualitative and quantitative features: we use quantitative methods to analyse data that we generated at the firm level via large-scale field work with a questionnaire. The data we collected refers both to qualitative matters of interest (where it pertains to the relationships between parent network, FIE and host economy) and some quantitative matters, in particular the composition of sales and purchases. Following the state-of-the-art in research on technology transfer via foreign direct investment (FDI), we focus on the relationship between FDI subsidiaries and their parent network on the one hand and their local host economy on the other. To target our field work and to efficiently define our questionnaire, we developed a conceptual framework. Slavo Radoševic, our workpackage consultant, aligned his conceptual framework to the characterisation of FIEs in the modern organisational theory and the international business and management strategy literature[10]. The focus is explicitly on the local subsidiary as a bearer of mechanisms by which FDI affects productivity growth in the host economy. The subsidiary role determines such mechanisms by the way and extent that linkages are generated and by the way that control and governance between the subsidiary and the foreign owner is determined. In that respect, research in this workpackage combines growth and international business studies approaches. In this body of literature, the typical multi-national investors are characterised as differentiated 'inter-organisational networks' (Roth/Morrison, 1992, p.141) in which often a variety of different FIEs operate as 'quasi

[10] See *e.g.* White/Poynter, 1984; Young/Hood/Dunlop, 1988; Bartlet/Ghoshal, 1989; Birkinshaw/Hood, 1998; Tavares, 2001, and Holm/Malmberg/Sölvell, 2002.

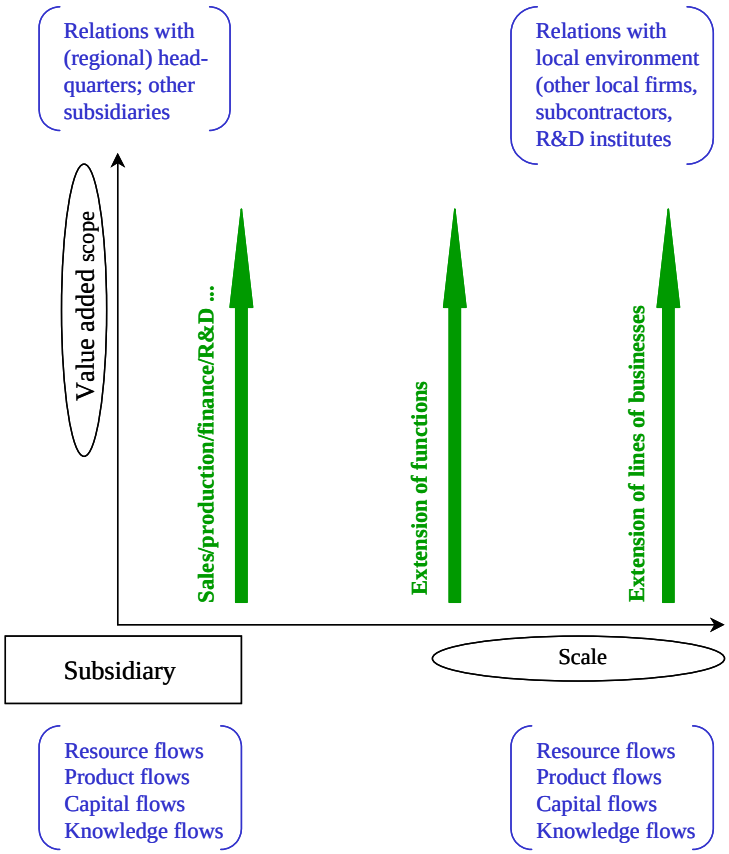
firms' (Tavares, 1999). Within this network, each subsidiary is controlled through different mechanisms and to different extends according to its role in the network. Hence, "the subsidiary is a semiautonomous entity capable of making its own decisions but constrained in its action by the demand of head office managers and by the opportunities in the local environment" (Birkinshaw/Hood, 1999, p. 780).

The part of the literature dealing with 'subsidiary development' is of very recent origin and is focused on the process through which MNCs subsidiaries enhance their resources and capabilities, and in so doing add increasing value to the MNC as a whole. Our research aims to contribute to the empirical knowledge on the mechanisms of subsidiary development.

In our concept, the intensity of technology transfer depends on its 'role in the network' and the conditions in the local environment, and how both evolve over time, *i.e.* with the subsidiary developing: at the most general level, the literature assumes that the stronger the competencies of the subsidiary in terms of its own management *vis-à-vis* control by the head quarter, the stronger will be the positive technology-impact of the subsidiary on the host economy environment (*e.g.* Holm/Malmberg/Sölvell, 2002, p. 17 and 29).

On the more dynamic level, at early stages of development of subsidiaries, parent companies can be "adverse to technological incongruity" (Dyker/Stolberg 2003, following Ozawa 1979 and Wells 1983) and could "tend to place considerable stress on the importance of being able to impose their own technological culture on subsidiaries (...) as a way of guaranteeing control over productivity..." (Dyker/Stolberg 2003, p. 4). This effect might be particularly relevant in transition economies with a log history of industrial development, however, by use of a very different kind of technology. With subsidiaries moving up the institutional learning curve of technological learning, they could gradually accumulate more competencies in terms of both scale (more different fields of competencies) and scope (more autonomy in given fields of competencies).

Figure 3. Conceptual framework for the design of field study and analysis



Our conceptual approach, derived from the literature on FDI and growth, on developmental subsidiaries, and on linkages between international business and endogenous growth theories, is based on two forms of upgrading of position of subsidiaries and on several dimensions of integration of subsidiary into MNC network. A subsidiary can upgrade its position trough functional extension, *i.e.* by adding new mandates or functions and/or through lines of business extension, *i.e.* by extending scale of the existing mandate through sales and exports or new lines of business. Upgrading of subsidiary occurs through several dimensions, *i.e.* product flows, knowledge flows and capital flows. Mechanisms of subsidiary upgrading and productivity growth are introduction of new functions and new lines of businesses (expansion of scope) as well as expansion of the existing functions (expansion of scale). Figure 3. summarises the conceptual framework in a graphical representation.

4.1.1. The design of the questionnaire

In an extensive field work effort, we sent out an identical, concise two-page questionnaire to the top 50-100 foreign investment enterprises (FIEs) in Poland, the Slovak Republic and Hungary, and the top 20-50 FIEs in Estonia and Slovenia. The first

wave of sending out questionnaires was conducted in early 2002. Most of our responding firms reacted to the hard-copy of the questionnaire, some also filled out the questionnaire on the project's internet-site. In 2003, we repeated the field work to improve the response rate and the representativeness of the country-samples.

In the questionnaire, we asked firms to fill out a set of 15 questions. These included firm characteristics like the industry of activity, size, age, whether they produce final or intermediary goods, the number and changes to the lines of businesses. The second group of questions targeted the relationship between the subsidiary, its parent network, and its host economy (sample questionnaire in the annex).

4.1.2. The 'CEE subsidiary database'

Out of the 2,203 subsidiaries we approached, only 458 provided us with a filled-out questionnaire; their answers constitute our **'CEE subsidiary database'**. The response rate was the highest in Slovenia with 34.4 *per cent*, followed by Slovakia (30.2 *per cent*) and Estonia (30.0 *per cent*), while in Poland and Hungary only 18.8 *per cent* and 11 *per cent* answered, respectively.

Compared to the actual number of FIEs in the respective manufacturing industries, our sample size seems to be quite small. This is particularly true for Poland and Hungary. The 153 Polish FIEs and the 85 Hungarian FIEs, however, already provide a sufficiently large base to generate reliable and robust results. The lowest number of firms across countries and sectors are the 36 FIEs in the high tech group. Again, this number appears to be sufficiently high to guarantee meaningful statistical and econometric analysis. In terms of the distribution of FIEs across countries, Poland dominates the whole sample: the share of Polish FIEs is about one third, which however corresponds to the comparatively large size of the Polish industry.

Comparing the sample distribution with the actual distribution in the sectors and countries, we identify some biases: the share of more sophisticated activities (high and medium-high technology industries) is overrepresented. This particularly pertains to our Polish sample. The sample distribution according to sales structures and export structures in each technology class is more similar to the actual structures in the countries and sectors. The Slovenian sample, however, includes more export-oriented FIEs in the medium-high technology industries, while low-tech firms are under-represented. The opposite bias is true for the Hungarian sample, where high tech FIEs accumulate only 14 *per cent* of the total exports of the country-sample as compared to the 26 *per cent* share in manufacturing exports of all actual FIEs. Finally, our samples are biased towards larger FIEs. This is a common problem in large-scale fieldwork. The

average size of firms in terms of employment is 450 employees across the whole sample. More specifically, the biggest shares of larger FIEs (with over 200 employees) are recorded in Hungary and Poland, the biggest share in small FIEs (with up to 50 employees) is in Slovenia and the Slovak Republic. Hungary records by far the lowest share in small FIEs.

Table 10. Distribution of sample-FIEs according to technology-intensity[1)] and countries

	High tech		Medium-high		Medium-low		Low tech		Sum [2)]	
	%	#	%	#	%	#	%	#	%	#
Estonia	10.0	5	10.0	5	22.0	11	58.0	29	100.0	50
Poland	9.2	14	36.6	56	34.0	52	20.3	31	100.0	153
Slovakia	4.8	3	27.4	17	30.6	19	37.1	23	100.0	62
Hungary	11.8	10	22.4	19	25.9	22	40.0	34	100.0	85
Slovenia	5.8	4	39.1	27	40.6	28	14.5	10	100.0	69
Sum	8.6	36	29.6	124	33.2	132	30.3	127	100.0	419

Source: CEE subsidiary database.

Notes: [1)]The classification scheme is derived from the usual OECD-classification: high tech (NACE 3530, -2423, -244, -30, -32, -33); medium-high tech (-31, -34, -24 (excl. 2423), -352, -354, -359, -29); medium low tech (-23, -25, -26, -27, -28, -351); and low tech (-15, -16, -17, -18, -19, -20, -21, -22, -36, -37). See Hatzichronoglou 1997.

[2)] Not all FIEs could be classified into the four technology classes. This pertains in particular to the service sector of the Estonian sample.

Table 11. Distribution of sample-FIEs according to country and size

	Estonia	Poland	Slovakia	Hungary	Slovenia	All
Number of FIEs	73	153	78	85	69	458
Country share	15.9	33.4	17.0	18.6	15.1	100.0
Small FIEs [1)]	23.4	24.2	34.2	14.1	38.9	26.4
Medium FIEs [2)]	44.7	24.8	30.2	27.1	31.9	29.6
Large FIEs [3)]	31.9	51.0	35.6	58.8	29.2	44.0

Source: CEE subsidiary database.

Note: [1)] Share of country-specific FIEs with up to 50 employees; [2)] with up to 200 employees; [3)] with over 200 employees.

By equity share, the sample has only a few minority foreign owned FIEs (15 *per cent*), while 57 *per cent* of all FIEs are totally foreign owned. The 100 *per cent* foreign owned FIEs are the most frequent in the Slovak, Estonian and Hungarian groups (69 *per cent*, 67 *per cent*, and 64 *per cent* respectively), while in the Polish sample, half of them and in Slovenia only 42 *per cent* were completely foreign owned. By age of the sample FIEs, Hungarian and Estonian FIEs were older than average (69 *per cent* in both were established before 1995), while in the Slovak, Slovenian and the Polish sample, more then half (59 *per cent*, 57 *per cent*, and 54 *per cent* respectively) were registered as FIEs after 1995. These differences by countries in the structure of sample FIEs already suggest that we will be confronted with a strong heterogeneity in answers and results of analysis.

4.2. Macro-analysis of the role of FDI in CEECs

As a first step in the analysis of technology transfer via FDI, we compared the extent of FDI in each of the sample countries and the role that FDI plays in those countries. The relevant information was compiled by each country group and published as the set of so-called 'country-reports'. This information was selected and summarised to correspond to our field work analysis by the Hungarian team leader Judit Hamar.

At the most general level, we established that besides several similarities among the countries' FDI trends and features, FDI effects on economic and productivity growth and on industrial restructuring revealed more differences than similarities across countries. This is an important pre-requisite for any further comparative analysis of the subject. The most important determinants for this phenomenon turned out to be the different stages and paths of economic transition and development, the different speeds and depths of the recovery from the transitional crises, different industrial structures, and the different levels of FDI-penetration.

4.2.1. FDI, productivity and economic restructuring in Central East Europe

Our first hypothesis relates to international theory of trade and finance (Markusen, Venable, Ethier, De la Dehesa, *etc.*) and empirical evidences (Havlik, Hamar, Hunya) on the effects of FDI on the host country:

- FDI speeds up productivity growth and restructuring;
- but FDI effects differ strongly across countries:

- due to differences in the economic and political starting conditions;

- due to differences in the timing and sequencing of policy changes (setting of legal conditions, liberalisation of foreign trade and FDI, the methods and timing of privatisation, etc);

- due to differences in prospects for future catch up as perceived by international markets. Perceptions are determined by the different productivity levels the countries have reached, by the different extents and speeds of technological upgrading in the countries and by the different levels of penetration of the countries' markets by existing FDI.

Our research results point in the same direction: the size of effects of FDI on the host economies depends on country-specific features. This limits the comparative method of our analysis. Since the outset of systemic transformation during the early 1990s, the countries assess in our project were able to narrow their productivity gaps to the levels predominant in West Europe. Still, large differences exist both *vis-à-vis* the West and also between our countries of CEE. The inflow of FDI played an important role in each of our countries in their individual process of catching up, but effects differed much by the time of entry, by activities, and by the timing and sequencing of policy reforms across the countries.

Chart 3. demonstrates that the growing stock of FDI (here normalised by the host country's GDP, and all for 1993, 2000 and 2002) is positively associated with productivity improvement in each of the countries. However, the slopes of curves tend to become flatter the further right the curve is located in the chart:

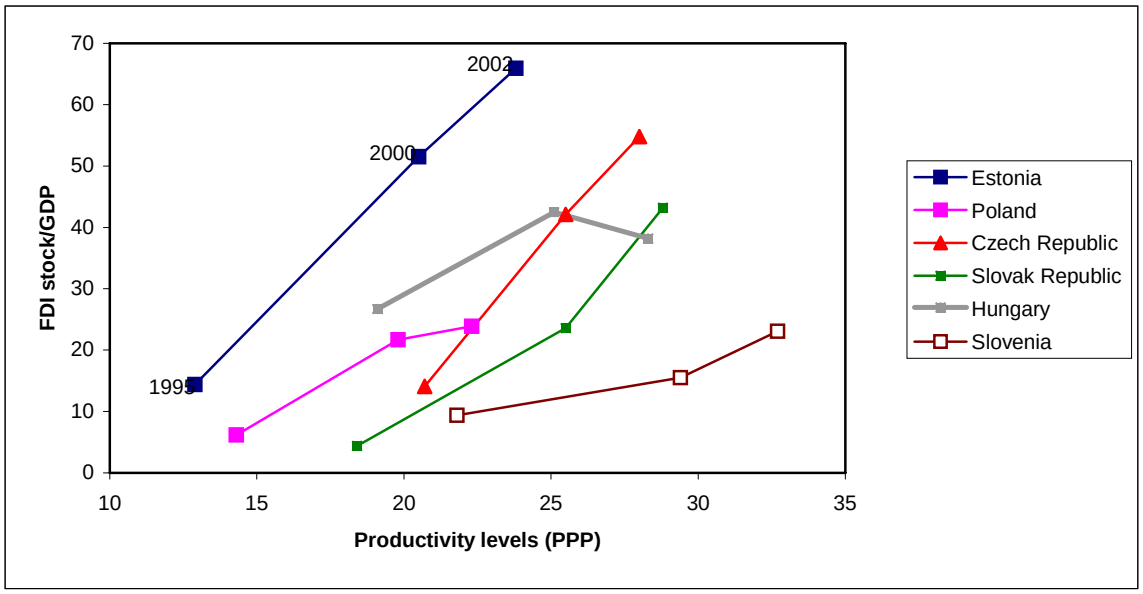
- The highest increases both in terms of productivity and in FDI occurred in Estonia: from the comparatively lowest productivity level with a relatively high FDI ratio, productivity growth was the strongest and, parallel to that, additional FDI inflows increased the most, indicating the highest FDI attractiveness;

- On the other extreme, Slovenia started with a highest level of national productivity level, and while productivity growth was strong, the country's attractiveness for additional FDI was low, little further FDI inflows have been recorded;

- The Slovak and Czech Republics started with productivity levels somewhere between those two extremes, and likewise are their additional increases in FDI inflows were between the ones of Estonia and Slovenia. In the Slovak Republic, increases in FDI inflows are initially lower which might be associated with political uncertainty;

- Hungary and Poland take a different path: Hungary has a much older history of FDI than any of the other countries, hence if assuming decreasing returns, FDI attractiveness is lower than anticipated according to the criterion of initial productivity levels (the negative association between 2000 and 2002 is due to repatriation of profits from FDI which are registered as negative FDI inflows, just another sign of comparatively mature FDI). Poland should be attractive due to a low initial productivity level, yet FDI inflows per GDP are rather low, possibly due to its sheer size.

Chart 5. FDI and national labour productivity



Notes: Labour productivity levels calculated with PPP exchange rates in EUR 1000 values added per employment (full time equivalent). FDI stocks are calculated as inward FDI (net of outflows) stock as percentage of GDP.

Sources: Productivities: WIIW, National Statistical Offices, own calculations. FDI stock: UNCTAD, FDI/TNC database (WIR, 2003).

4.2.2. National and industrial labour productivity levels

Labour productivity increases in CEE were partially due to falling employment rates in the second part of last decade. The only exception was Hungary, where in spite of a shrinking population and despite slightly increasing employment levels, the employment rate still remained the lowest amongst the countries assessed and that remained true even at the end of the last decade.

Each of our countries could narrow the national productivity gaps to the EU-15, but in the second half of the last decade, this development was partially due to a slow-down in labour productivity improvement in the EU (also *vis-à-vis* the USA, the EU-15 productivity level fell from 79,5 *per cent* in 1995 to 73 *per cent* in 2001). By 2000, national labour productivities in each of our countries surpassed the lowest levels amongst the EU-15, which is Portugal. All CEEC except Poland have already surpassed the 50 *per cent* threshold of the productivity gap to the EU-15, and the Slovenian productivity levels already surpassed that of Spain.

CEEC's industrial productivity levels, however, demonstrate a much wider gaps to the EU-15 average (see table 12.) than the gaps in the national levels. This is mainly due to the fact that productivity levels in financial sector in particular, and also in market and household related services are much closer to the average of the EU-15. In general, CEEC's industries today still exhibit sizeable gaps in industrial labour productivities, achieving no more than 35-60 *per cent* of the average EU-15 level. Productivity growth by far outpaced that of the average EU-15, but even those above-average rates would be associated with still several decades for productivity convergence. In terms of estimations for the time needed for complete catch up, the relevant literature assumes some 10-15 years for Slovenia, 20-30 years for Hungary, Czech Republic and Slovakia, and even more for Poland and Estonia.

Table 12. National and industrial labour productivity level of selected CEECs in 2000

In % of average EU–15	National levels	Industrial levels
Estonia	52.0	34.2
Poland	46.3	44.5
Czech Republic	62.7	51.3
Slovak Republic	58.6	43.9
Hungary	61.1	51.6
Slovenia	76.9	58.6

Sources: EUROSTAT, OECD, WIIW, National Statistical Offices, own calculations.

Note: PPP, €, sum of VA in all sectors (without taxes, subsidies and FISIM) per total employment (not accounted for intensity of use).

The differences between national and industrial productivity levels are associated with fast restructuring in all countries: the weight of agriculture in the economies of CEE fell fast everywhere (except in Poland by employment shares), while service sectors grew

rapidly in all countries of Central East Europe assessed in our project. The service sector became the largest one in Hungary already in 1993 and grew further to 60 *per cent* in terms of employment and 63 *per cent* in terms of value added by 2000. The manufacturing sector retained its weight in Hungary and increased in Estonia in terms of employment, whilst by gross value added, Slovakian manufacturing increased its contribution to GDP the most (see table 13.)

Table 13. Structural changes: the share of manufacturing sectors by employment and by gross value added

in % of GDP	Estonia		Poland		Czech Republic		Slovakia		Hungary		Slovenia	
	1993	2000	1993	2000	1993	1999	1993	2000	1993	2000	1993	2000
By employment	21.4	22.6	20.2	17.6	31.2	30.0	26.8	25.7	24.5	24.2	36.6	29.4
By VA	19.0	16.5	22.0	20.6	25.8	26.3	20.6	24.0	22.0	23.5	29.5	27.2

Sources: same as in the previous table.

Note: PPP, €, sum of VA in all sectors (without taxes, subsidies and FISIM) per total employment (not accounted for intensity of use).

In all countries observed, the structural content of the productivity gap decreased, but remained large enough to remain a problem: these countries will need a long time to catch up with the Western EU average. The gaps between levels of national labour productivities to the EU-15 average and in particular that of industrial labour productivities remain large in all cases today. That means that further intense restructuring and in particular productivity improvements are needed in the industries of each country to close the productivity gap to the West. In some countries, such as Hungary, Slovakia, and Estonia, efficiency improvement in the public sectors is also inevitable for closing the gap.

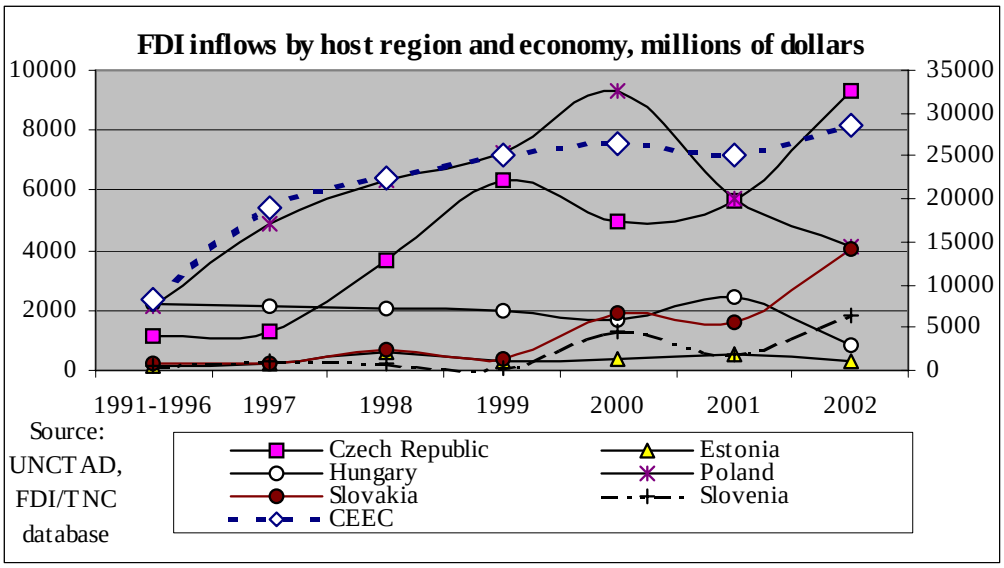
For all countries observed here, we detect the similarity that FDI played an important role for productivity upgrading, but the level of importance of FDI, the speed of restructuring, the economic structure by activities, the industrial structure by factor intensities, and the respective productivity levels of countries and sectors remain highly differentiated even today.

4.2.3. FDI trends and their economic role

Foreign direct investment assisted the fast restructuring and economic development in all CEECs, yet the countries attracted foreign investors to very different extends. Also FDI inflows varied strongly over time (see chart 6.

Inflows of FDI into CEE are determined to a large extent by the privatisation of formally state-owned enterprises, but foreign investment also depends on the current perception about the attractiveness of the host economy (extent of reforms, economic restructuring, political stability, *etc.*) and future expectations of investors about profitability. Hungary was the first country in CEE to provide preferable conditions to attract large amounts of FDI, hence net FDI inflows were robust ever since at least 1996 (even if abating in 2002 due to increasing profit repatriation). Poland as the largest economy attracted nearly as large amounts as Hungary with its much smaller economy between 1991 and 1996. From then, inflows became much larger, yet abated dramatically from 2000 onwards.

Chart 6 FDI inflows into CEECs, in US-$



Due to a late start in privatisation to foreign investors and the country's financial crisis, FDI-inflows in the Czech Republic picked up only in 1997 and grew fast until 2002. In Slovakia and Slovenia FDI inflows started to increase significantly from 1999, in parallel with a more FDI friendly policy.

Table 14. Inward FDI stock as a percentage of GDP

Percentage	1995	2000	2001	2002
Estonia	14.4	51.5	57.2	65.9
Czech Republic	14.1	42.1	47.4	54.8
Slovakia	4.4	23.6	30.4	43.2
Hungary	26.7	42.5	45.4	38.2
Poland	6.2	21.7	22.4	23.9
Slovenia	9.4	15.5	16.4	23.1

Source: UNCTAD, FDI/TNC database (WIR, 2003).

The FDI stock to GDP reached the highest rate in Estonia already from 2000 onwards, second in the Czech Republic since 2001. Even Slovakia has a higher rank in 2002 than Hungary which was the only country, where the FDI/GDP ratio fell seriously in 2004. The cumulated stock of FDI in Poland remained relatively (after Slovenia) the lowest. The Hungarian National Bank recently published corrected FDI data including the reinvested profits (estimated at 2 billion € per year for 1995-2003), but even these new data show the recent decline).

The Central East European countries are at different stages concerning the importance of FDI in their economies.

- Foreign investment enterprises (FIEs) in Slovenia, still in 2001, accounted for only 15 *per cent* of total assets and 12 *per cent* of employees of the Slovenian non-financial corporate sector. They realized 20 *per cent* of sales, 22 *per cent* of operating profits, and 31 *per cent* of total exports.

Table 15. FIEs' share in the Hungarian economy (in *per cent*)

	Number of FIEs	Assets	FDI/Assets	Investment	Sales	Exports	Employment	Salaries
1992	21.4	17.8	10.1	n.a.	24.4	37.3	15.3	19.1
1996	19.4	44.7	31.6	61.8	47.2	70.8	28.7	41.3
2000	14.4	63.6	56.7	60.1	54.1	82.5	32.3	47.2
2001	12.6	64.9	58.4	59.1	53.3	83.1	30.5	44.7

Source: Tax reports of double-entry accounting firms, own calculations.

- Poland took a medium stage: the number of FIEs in the economy grew fast between 1993-2001 (from 15,814 to 44,477), employing 310 thousand persons in 1993, and almost one million (966 thousand) in 2001 (8.4 *per cent* of total employment, except for agriculture). FIEs' share in exports grew from 16 *per cent* to 53 *per cent*, and reached 61 *per cent* in total imports by 2001. Output share of FIEs increased from 12.4 *per cent* in 1994 to 34 *per cent* in 2001, and in terms of investment from 3.3 *per cent* to 30.4 *per cent*.

Table 16. Inward FDI flows as a percentage of gross fixed capital formation (GFCF)

GFCF = 100	1991-1996	1997-2001
	Annual averages, %	
Estonia	23.9	30.5
Poland	10.1	17.4
Czech Republic	9.6	28.3
Slovakia	4.4	15.2
Hungary	26.8	18.3
Slovenia	4.0	5.6
CEEC	5.8	14.9

Sources: UNCTAD, FDI/TNC database (WIR, 2003).

- Hungary has a different position: the number of FIEs grew from 12,363 in 1992 to 20,943 in 2000. Whilst relative to all firms, it has not increased any more since 1996, in assets, investment and especially in exports the role of FIEs grew continually (see table 15.). By the end of the last decade, they dominated the whole economy, especially in terms of exports and investment. The year of 2000, however, marks the first year, when indigenous firms invested relatively more than FIEs (the investment share of FIEs fell from 71 *per cent* of the previous year to 60 *per cent*) and in 2001, FIEs' share diminished almost in every respects (except for share in total assets).

- In Estonia, FDI also played a very important role in economic restructuring and created a favourable starting base for real convergence toward the EU. The number of FIEs was 3,066 at the end of the last decade. FDI to gross fixed capital formation (GFCF) accelerated in the second part of the last decade: from 24 *per cent* (as

annual average between 1991-1996) to 31 *per cent* (in 1997-2001). In 2002, however, FDI inflows relative to gross fixed capital formation fell to 17 *per cent*.

The role of FDI in respect to gross fixed capital formation has accelerated in each country during the second part of the last decade, except for Hungary, where it was the highest in the first part of the last decade.

4.2.4.The changing focus of foreign investors by broad sectors of the economies

The distribution of FDI by main economic activities also differed by countries. Manufacturing and trade were the focus of foreign investors at the early stage of FDI-inflows in Hungary and in Estonia (as now in Slovakia and Slovenia). The timing of large privatisation processes also influenced the structure of FDI inflows by years.

- In Hungary, the FDI ratio to assets by sectors reached 21 *per cent* in manufacturing, and 15 *per cent* in trade already in 1992, and had increased fast to 51 *per cent* and 36 *per cent* respectively by 1996. Since then, its dynamics had slowed down: the FDI to assets ratio then grew only to 58 *per cent* in manufacturing, and to 56 *per cent* in trade, while business services and especially financial activities had become the most attractive sectors for FDI by 2000. The FDI ratio to assets grew from 21 *per cent* to 58 *per cent* in business services, and from 44 *per cent* to 89 *per cent* (!) in financial intermediates between 1996-2000.

Table 17. Stock of FDI in manufacturing and some major service sectors

	Activities, sectors	Estonia 2002	Hungary 2000	Slovakia 2002	Slovenia 2001	Poland 1998
D	Manufacturing	18.7	19.0	41.7	38.5	69.6
E	Electricity, gas and water supply	2.5	5.0	0.2		
G	Wholesale, retail trade	13.4	8.6	12.9	13.9	5.3 *)
I	Transport, storage, communication	22.6	4.2	13.2		
J	Finance	27.4	36.6	26.5	27.8	17.6
K	Real estate, renting and business activities	9.6	23.5	3.2	11.1	1)
All	Total	100	100	100	100	100

Sources: Polish Agency for Foreign Investment; Hungary: tax data base, own calculations, for other countries calculations are based on country studies (http://www.iwh-halle.de/projects/productivity-gap).

Notes: *) For Poland, trade includes real estate, services attracted 25% of FDI in 1998, but it included construction, too.

- The changing FDI distribution by sectors showed a similar trend in Estonia as in Hungary. During the first years of transition, the structure of inward FDI was rather stable. Manufacturing industry was the major recipient, followed by the wholesale and retail sales sectors. These two sectors of the economy attracted nearly 70 *per cent* of the FDI inflow in 1994-1995. Since 1996, the importance of the manufacturing industry as a target for FDI has decreased and the financial sector together with transportation and communication industries became more attractive to foreign investors. Changes in the structure of FDI inflows are reflecting the dynamics of privatisation programme of the Estonian government. After 1996, there were no large privatisation projects in industry, while some infrastructure and transport enterprises attracted large investment, as did two leading commercial banks (involving Swedish and Finish investments in 1998 and 2002).

The changing focus of foreign investors by activities after a longer involvement and the differences in weight of FDI in manufacturing can be illustrated by the distribution of FDI-stocks accumulated in manufacturing industries (see table 17.).

4.2.5. The penetration of CEECs' manufacturing industries by FDI

The share of FIEs in manufacturing industry is also very different across countries.

- By the end of the last decade, the highest (perhaps already extreme) dominance of FIEs was reached in the Hungarian manufacturing industry. This is especially pronounced in terms of exports (Hungarian data in table 18. relates to double entry accounting firms only), sales and capital endowment, but also in terms of employment in foreign subsidiaries.

- In Estonia, the extent of foreign penetration in the manufacturing industry is indicated by the 10 *per cent* share of FIEs in the total number of manufacturing firms, by a 37 *per cent* share in fixed assets, by a 27 *per cent* share in employment, by a 34 *per cent* share in sales, and by a 45 *per cent* share in exports in 2000.

Table 18. FIEs' share in manufacturing industries

	Estonia	Hungary	Slovenia	Poland
FIE to the all manufacturing firms, %	2000		2001	
Number of firms	9.8	17.1	4.8	1.2
Fixed assets	37.2	75.6	21.8	13.4
Sales	34.3	73.7	26.2	21.1
Exports	44.9	88.5	33.8	50.9
Employment	27.3	49.3	16.5	21.0

Sources: same as in the previous table.

- In the Slovenian manufacturing sector, the number of FIEs to all firms reached less than 5 *per cent*, but FIEs employed 17 *per cent* of the manufacturing labour force, had 22 *per cent* of fixed assets, and produced 26 *per cent* of sales, and exported 34 *per cent* of total manufacturing exports.

- For the Slovak manufacturing industry, we have data only for the share of FIEs in total fixed assets which reached 22 *per cent* in the year 2000.

4.2.6. The role of FIEs in CEECs' productivity improvements

The growing inflow of foreign technology and knowledge via FDI can be assumed to have contributed to the productivity improvement in the manufacturing industries of each of our Central East European economies. The clear differences in main economic indicators between foreign investment (FIE) and domestic (DE) enterprises groups can serve as indication for this. Performance gaps between the two groups of companies narrowed somewhat by the end of the decade, but remained still large proving the advantageous position of FIE group almost in all of the countries observed. The largest performance differences, however, still exist in Hungarian manufacturing, while the smallest differences can be observed in Slovenia.

- In Estonia convergence between FIEs and DEs could be registered in unit labour cost (with the ratio falling from 0.69 to 0.92 between 1996 and 2000), and in capital/labour ratios (from 3.39 to 1.65), while differences in export-orientation remained high (in FIEs 2.33 times higher in 1996, and 2.17 times higher in 2000). Yet, the difference in productivity between the FIE and DE groups by value added per employee shows an opposite trend: in 1996, it was 1.41 times higher in favour

of FIEs, and 1.45 times in 2000, indicating that FIEs' productivity levels grew slightly faster than those of the DE group average. The ratio of wage levels also increased a little (FIEs paid 1.27 times higher wages in 1996, than DEs, and 1.28 times higher in 2000).

- In Hungary, similar to the Estonian trend, capital/labour ratios decreased from 3.9 in 1996 to 3.2 in 2000. Whilst the difference in wage levels was higher than in Estonia, it converged in Hungary somewhat from 1.8 to 1.6 during the same period. The ratio of exports per employees was also higher and increased further (from 5.5 to 7.9). Whilst the indigenous firm group could increase its profitability more than the FIE group between 1996 and 2000 (growth of profit after taxation in the DE group was 5-fold, while in the FIE group it was only 2.4-fold). Productivity differences between the two groups were higher and increasing by net sales per employee (2.6 times in 1996, and 2.9 times in 2000), while in terms of the ratio of value added per employee, it decreased from 5.9 times to 4 times.

Table 19. Performance differences between foreign (FIE) and domestic firms (DE)

	Hungary	**Estonia**	**Slovenia**
Ratios in FIEs/DEs	2000		2001
Sales per employees	2.9	1.26	n/a
VA/employees	4.0	1.45	1.2
Wages	1.6	1.28	n/a
Capital/labour	3.2	1.65	1.5
Exports/sales	2.8	2.17	1.4

Sources: same as in the previous tables.

- Differences between the FIEs and DEs groups were lowest in Slovenia: the ratio of value added productivity in manufacturing was only 1.2 in 2001; the ratio of assets per employees was 1.5, while the difference in export-orientation (export per sales) was only 1.44: FIEs exported 72 *per cent*, and DEs only 50 *per cent* of their sales. Comparing to the Hungarian rates, where FIEs exported 60 *per cent* of their output, and domestic firms only 22 *per cent* in 2000, it is clear that both FIEs and DEs were much more export-oriented in the Slovenian manufacturing industry than in Hungary.

- In Poland, overall productivity (measured in revenue per employee) in the economy grew faster than in the group of FIEs (annual average growth rate between 1996-2000 was 124.5 *per cent* in total, and 123.1 *per cent* in the FIEs group). The ratio of productivity differences between FIEs and DEs increased up to 1996, but since then domestic firms narrowed the gap: the FIE/DE ratio decreased from two-times to 1.5 times. Export-orientation of FIEs was also 2.6 times higher than that of the DEs.

- For Slovakia, we can only use estimations: the productivity gap (by employment) was estimated 2.9 times lower in the FIE group as compared to the whole economy, by value added per employee the rate was only 1.6 times higher. According to the profitability indicator of value added to sales, FIEs had lower than average results (0.8). FIEs' share in exports decreased from 37 *per cent* in 1994 to 31 *per cent* in 2000, and increased only in 2001 (to 36 *per cent*).

4.2.7. The role of FIEs in technology upgrading

Productivity differences and economic development in Central East Europe depended much on structural changes inside their manufacturing industries: the prospect of catching up was to some degree determined by the shift from declining activities (firms) to dynamic ones, and from low value added activities to high value added industries. The analysis of the path of specialisation and the changing industrial structure (*e.g.* by technology intensity) revealed that each of the studied CEECs attracted FDI first in labour-intensive low-technology production. A shift towards more sophisticated activities could be registered in all CEE countries, and it was led mainly by the FIEs, while DEs remained more traditionally specialised. In spite of the progress, however, even in the most advanced countries, the FIEs group itself is still mainly located in the less (low- and medium low) technology intensive industries. This is particularly true in terms of number of firms and share of employees (see tables 20 and 21).

Table 20. Structure of FIEs according to technology levels of manufacturing industries(WIIW classification)

Sectors by WIIW classification	Estonia	Hungary	Poland	Slovakia	Slovenia
	Distribution of number of all FIEs in manufacturing				
'High and medium-high' technology	13.9	28.4	27.6	30.2	38.4
'Low' plus 'Medium-low' technology	*86.1*	*71.6*	*72.5*	*69.8*	*61.6*
Total D (no of FIEs)	100 (402)	100 (3743)	100 (4417)	100 (258)	100 (302)
	Distribution of FIEs by fixed assets				
'High and medium-high' technology	12.1	49.5	37.7	21.4	47.8
'Low' plus 'Medium-low' technology	87.8	50.4	62.3	78.6	52.2
Total D (fixed assets of FIEs)	100	100	100	100	100
	Distribution of FIEs by sales				
'High and medium-high' technology	18.5	55.3	34.3		59.0
'Low' plus 'Medium-low' technology	81.5	44.8	65.6		41.0
Total D (sales of FIEs)	100	100	100		100
	Distribution of FIEs by exports				
'High and medium-high' technology	24.4	74.3	53.3		64.8
'Low' plus 'Medium-low' technology	75.6	25.7	46.7		36.1
Total D (exports of FIEs)	100	100	100		100
	Distribution of FIEs by employment				
'High and medium-high' technology	25.4	55.3	42.6		48.5
'Low' plus 'Medium-low' technology	*74.5*	*54.6*	*63.4*		*51.4*
Total D (employment of FIEs)	100	100	100		100

Sources: For Hungary and Slovenia: tax reports of double-entry accounting firms. For Slovakia: estimation based on the sample firms, except the distribution of fixed assets of

FIEs, here the source was the Statistical Office (own calculation based on the country reports data).

Note: The classification is based on the use of technology (WIIW classification).

The OECD classification of manufacturing industries includes four groups. High technology industries include: Aircraft and Spacecraft (3530); Pharmaceuticals (2423; 244); Office, Accounting and Computing machinery (30); Radio, television and communication equipment (32); medical, precision and optical instruments (33). Medium-high technology industries: Electrical machinery and apparatus (31); Motor vehicles, trailers and semi-trailers (34); Chemicals excluding pharmaceuticals (24 excl. 2423); Railroad equipment and transport equipment (352+359; 35.2+35.4); Machinery and equipment (29). Medium-low technology industries: Coke, refined petroleum products and nuclear fuel (23); Rubber and plastic products (25); Other non-metallic mineral products (26); Basic metals (27); Fabricated metal products, except machinery and equipment (28); Building and repairing of ships and boats (351; 351). Low technology industries: Food products, beverages and tobacco (15+16); textiles, textile products, leather, and footwear (17+18+19); Wood, pulp, paper, paper products, printing and publishing (20+21+22); Manufacturing n. e. c., and recycling (36+37).

The WIIW classification does not separate the 'high' and the 'medium high' technology industries (the Aircraft and Spacecraft, Pharmaceuticals, and building and repairing of ships and boats and the different engineering sub-sectors).

Table 20.presents the shares of FIEs in sectors by four groups of technology intensity (OECD classification, where data is available, otherwise WIIW classification). The shares of FIEs in each sector demonstrate clearly how important a role FDI played in upgrading the technological structure: the more sophisticated the activities, the higher is the share of FIEs, especially in exports, sales and capital endowment. This is the most explicit for Hungary, where FDI arrived at the earliest time.

Table 21. The importance of FIEs by technological level (OECD and WIIW classification)

Manufacturing	**Shares of all FIES in % of all FIRMS in the sector group**				
Hungary, 2000, NACE Rev. 1 OECD	No. of firms	Fixed assets	Sales	Exports	Employment
'High' technology industries	18.4	81.1	89. 9	96.8	69.7
'Medium-high' tech. industries	20.8	86.6	83.7	93.1	60.9
'Medium-low' tech. industries	18.0	77.6	70.3	78.1	47.1
'Low' technology industries	15.2	58.5	56.2	71.6	38.6
Total manufacturing industries	17.1	75.6	73.7	88.5	49.3
Slovenia, 2001, NACE Rev. 1 OECD	No. of firms	Fixed assets	Sales	Exports	Employment
High technology industries		22.5	21.4	23.7	19.1
Medium-high tech. industries		31.5	44.2	49.1	25.3
Medium-low tech. industries		20.2	23.5	30.4	18.0
Low technology industries		16.1	14.4	19.1	9.9
Total manufacturing industries	4.8	21.8	26.2	33.8	16.5
Estonia, 2000, WIIW	No. of firms	Fixed assets	Sales	Exports	Employment
High technology industries	13.9	33.8	43.0	56.1	41.3
Medium-high tech. industries					
Medium-low tech. industries	10.6	54.1	35.7	44.2	22.6
Low technology industries	8.6	32.5	31.8	41.4	24.9
Total manufacturing industries	9.8	37.2	34.3	44.9	27.3
Poland, 2001, WIIW	No. of firms	Fixed assets	Sales	Exports	Employment
High technology industries	1.9	14.8	25.8	59.8	30.0
Medium-high tech. industries					
Medium-low tech. industries	1.5	9.5	13.1	37.4	19.2
Low technology industries	0.9	16.6	22.9	47.7	17.3
Total manufacturing industries	1.2	13.4	21.1	50.9	21.0

Notes and sources are the same as at the previous table.

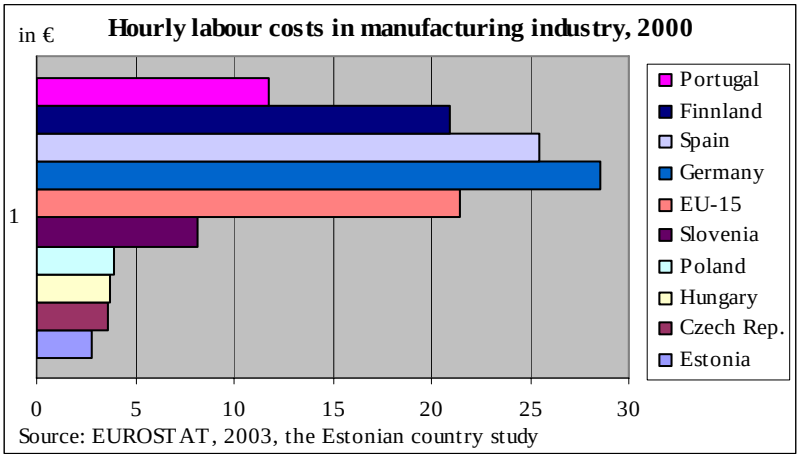
For Slovakia, the project's country study reports only statistical office data for the FDI share to total investment in industrial production, but on the basis of estimations by author: "Despite the fact, that FDI influenced the value added improvement and technological upgrading, value added per employee was only slightly more positive in the FIEs group than the economic average. The low ratio of value added of sales, and thus also low economic efficiency demonstrate that the main orientation of foreign investors in an early stage of development is focused on the most important comparative advantage of Slovakia – cheap, technically educated and skilled labour force. This tendency is continuing, and only in some branches, sophistication of production is mildly increasing." (Sabol et al, 2003.)

Summing up the statements of the project's country studies about the motives of foreign investors, and host country's regulations to attract them, more similarities than differences can be found. Each of the countries assessed had (more or less) the same comparative advantages at the beginning of FDI-inflow liberalisation: a relatively cheap but well educated labour force, knowledge on companies (under decades of OPT), and geographical proximity to the main investors. Differences can be found in market size (in particular Poland), in the rank of the main investors by geographical origin (Scandinavians in Estonia, French investors in Poland; German, Dutch and Austrians in Slovenia, Slovakia, and Hungary; American and Japanese investors display a higher activity in Hungary), and, also, in timing and sequencing of legislation and economic restructuring and stabilisation.

The main motives for investment in each country were at first market-seeking (home and neighbouring markets, prospect for EU integration). Next, foreign investors were increasingly efficiency seeking (mainly relatively low labour costs, and in Poland, and Slovakia, raw materials, too), combined with multinational company strategies (global and/or regional). Only the Slovenian study mentioned the importance of recognized trademarks (however, this was an unspoken motive for investment to food industry almost in all our countries).

The volume of FDI in time, across all our countries, depended much on timing of legislation (the most important laws for creating safe legal conditions for FDI, such as the Foreign Trade Act, and the Company Law in Hungary in 1988-1989, or in Slovenia, just in 1999), and on the sequencing of privatisation projects. Several barriers on FDI were abolished in Slovakia just recently, while in Hungary, Estonia, and in Poland, this happened already during the early 90s.

Chart 7. Industrial labour costs in European countries



The most important basic conditions, however, everywhere, every time, are the political and economic stabilisation (transparency and prospects, as the peaceful and fast transition in Hungary promised at early 90s, and economic stabilisation in 1995 facilitated, or the recent consolidation of political and economic situation in Slovakia). Clear regulations and special incentives to investors could attract more (or a lack of them would deter) FDI in competition with conditions in the neighbouring countries. Disturbance in political and economic transparency seems to be an important factor in the recent decline in Hungary to attract FDI, but is most clearly indicated in the case of the Slovak Republic.

Differences in regulations (and in possible future incentives), however, are next to be eliminated by full EU membership, and comparative advantages of relatively low labour costs are fast eroding in each of these economies (especially in comparison to the non-member neighbouring European or transition economies and most of the developing countries, like China). To the EU average, however, each of the candidate countries has some space to catch up with hourly labour costs, even if we consider the levels of productivity gaps. The relative level of hourly labour costs compared to the average of the EU-15 in 2000 was still 38 *per cent* even in the most developed of our countries Slovenia, the Polish, Hungarian and Czech levels were 17 to 18 *per cent*, and in Estonia, it hardly surpassed 13 *per cent* of the EU-15 average. For comparison, hourly labour costs in Portugal stood at a mere half of the average EU-15 level (see chart 7.).

4.3. Comparative analysis of data collected at the firm level

A number of researchers involved in this workpackage have decided to assume responsibility to analyse our CEE subsidiary database from a cross-country comparative perspective rather than from the individual country-perspective ventured by the members of the consortium so far. The team consisting of Slavo Radoševic, Boris Majcen and Matija Rojec edited a paper summarising the descriptive results of the comparative analysis. The most important results from this analysis include:

4.3.1 Autonomy of subsidiaries

Data generated enabled us to find out whether individual business functions are undertaken by the subsidiary, or by foreign parent company or any weight of cooperation between them. Autonomy of business functions of subsidiaries is grouped into operational, marketing or strategic autonomy. Table 22. shows average control of individual functions by subsidiaries across the five countries assessed, in aggregate and groupings of functions.

Table 22. shows that subsidiaries have the biggest autonomy in operational functions (accounting and finance, supply and logistics, operational management, and process engineering) and the smallest in strategic functions (determining product price, investment finance, product development and strategic management). Marketing autonomy is intermediate. Analysis of autonomy of business functions shows that the biggest autonomy in all countries is in accounting and finance. Within operational management related functions process engineering is the least autonomous in all countries. This may be expected given that the process engineering involves technological improvements and thus certain degree of technological mastery. Autonomy in product development is much smaller in all countries when compared to process engineering. In fact product development is the least autonomous of all functions. Among marketing functions after sales services and distribution activities are the most autonomous while market research is the least in control of subsidiaries.

There are some statistically significant differences across countries in all business functions except in supply and logistics. The usual ordering of FIEs functional autonomy, the highest being in operational functions, the lowest in strategic functions, with marketing functions in between is present in three of the analysed countries (Slovakia, Hungary and Estonia). For Poland, marketing autonomy is more frequent than operational autonomy. This may be result of the market size and market seeking nature of FDI in Poland. This is also confirmed by Mann-Whitney test, according to which in all

marketing functions except advertisement, Polish FIEs show statistically significant and higher autonomy than average for total sample FIEs, while in some operational functions (operational management and process engineering) the situation is the opposite. On the other hand, Slovak FIEs show statistically significant and lower autonomy in all marketing functions.

It thus seems that market orientation also influences subsidiaries' autonomy. The more subsidiary is oriented towards local market we may expect that it will have bigger autonomy in terms of marketing functions and partly in terms of operational autonomy. Poland seems to fit quite well this pattern. The more subsidiary is export oriented we may expect that it will have lower strategic and marketing autonomy. Again, Slovakia pretty well reflects this situation. Indeed, when we look at data on FIEs sales structure Slovak FIEs have the biggest export orientation, while Polish FIEs are the most local market oriented. Mann-Whitney test tends to prove this as statistically significant. However, both factors operate in interdependence and only econometric testing can confirm these hypotheses.

Table 22. Autonomy of business functions of FIEs

Business functions	Autonomy indicator [1]					
	Total [2]	Slovenia	Slovakia	Hungary	Poland	Estonia
Operational management	0.253	0.111	0.199	0.212	0.370	0.262
Process engineering	0.353	0.278	0.245	0.396	0.426	0.338
Supply & logistics	0.247	0.194	0.278	0.237	0.268	0.232
Accounting & financial operations	0.145	0.083	0.140	0.124	0.165	0.220
Operational autonomy	0.250	0.167	0.216	0.242	0.307	0.263
Distribution, sales	0.306	0.319	0.454	0.323	0.201	0.366
Advertisement	0.336	0.333	0.460	0.340	0.282	0.310
After sale services	0.256	0.305	0.362	0.270	0.181	0.232
Marketing	0.373	0.403	0.515	0.352	0.295	0.379
Market research	0.391	0.463	0.563	0.376	0.287	0.352
Marketing autonomy	0.332	0.365	0.471	0.332	0.249	0.328
Determining product price	0.363	0.315	0.490	0.335	0.355	0.310
Investment finance	0.389	0.269	0.475	0.307	0.412	0.506
Product Development	0.501	0.454	0.643	0.490	0.475	0.447
Strategic management and planning	0.500	0.398	0.580	0.468	0.532	0.482
Strategic autonomy	0.438	0.359	0.547	0.400	0.444	0.436

Notes: [1] Indicators are calculated by giving individual answers the following weights: 0=only FIE, 0.33=mainly FIE, 0.66=mainly foreign parent, 1=only foreign parent. The nearer is indicator to 0 the higher is the autonomy of FIEs themselves and *vice versa*.

[2] Weighted average.

For Slovenia, strategic autonomy is nearly the same as marketing autonomy. Indeed, in investment finance and strategic management and planning, Slovenian FIEs show statistically significant and higher autonomy than total sample average. Slovenian FIEs also have significantly more than total sample average autonomy in some operational functions (operational management, accounting and financial operations). This is also true for Slovakia in operational management and process engineering. However, marketing and strategic autonomy is the smallest in Slovak FIEs, which exhibit statistically significant and lower autonomy than total sample average in all marketing

and strategic functions. All this may suggest that Slovenian subsidiaries are the most autonomous while Slovakian are the least autonomous. How do we interpret these differences in functional autonomy across five CE countries? Differences may be explained by the nature of inherited capabilities and by market orientation of subsidiaries. The more developed are firms' capabilities we may expect that subsidiary should be more autonomous. If we take as proxy for subsidiaries' technological capabilities the importance of their own R&D, and patenting activities than Slovenian subsidiaries give significantly higher importance to their own R&D activities when compared to the Slovak. Slovak subsidiaries ascribe higher importance to quality control assistance by parent companies when compared to Slovenian which suggest that they are dependent strongly production oriented subsidiaries.

When control of functions is compared across manufacturing sectors, the following four main features appear:

x) There are no statistically significant differences among sectors as far as operational functions are concerned.

xi) There are only four sectors, which in fact show really statistically significant differences from total sample averages.

xii) Practically all the sectors, which prove to be significantly different than total sample average in terms of marketing functions are also significantly different in strategic functions.

xiii) The sense of the difference goes always in the same direction. Sectors which have significantly higher than average autonomy in marketing functions also have significantly higher than average autonomy in strategic functions, and *vice versa*. Sectors with significantly lower than average autonomy in marketing and strategic functions are DC – leather and leather products, DD – wood and wood products and DM – transport equipment. The only sector with significantly higher than average autonomy in marketing and strategic functions is DA – food, beverages and tobacco.

This suggests that levels of autonomy in marketing and strategic functions are linked and that market orientation of subsidiaries is very much industry specific as well as country specific. Food, beverages and tobacco industry in CE is mainly much local market oriented and higher than average autonomy in market and strategic functions corresponds to that orientation. Transport equipment industry, *i.e.* mainly automotive

industry has very low marketing and strategic autonomy which suggest that the CE subsidiaries in this industry are mainly production oriented subsidiaries.

4.3.2. Market orientation and structure of suppliers

Market orientation of subsidiaries is a very important variable for understanding autonomy of business functions as well as patterns of upgrading. It also indicates the integration of FIEs in their foreign parent companies networks. In overall, sample FIEs export 51.8 *per cent* of their sales. However, there are big country differences in that respect. We have three countries with distinctively export oriented FIEs; *i.e.* Slovenia with 72.9 *per cent* exports to sales ratio, Slovakia with 64.4 *per cent* and Estonia with 59.8 *per cent*. On the other hand, we have Poland where 67.1 *per cent* of sales is sold on domestic markets. Hungary with 52.1 *per cent* exports to sales ratio is somewhere in between. Export orientation is closely related with sales to foreign parent company. Slovenian and even much more so Slovakian FIEs sell most of their total sales to their foreign parent companies (Slovenian FIEs 37.1 *per cent* and Slovakian FIEs 47.5 *per cent*). Slovakian FIEs export almost three times as much to foreign parent companies than to other foreign buyers. This confirms that Slovakian, but also Slovenian subsidiaries are most often production oriented dependent subsidiaries. In the case of Poland, Hungary and especially Estonia much lower proportion of exports goes to foreign parent companies. In the case of Estonian FIEs, 30.6 *per cent* of sales go directly to other foreign buyers and only 29.2 *per cent* to foreign parent companies themselves. Orientation of Polish subsidiaries towards local market is consistent with the strong marketing autonomy of Polish subsidiaries. In all countries, sales to other local subsidiaries of foreign parent are very limited. In Slovenia and Slovakia, they are almost non-existent (see table 23.). It is also true that it is not very probable that MNCs have more than one subsidiary in small countries like Slovenia, Slovakia or Estonia.

Mann-Whitney test confirms some of the above differences among countries as far as FIEs marketing orientation is concerned. Slovak FIEs show statistically significant and higher than total sample average sales orientation to foreign parent companies and lower sales orientation to domestic buyers. Similarly, Slovenian FIEs show statistically significant and higher orientation to other foreign buyers (but not to foreign parent companies) and lower sales orientation to domestic buyers. Quite opposite is situation for Polish FIEs, which show statistically significant and lower sales orientation to foreign parent companies and other foreign buyers, but higher sales orientation to domestic buyers. It is, therefore, obvious that Slovak and Slovenian FIEs are significantly more export oriented, while Polish FIEs are significantly more local market oriented.

Table 23. FIEs sales structure, in *per cent* of total FIE sales

Countries	Sales to			
	Other domestic buyers	Foreign parent	Other foreign buyers	Other domestic subsidiaries of foreign parent
Total *)	44.6	30.5	21.3	3.3
Slovakia	31.7	47.5	16.9	2.5
Slovenia	28.1	37.1	35.8	0.5
Hungary	43.3	27.7	24.4	3.5
Poland	62.6	20.8	12.0	4.5
Estonia	35.9	29.2	30.6	4.4

Note: *) Weighted average.

There are also statistically significant differences in marketing orientation among FIEs in different manufacturing sectors. Exports and local market oriented sectors can be identified. Sectors DB – textiles and textile products, DC – leather and leather products and DM – transport equipment are significantly more oriented to sales to their foreign parent companies, while sectors DA – food, beverages and tobacco, DE – paper, publishing and printing and DI – non metal mineral products are significantly more than total sample average oriented to local market sales.

Structure of suppliers is another variable for understanding autonomy of business functions of FIEs as well as of FIEs integration in their foreign parent companies networks and in the local economies. Contrary to the situation on the sales side, where foreign parent companies prevail, in supplies other domestic suppliers with 34.4 *per cent* of total supplies and other foreign suppliers with 28 *per cent* have more important role than foreign parent companies with 27.6 *per cent*. It seems that FIEs have more autonomy in supplies than in sales. All in all, FIEs purchase more supplies from abroad (55.6 *per cent*) than at home. Of course there are quite some differences among individual countries. The share of imported supplies is the lowest in FIEs from Hungary (49.9 *per cent*) and Poland (51.8 *per cent*), and higher in Estonia (54.9 *per cent*), Slovenia (58.1 *per cent*) and Slovakia (68.8 *per cent*). The shares of foreign parent companies supplies is the highest in Poland and Slovakia (see Table 24.)). One can not avoid the conclusion, that FIEs from those countries, whose sales are the most local-market oriented (Poland and Hungary), are also more local-market oriented as far as supplies is concerned. More exports is obviously linked to more imported supplies and *vice versa*. Also, size of the country is relevant here. Smaller countries do not offer smaller possibilities only for sales

but also for supplies. Mann-Whitney test seems to confirm these differences among countries. Thus, Slovenian and Slovak FIEs source significantly more supplies than total sample average from other foreign suppliers (Slovenia) or from foreign parent companies (Slovakia) and significantly less from domestic sources (Slovakia). On the other hand, Polish FIEs source significantly less from other foreign suppliers, and Hungarian FIEs significantly less from foreign parent companies and more from domestic suppliers. The only surprise in this pattern might be that Slovenian FIEs source significantly more from domestic suppliers.

Table24. FIEs purchases structure, in *per cent* of total FIE purchases

Countries	**Purchases from**			
	Other domestic suppliers	**Other foreign suppliers**	**Foreign owner**	**Other domestic subs. of foreign owner**
Total *)	34.44	28.0	27.6	7.2
Slovakia	1.62	36.08	32.70	23.01
Poland	40.47	17.83	33.98	6.66
Estonia	36.57	30.10	24.84	5.43
Slovenia	41.3	34.6	23.5	0.5
Hungary	45.29	32.03	17.88	1.18

Note: *) Weighted average.

As far as differences in suppliers structure among manufacturing sectors is concerned, Mann-Whitney test in part reflects the pattern in sales structure. Sectors, which export significantly more to foreign parent companies or other foreign buyers (DB – textiles and textile products, DC – leather and leather products, DM – transport equipment), source significantly less locally; sectors, which exports significantly less to foreign parent companies or other foreign buyers (DA – food beverages and tobacco) source significantly more locally. Other sectors which source significantly more from foreign parent companies and significantly less locally are DL – electrical and optical equipment, DN – furniture and other manufacturing, while sector DH – rubber and plastic products sources significantly more locally and significantly less abroad.

4.3.3. Effects of industrial integration on local subsidiaries

The questionnaire enables us to get some idea of the magnitude and types of changes in local subsidiaries since they became FIEs. The changes were classified into five categories, changes in value of sales, changes in exports, changes in productivity level, changes in technology level and changes in quality level. The analysis put forward two main features of the magnitude of changes in sample FIEs (see Table below).

Table 25. Magnitude of changes since the registration of a company as FIE [1)]

Countries	Value of total sales	Share of exports	Level of productivity	Level of technology	Level of quality
Total [2)]	0.50	0.45	0.56	0.55	0.56
Slovenia	0.61	0.57	0.57	0.51	0.46
Hungary	0.59	0.39	0.61	0.56	0.56
Poland	0.46	0.35	0.54	0.58	0.58
Estonia	0.69	0.46	0.56	0.56	0.56
Slovakia	0.26	0.57	0.54	0.51	0.60

Notes: [1)] Magnitude of changes ranges from -1=considerable reduction, -0.5=reduction, 0=no change, 0.5= increase, and +1=considerable increase.

[2)] Weighted average.

Firstly, FIEs estimate that the intensity of changes is very similar for productivity, technology and quality. Moreover, differences in improvements in these three categories are statistically not significant across five countries (With the exception of Slovenian FIEs where magnitude of changes in the quality changes has been significantly lower than in total sample average). This lack of differentiation in magnitude of changes suggests that technological improvements in CE are still very much focused around quality, training and organisational improvements, *i.e.* around production capability. Nevertheless, there are some statistically significant differences across manufacturing sectors. Magnitude of productivity changes in DB – textiles and textile products has been significantly higher than total sample average, while *vice versa* is true for DG – chemicals and man-made fibres. DD – wood and wood products and DG - chemicals and man-made fibres have experienced significantly lower than average magnitude of changes in quality.

Secondly, changes in sales and exports are somewhat lower in intensity, especially as far as exports are concerned. Lower magnitude of changes in exporting suggests that maybe FIEs were exporters already before take-over. Higher experienced increase of sales when

compared to exports may also suggest that subsidiaries have actually strengthened their local market orientation. Mann-Whitney test suggests significantly higher than total sample average magnitude of change in sales for Hungary and Estonia and significantly lower for Slovakia. Slovak FIEs are the only ones, which recorded significantly higher than average magnitude of changes in exports. There are no significant differences among manufacturing sectors as far as magnitude of changes in sales is concerned. Magnitude of changes in exports has been significantly higher than total sample average in DJ – basic metals and products, and significantly lower in DA – food, beverages and tobacco and DI – non metal mineral products.

4.3.4. Competence profile of subsidiaries

Key sources of competitiveness of subsidiaries are quality control (0.836 on the scale between 0=not important and 1=extremely important) and management capabilities (0.778), followed by trained labour force (0.698) and further behind by R&D and licences (0.532). This further reinforces view that CE subsidiaries base their market position on developed production, much less on technology capabilities. This is the most visible in case of Hungary where the difference in the importance of quality vs. R&D as sources of competitiveness is the biggest. Among the analysed countries, Polish and Slovenian subsidiaries consider R&D/licences as relatively the most important source of their competitiveness (see Table 26.).

Table 26. Areas of competitiveness of FIEs

Areas of competitiveness	Importance [1)]					
	Estonia	Slovenia	Poland	Slovakia	Hungary	Total [2)]
Quality control assistance	0.801	0.861	0.811	0.822	0.895	0.836
Management	0.765	0.767	0.791	0.770	0.780	0.778
People and training	0.791	0.726	0.676	0.679	0.675	0.698
Patents, licences, R&D	0.536	0.576	0.579	0.520	0.419	0.532

Notes: [1)] Importance of areas of competitiveness ranges from 0=not important, 0.25=little important, 0.50=important, 0.75=very important, 1=extremely important.

[2)] Weighted average.

In the Polish case this may be expected given local market orientation of Polish subsidiaries. In the Slovenian case it may be linked to greater autonomy of Slovenian FIEs in strategic management and planning, and product development. This pattern

seems to be confirmed by Mann-Whitney test, showing R&D/licenses as significantly more important than total sample average area of competitiveness in the case of Polish FIEs and *vice versa* in the case of Hungarian FIEs. For Hungarian FIEs quality control is significantly more important than total sample average area of competitiveness, while for Estonian FIEs this is true for trained labour force.

Statistically significant sectoral differences in various areas of FIEs competitiveness are quite few. There are no statistically significant differences in quality control, probably because it is very important for all the sectors. For DB – textiles and textile products and DN – furniture and other manufacturing R&D/licensing is significantly less important area of competitiveness than on average for the sample, what is to be expected. On the other hand, training for DE – paper, publishing and printing, and management for DH – rubber and plastic products and DI – non-metal mineral products are significantly more important areas of competitiveness than for total sample average.

4.3.5. Internal and external sources of competitiveness

Competitiveness of subsidiaries may be due to their own activities or due to reliance on foreign parent or other external organisations. Data allow us to trace whether the key sources of competitiveness are internal or external to subsidiary. Table 27. shows areas of competitiveness by sources of this competitiveness. If we take 0.5 (on the scale between 0=not important and 1=extremely important, *i.e.* equivalent to important source) as threshold level of importance of a source three main conclusions can be drawn:

xiv) Subsidiary's (FIE's) own activities and relationship to foreign parent company are the most important sources of their competitiveness in all four areas (quality control; management, training, R&D/licences).

xv) Only in quality control subsidiaries are significantly dependent on value chain partners (local and foreign suppliers and buyers).

xvi) Other local subsidiaries of foreign parent company and other organisations are not important source of competitiveness for subsidiary in any area. This reinforces conclusions about dyadic or in this case value chain driven determinants of productivity for subsidiaries.

The country specific patterns of sources of competitiveness (not presented in the table due to the size of the table) show the following two differences when compared to average aggregate pattern. First, Slovenia's, Slovakia's and Estonia's pattern is the most similar to the aggregate one. We should remember that their subsidiaries are the most

export intensive, which makes them in quality control dependent on foreign parent but also on foreign suppliers and buyers. However, in quality control they are also relatively strongly dependent on local buyers and suppliers. This dependence is not so strong as from foreign partners but is still above 0.5. Again, this may be due to strong export orientation of their subsidiaries, which are forced to meet export quality requirements and thus are dependent on quality of their partners. Second, Poland and Hungary are the least dependent on their value chain partners. More local market oriented nature of their subsidiaries led to situation that for quality control they are more dependent on local suppliers/buyers than on foreign. Unlike Hungarian, Polish subsidiaries are strongly dependent on foreign parent in all areas of competitiveness. Hungarian subsidiaries are relatively less dependent on foreign parent and consider their own quality control as by far the most important source of their competitiveness.

Country differences are important in terms of balance between external and internal sources of competitiveness. Moreover, we can observe country specific patterns of dependencies of companies on external vs. internal sources of competitiveness. Mann-Whitney test of differences among the countries shows statistically significant differences from total sample averages for Hungary in 22 out of 32 possible pairs of areas and sources of competitiveness, for Estonia in 10, for Poland and Slovakia in 9 and for Slovenia in 7.

Table 27. Sources of individual areas of competitiveness of FIEs [1)] for all countries [2)]

Sources	Quality control assistance	Management	People and training	Patents, licences, R&D
Own company	0.82	0.79	0.72	0.50
Foreign parent	0.61	0.66	0.5	0.57
Other foreign buyers	0.55	0.35	0.29	0.31
Other foreign suppliers	0.51	0.3	0.26	0.3
Other local subsidiaries	0.23	0.21	0.19	0.16
Other local buyers	0.52	0.36	0.3	0.28
Other local suppliers	0.52	0.32	0.29	0.28
Other organisations	0.35	0.32	0.35	0.31

Notes: [1)] Importance of areas of competitiveness ranges from 0=not important, 0.25=little important, 0.50=important, 0.75=very important, 1=extremely important.

[2)] Weighted average.

Hungary, obviously stands out as a rather specific in terms of sources of competitiveness. The pattern for Hungary is that FIEs themselves are significantly more important for quality control but less for R&D/licenses. Foreign parents are significantly less important in quality control and training. Other foreign buyers from and sellers to Hungarian FIEs are significantly less important source in all areas of competitiveness, except in quality control. The same is true for domestic buyers and sellers of FIEs. In Hungary, FIEs themselves seem to be even more important for quality control than on average for the sample, and *vice versa* goes for foreign parents. This has to do with higher importance of local market in the case of Hungarian FIEs. Hungarian FIEs also depend more than the total average of sample FIEs on their buyers and sellers as far as quality control is concerned.

In Poland, FIEs themselves are less important source of quality control and training than sample FIEs on average. Contrary to the situation in Hungary, foreign buyers and sellers are less important source of quality control, but domestic buyers and sellers are significantly more important than in the total sample average. Obviously, domination of local market in Polish FIEs sales structure makes its actors the main criteria for quality.

Mann-Whitney test does not provide a clear common pattern of significant differences in sources of competitiveness for FIEs from the smaller three countries Estonia, Slovakia and Slovenia. The only real difference is that foreign buyers and sellers seem to be significantly more important source of competitiveness for them than on average for total sample FIEs. This has to do with higher export orientation of FIEs from these three countries.

Analysing significance of differences by different sources of competitiveness shows the following:

xvii) For FIEs themselves as a source of competitiveness, there are some significant differences in all the countries except Slovakia.

xviii) For foreign buyers and sellers Slovakia, Hungary and Estonia show significant differences.

xix) For domestic buyers and sellers only Hungary shows some significant differences

xx) While for foreign parent companies there are very few significant differences among countries.

Given the high importance of foreign parent in all areas of competitiveness for subsidiary the latter suggests that the CE subsidiaries in all countries are strongly and similarly dependent on foreign parents.

Differences among manufacturing sectors in their sources of competitiveness are very few. Mann-Whitney test shows some statistically significant differences from total sample averages only in DA – food, beverages and tobacco, where foreign parents are significantly less important source in all areas of competitiveness, DB - textiles and textile products, where domestic buyers and sellers are significantly less important source, and DI – non metal mineral products, where FIEs themselves are significantly more important source of competitiveness.

4.3.6. Financial integration

Similar to competence flows, CE subsidiaries are in terms of financial flows dependent on their own retained earnings (average mark 0.692 on the scale between 0=not important and 1=extremely important) and on foreign parent company (0.618). Despite significant country differences, retained earnings and foreign parent company are the two most important sources of finance for all of them. The situation is somewhat different only in Hungary where domestic sources, either banks or other firms, are more important source than foreign parent company (see table 28.). This corresponds to relatively smaller reliance of Hungarian subsidiaries on foreign parent companies as source of competitiveness. Some correspondence between competence flows and financial flows can also be observed in correlation between reliance on foreign parent company as a source for quality control and foreign parent company as source of finance. Correlation coefficient between these two variables for five CE countries is 0.77. Reliance of subsidiaries on foreign sources other than foreign parent is the biggest in Poland. This may reflect relatively the highest costs of local finance for Polish firms.

Table 28. The importance of various sources of finance of FIEs [1)]

Country	Retained earnings	Foreign owner company	Other domestic sources (banks, other firms, *etc*...)	Other foreign sources (banks, other firms,...)	Other domestic subsidiaries of foreign owner
Slovakia	0.801	0.632	0.395	0.247	0.088
Hungary	0.732	0.528	0.627	0.168	0.048
Slovenia	0.699	0.562	0.462	0.285	0.035
Estonia	0.681	0.656	0.468	0.287	0.041
Poland	0.613	0.672	0.478	0.324	0.215
Total [2)]	0.692	0.618	0.488	0.270	0.112

Notes: [1)] Importance of areas of competitiveness ranges from 0=not important, 0.25=little important, 0.50=important, 0.75=very important, 1=extremely important.

[2)] Weighted average.

Mann-Whitney test sheds some additional light on country differences in sources of finance for FIEs. For Hungarian FIEs, other domestic sources are significantly more important source of finance than on average, while other foreign sources significantly less. For Slovak FIEs, retained earnings are significantly more important source of finance than average, while *vice versa* is true for other domestic sources. For Polish FIEs, retained earnings are significantly less important and other foreign sources significantly more important.

There are very few statistically significant sectoral differences in FIEs sources of finance. Retained earnings are significantly more important source than average in DH – rubber and plastic products, foreign parent company is significantly more important than average in DE – paper, publishing and printing, other domestic sources are significantly more important than average in DA – food, beverages and tobacco, while other foreign sources are significantly less important than average in DA – food, beverages and tobacco.

4.3.7. Upgrading activities

In this section, we analyse upgrading activities of CE subsidiaries. The analysis is composed of two issues, who initiates changes in FIEs, and how the future mandate of FIEs will evolve. In particular, our data enable us to analyse, who initiates what kind of upgrading and what is the likely change of the subsidiaries' mandate. We distinguish

between functional upgrading (organisation and business functions), product diversification (number of lines of businesses) and sale upgrading (sales and exports).

Table 29. on who is the initiator of changes in FIEs, ranges initiatives indicator between 0=FIE itself and 1=foreign parent. The nearer is indicator to 0 the more initiatives have been undertaken by FIEs themselves and *vice versa*. The table suggests several conclusions:

xxi) In all three aspects (organisation and business functions, number of lines of businesses, and sales and exports) FIEs themselves are more frequent initiator of changes than foreign parent companies. In overall, local subsidiaries thus seem to have a high degree of autonomy within their charter; initiatives indicator varies from 0.31 (lines of businesses in Estonia) to 0.61 (lines of businesses in Slovakia).

xxii) In all the countries, except Slovakia, FIEs are more important initiator of changes than foreign parent companies. On average foreign owners are relatively the most frequent initiator of change in Slovakia and the least frequent in Estonia.

Mann-Whitney test confirms these differences of Slovakia and Estonia from total sample average as statistically significant. It is difficult to interpret these differences as they may reflect industry differences, which are significant for sales and for number of lines of businesses.

Table 29. Who gives initiative for changes [1)]

Countries	Organisation and business functions	Number of lines of business	Sales and exports
Total [2)]	0.38	0.48	0.43
Slovenia	0.37	0.43	0.43
Slovakia	0.38	0.61	0.54
Hungary	0.30	0.46	0.46
Poland	0.44	0.50	0.39
Estonia	0.33	0.31	0.31

Notes: [1)] Importance of areas of competitiveness ranges from 0=not important, 0.25=little important, 0.50=important, 0.75=very important, 1=extremely important.

[2)] Weighted average.

xxiii) Foreign parents most frequently initiate changes in terms of product diversification (number of lines of businesses), then in terms of decisions regarding sales and exports. Foreign parents are the least involved as initiators of changes regarding organisation and business functions. This latter may suggest that subsidiaries have certain degree of autonomy to expand on their mandate irrespective of their current charter. However, as foreign parents initiate more frequently changes regarding products and sales/exports, changes in organisations and business functions are more likely to be changes only within the existing charter of subsidiary.

xxiv) There are only very few statistically significant differences among manufacturing sectors in terms of who is the initiator of changes. These differences are as a rule in sales and exports and are present in DA – food, beverages and tobacco, where foreign parents have significantly lower initiative for changes than on average in total sample, while the situation in DC – leather and leather products and DM – transport equipment is the opposite. This may have to do market orientation of this sectors.

Table 30. Development of future mandate of FIEs [1)]

Countries	Sales and exports	Number of other business functions undertaken independently	Number of lines of businesses
Total [2)]	0.414	0.383	0.506
Slovenia	0.667	0.319	0.472
Slovakia	0.474	0.455	0.500
Hungary	0.321	0.205	0.238
Poland	0.331	0.503	0.704
Estonia	0.349	0.279	0.395

Notes: [1)] Importance of areas of competitiveness ranges from 0=not important, 0.25=little important, 0.50=important, 0.75=very important, 1=extremely important.

[2)] Weighted average.

Table 30. reveals directions in which FIEs expect their future mandate will evolve. On average the FIEs from all the countries in all the areas expect that their future mandate will increase; the highest increase is expected in the number of business lines (0.506), followed by sales and exports (0.414) and finally by the number of business functions to be undertaken independently by FIEs (0.383). There are significant country differences in

terms of the expected increase of their current mandate. On average, Hungarian and Estonian FIEs expect lower increase of their mandate than FIEs from other three countries. The lowest increase of mandate is expected by Hungarian FIEs in business functions (0205) and in lines of business (0.238), and by Estonian FIEs in business functions (0.279). The highest increase is expected by Polish FIEs in number of business lines (0.704) and business functions (0.503), by Slovenian FIEs in sales and exports (0.667) and by Slovak FIEs in number of business lines (0.500).

Mann-Whitney test confirms the above country differences and shows statistically significant differences from total sample average for Slovenian FIEs in sales and exports (higher than average increase of mandate), for Poland and Hungary in organisation and business functions and in lines of businesses (higher than average for Poland and lower for Hungary), and for Estonia in lines of businesses (lower than average). However, these differences are not significant across industries, what suggests that perhaps market orientation of subsidiaries, which is country specific, remains the key intervening variable regarding prospects for changes in mandate.

It is difficult to interpret these differences and why Hungarian and Estonian FIEs expect lower increase if their mandate than those from Slovakia, Poland and Slovenia. It seems that Slovenian subsidiaries will continue to evolve as exporters but which are capable for functional upgrading. Given that Slovenian subsidiaries rank the best in terms of the role of R&D this proposition may have some basis. Polish subsidiaries expect the most often increases in terms number of lines of businesses. Given their dominantly local market orientation this further product diversification may be consistent with that orientation.

4.4. Knowledge Discovery Techniques to determine what the pure data can tell us

The second comparative view on the data applies the so-called knowledge discovery techniques. This allows us to analyse the data purely, *i.e.* without imposing any assumptions or theoretical concepts. The analysis was undertaken by the Slovak team, consisting of Tomas Sabol and Vincent Soltes. This analysis involves all data generated, *i.e.* for all industries and all countries.

4.4.1. Methods of Knowledge Discovery Techniques

The method tests a novel approach to the analysis of the CEE subsidiary database using knowledge discovery techniques. Knowledge discovery in databases is a process of semi-automatic extraction of knowledge from databases. The first step in the analysis is 'pre-processing': this usually includes data clearing (processing of missing values, outliers

etc.), aggregation of data (transformation of original data into a higher level of abstraction, *e.g.* integration of several values -answers to questions- into a more general value), discretization (transformation of a numerical attribute into a symbolic attribute – *e.g.* numerical attribute from the interval between 0 and 100 *per cent* is transformed into four symbolic values).

Subsequently a data mining (DM) algorithm is applied on the pre-processed data. We tested the so called 'Apriori DM algorithm'. The Apriori algorithm identifies association rules, which define associations (dependencies) between items (in this case items are answers to questions in the questionnaire) in the form $X \Rightarrow Y$, where both X and Y are sets of items. Each association rule is characterised by parameters such as support (percentage of records (*i.e.* FIEs) for which the given condition – X or $(X \cup Y)$ holds), and confidence (probability that if X holds than also Y holds). Since the questionnaire used within the CEE subsidiary database survey has altogether almost 60 sub-questions, to investigate all the potential associations among them would be too complicated. For this reason, the problem was decomposed into smaller sub-problems and in most cases only associations between two questions in the questionnaire were investigated - since each question in the CEE subsidiary database questionnaire has several sub-questions (from three up to 13), such an analysis included about at least four attributes (sub-questions). The result of the data mining algorithm was a set of identified association rules describing (probabilistic) dependencies among values of attributes (*i.e.* among answers to sub-questions). These associations can then serve for support of denial or formulated hypotheses.

The next step involves the evaluation of identified data and knowledge identification. Result of the application of a DM algorithm is a set of patterns (a form of these patterns depends on the type of DM task and on the used DM algorithm). These patterns have to be analysed and then patterns representing new and potentially useful knowledge leading to a solution of the given task have to be selected. The DM algorithm can make some selection from identified patterns, *e.g.* taking into account statistically well represented patterns and/or confidence of association rules *etc.* However, the user himself (expert in the given area) should have a final say – to decide which identified patterns are interesting and useful for the solution of the given task. If the quality of the identified patters is not sufficient, the whole process proceeds with a next iteration (*i.e.* going back to the previous step of data mining) to change parameters or to use another DM algorithm. The final step in the application of knowledge discovery in databases is the application of acquired knowledge and evaluation of its use. If the expert is satisfied with the identified patterns and the patterns can be used for the solution of a given problem,

then the identified patterns turn into new and potentially useful knowledge in the given domain.

4.4.2. The main results of the Knowledge Discovery Technique

The following hypotheses were tested using the Apriori data mining algorithm:

- Hypothesis 1: Associations among business functions belonging to the same group, *i.e.* Operational (includes: Process engineering, Supply and logistics, Accounting and finance, Operational management), Marketing (Market research, Distribution and Sales, After sales services, Advertisement, Marketing), and Strategic (Product development, Determining the product price, Investment finance, Strategic management or Planning), are higher than associations among business functions belonging to different groups of business functions.

Conclusion: Although associations between business functions belonging to the same groups are strong (especially for marketing business functions), confidence of associations between some business functions belonging to different groups is also high (this may be consequence of 'cascade' dependencies between business functions, *i.e.* for example if a foreign owner is responsible for Strategic business functions, he is then most probably responsible also for Marketing as well as Operational business functions – see the Hypothesis 2 below). This was confirmed also using statistical approach – by Spearman's coefficients.

For the second hypothesis, we define that groups of business functions can be ordered in the following way: a) Level 0: Operational business functions, b) Level 1: Marketing business functions, c) Level 2: Strategic business functions.

- Hypothesis 2: Responsibility for business functions is delegated by the foreign owner to the local subsidiary in an "ascending order", *i.e.* before the local subsidiary assumes responsibility for the level i, he should have already responsibility for the level (i-1). It means, for example that the local subsidiary should first be responsible for Operational business functions and only then can overtake responsibility for Marketing business functions.

Conclusion: Confirmed (no contradicting association rule found).

- Hypothesis 3: The higher the responsibility of the foreign owner in business functions, the higher is the increase in productivity and share of exports.

Conclusion: Confirmed (no contradicting association rule found). This result of data mining was also confirmed for marketing and strategic business functions by Mann-Whitney test (at the level of significance of $\alpha = 0.05$).

- Hypothesis 4: FIEs with majority equity shares of the foreign owner experience higher increases in performance indicators.

Conclusion: Confirmed for the indicators of increase in volume of sales and level of productivity (and also by statistical tests).

4.4.3. Concluding evaluation of this method's application

The use of data mining techniques in this type of applications is a complementary rather than an alternative method to the statistical approach. A combined approach (*i.e.* DM plus statistical methods) bears several benefits. The potential advantages of the DM approach result from differences between association rules and correlation coefficients:

xxv) Correlation coefficients define dependency between variables, association rules define dependencies among concrete values of variables, that means association rules provide more detailed information.

xxvi) Correlation coefficients are symmetrical, association rules are in general asymmetrical. Association rules can thus provide more insight about how variables influence each other, especially if the relationship is highly asymmetrical, *i.e.* if the confidence for the rule $X \Rightarrow Y$ is significantly different from the confidence for the vice-versa rule $Y \Rightarrow X$.

xxvii) Association rules in general associate two or more variables (or strictly speaking between their values), correlation coefficients define relationship only between two variables.

But differences among these approaches can also be evaluated on a more general level: traditional approaches are deductive *i.e.* the researcher formulates a hypothesis (*e.g.* "FIEs where foreign owners have a majority in equity share exhibit higher increases in productivity"). It is then tested whether the collected data are in harmony with the formulated hypothesis or not. However, data mining techniques can support also an inductive approach – one would specify the required minimum confidence and the data mining tool would generate all the association rules with confidence higher than the specify minimum confidence.

In any case, the application of this approach on the CEE subsidiary database would warrant further research, including the testing of other data mining techniques (*i.e.* other than the Apriori algorithm), additional cross-country analysis of the results of data mining, and other statistical methods.

4.5. Country, industry and firm-size effects on FIE strategy in CEE

The first step into the analysis of data generated that corresponds to the conceptual framework and its objectives is from the Estonian team, consisting of Helena Hannula, Katrin Männik, and Urmas Varblane. Their analysis focuses on effects that a number of subsidiary-specifications (country, industry, and size) can have on the strategy that subsidiaries and their parent networks follow in their operations. In their econometric analysis, they make use of the complete CEE subsidiary database.

4.5.1. The method of analysis of FIE strategy

The analysis was carried out in three stages. The first stage involved principal component factor analysis to group 13 business functions by countries for which average estimations were received from the survey. Analysis of principal component factor was performed both at the level of each country and all countries together. Proceeding from the latter approach, we received four new factors.

After analysing the factor scores, four factors were identified: marketing group (determining the product price, market research, distribution & sales, after sale services, advertisement, marketing); technology group of business functions (incl. product development, process engineering, supply & logistics); management group (operational management, strategic management or planning) and financial group (accounting and finance of operations, investment finance).

The same picture of new factors was getting an approval through the individual principal component factor analysis for each country. Based on the analysis of principal component factors for each country (received automatically 14 new factors) and using Spearman correlation matrix between new factors, the common patterns of countries were figured out in the level of four cluster groups of business functions. For the further analysis the averages of all the new factor groups were calculated based on the original firm-level questionnaire data, and the variables were called: FACTTECH, FACTMARK, FACTMAN and FACTFIN.

In the second stage, analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA) were used to identify significant differences among the four groups of the factors and to distinguish country, industry, firm size and foreign ownership features in

CEE manufacturing subsidiaries. In addition to the question presented above, general information about the industry type, firm size, share of foreign ownership and year of registration of the company as a foreign investment enterprise was also asked in the survey and was used in the current research. In relation to factor groups four dummies, for country (variable: DCOUNTRY), industry type (DACTIVITY), firm size (DEMPLOY) and foreign ownership (DEQUITY) were used as categorical dummies in the ANOVA and MANOVA tests. In the final stage of the analysis the dummy for the year of registration (DESTBL) was added.

Industries were grouped into four types of sectors: high-tech, medium-high-tech, medium-low-tech and low-tech using 3-digit NACE level classification of manufacturing industries. Firm size was divided into two groups: small and medium size enterprises (below 250 employees), and large enterprises (250 and more employees). Foreign ownership was distinguished by minority (below 50 *per cent*) and majority (equal and above 50 *per cent*). Finally, the year of registration was described by three categories: before 1990 incl., between 1991-1995 and after 1996 incl. Factor component scores close to 0 indicate higher autonomy. Concerning categorical values, the categories for countries will be seen: 1 – Slovenia, 2 – Poland, 3 – Hungary, 4 – Slovakia, 5 – Estonia; for industries: 1 – high-tech, 2 – medium-high-tech, 3 – medium-low-tech, 4 – low-tech; for number of employees: 1 – SME, 2 – large firms; for foreign ownership: 0 – minority share, 1 – majority share; for the years of registration: 1 – before 1996 incl., 2 – between 1991 – 1995, 3 – after 1996 incl.

The ANOVA test was performed individually for each categorical variables and the MANOVA test in a compound way (all variables taken into the test) across all four factors. The tests were controlled for univariate normality of the dependent variables (FACTTECH, FACTMARK, FACTMAN, FACTFIN) and a post-hoc procedure (Bonferroni, Tamhane's T2 tests) was processed to get the appropriate answers for distinguishing significant differences between pairs of variables.

During the third stage of the analyses data from the original survey about the impact of foreign ownership on the performance of subsidiaries was executed. In the further process of analysis of the link between autonomy of subsidiaries and different performance indicators we used an ordered regression model, which compared to the frequently used methods for binary and nominal data have the advantage that they make full use of ranked data. This method takes very well into consideration our original data. In our survey we asked from the representatives of the subsidiaries about the magnitude of the changes of different performance categories (*e.g.* export orientation and productivity, technology and quality improvements) since the registration of their

company as a foreign investment enterprise. The scale for answers was given in the range from -2 = considerable reduction up to 2 = considerable increase. Consequently answers were ordered by 5 categories.

4.5.2. The aim of the analysis and the hypotheses

The aim of the analysis was to examine the contribution of FDI to knowledge and technology transfer into five CEE economies by analysing the country, industry and firm-specific effects on the autonomy of subsidiaries of multinational companies across business functions and investigate link between the autonomy and performance indicators.

- Hypothesis 1a: Economically more developed (measured by GDP) CEE countries have more autonomous subsidiaries.
- Hypothesis 1b: CEE countries that earlier started to get FDI inflow have more autonomous subsidiaries.
- Hypothesis 2: More autonomous subsidiaries are expected to exist in manufacturing industries with bigger capabilities in productivity.
- Hypothesis 3: More autonomous subsidiaries are expected to be among large firms compared to small and medium-sized firms.
- Hypothesis 4: The relationship between autonomy and performance depends on the type of autonomy.

4.5.3. The autonomy of FIEs - country features

Results at the country level showed that differences in subsidiary roles between the more and less developed CEE countries under consideration are statistically significant. In Slovenia and Hungary, economically more developed countries, the foreign affiliates are more autonomous, preferably in terms of management and financing decisions, but also in technology and marketing. Estonian and Slovakian foreign subsidiaries have less autonomy but the levels are more balanced between four factors of business functions. Therefore we can say that economically more developed CEE countries and those ones joined earlier with FDI inflow have more autonomous subsidiaries. However, we should make some specific notes about this conclusion. There are no subsidiaries in any country with higher autonomy in all four business activities compared to others.

4.5.4. The autonomy of FIEs - industry features

By interpreting results of the role of industry on the autonomy of subsidiary we discovered through ANOVA that difference of means ranks were not statistically significant. Now after combining industry and country categories industry sectors start to play significant role in terms of technology and management autonomy and firm size in terms of technology autonomy of subsidiaries. Furthermore, three categorical variables together give significant mean rank for technology factor group. The activities related to product development, process engineering, supply and logistics appear to significantly determine the role of subsidiary in five countries.

However differences in autonomy by technology become statistically significant combining country and industry categories. In general in more developed countries there are more autonomous subsidiaries among medium-tech sectors. Medium-tech sectors are also more productive. The high-tech sector is the most reluctant in giving autonomy to local subsidiaries in all countries. Poland differs from other less developed CEE economies with high technology autonomy in the low-tech sector and the lowest management autonomy in the medium-high-tech and medium-low-tech sectors. Local Implementers might be most prominent in medium-tech sectors in Poland.

As a conclusion about country and industry specifics, generally there exist more autonomous subsidiaries in more developed countries (especially in Slovenia) in medium-high-tech and medium-low-tech industries that are also more productive. Saying so, we can support the claim that in Slovenia and Hungary the more autonomous subsidiaries exist in manufacturing industries with bigger capabilities in productivity. Subsidiaries in Slovenia and Hungary are more autonomous in industries with higher technology intensity and with higher productivity.

4.5.5. The autonomy of FIEs – firm level features

Based on the descriptive analysis and MANOVA tests there are some different patterns in terms of firm size. Hungary, which has significantly larger companies in the sample, has the highest autonomy and Slovenia, which has smaller companies, has the lowest autonomy in a sample about technology. In Poland one can also see relatively high independence from the parent company among large firms. Estonia is a specific case, small firms prevailing in the sample. Small firms have less autonomy in technology than bigger firms. In Estonia, the significant number of SMEs in the manufacturing industry could reduce by average the general autonomy level among subsidiaries compared to other countries. In Slovakia and Slovenia the smaller firms are more independent compared to large firms. Consequently characteristic for Slovenia is the presence of small

high-tech companies, which are rather dependent on the mother company. There might be more 'Specialised Contributors' in Slovenia and Estonia compared to other countries. So, we can say that the more autonomous subsidiaries exist among large firms only in Poland, Hungary and Estonia. In Slovenia and Slovakia the smaller firms have higher autonomy.

As it is seen, generally no common pattern of subsidiary mandates could be presented in all five CEE economies. The role of subsidiary is above all country, industry and firm specific. Technology autonomy appears to be the most critical factor of subsidiary strategies in all countries, both in terms of industry and firm size. Even in Hungary and Slovenia where the development level of the economies is higher compared to other three countries. Technology autonomy does show significant patterns in combination with country, industry and firm size effects.

4.5.6. The relationship between the autonomy and the performance of the subsidiary

Our analysis supports the argument that the relationship between autonomy and performance depends on the type of autonomy. The most powerful type of autonomy which influences the direction of performance of subsidiaries is marketing. The lower the autonomy level in marketing activities in five examined CEE countries the bigger the effects either on the technology upgrading (productivity level, technology level of production equipment and quality of produce) and the exports` share. The second most powerful autonomy type is financing. The analysis shows the higher the financing mandates in foreign subsidiaries the bigger the positive changes either in exports` share and the level of product quality. Technology autonomy played the significant role only in case of model without any country, industry or firm specific features which showed that higher autonomy in technology is supposed to contribute positively to export orientation.

Secondly, we must say that the performance of subsidiaries is also country, industry and firm dependent. Basically majority owned, large and medium-low-tech foreign subsidiaries have achieved more extensive positive effects on their performance. Subsidiaries from high-tech industries showed even significantly smaller influences either on the productivity level of production and the level of technology of production equipment compared to low-tech sector. By countries differences in size of local market, the development level and the starting position as being foreign investment enterprise give an effect on the subsidiaries` performance. Compared to Estonia which is one of the smallest by local market, one of the less developed among examined CEE countries and one of the countries receiving foreign investments later than others, has achieved more

significant effects on share of exports compared to Poland and Hungary, and on level of product quality compared to Slovenia. The year of establishment of the firm as foreign investment enterprise has not generally played the significant role in terms of the subsidiaries` performance excl. the productivity level in production. Subsidiaries which have been established later than 1996 (incl.) compared to those ones created before 1990 (incl.) have achieved larger productivity level in production.

Thirdly, from the perspective of knowledge and technology transfer into foreign subsidiaries and indirectly into domestic firms in CEE countries we could conclude that the rate of the autonomy could diverge along the types of the autonomy and it is expected to be country, industry and firm-specific. Subsidiary management should actively co-operate with mother company in areas of shortage in knowledge, especially in innovation activities in CEE countries. We argue that it is good to have or even lose the autonomy in some specific business function aiming at getting the missing knowledge from the mother company. From the perspective of the host country the subsidiary should move from knowledge and technology adoption towards knowledge and technology development. Having its own capabilities the subsidiary could get more mandates and finally to have power over more strategic business functions.

4.5.7. Implications in subsidiary management and policy level

The question is: does the autonomy of the subsidiary have positive or negative effects on the subsidiaries` performance? We cannot provide an unambiguously clear answer. As we could see in more developed countries like Hungary and Slovenia or in more productive industry sectors like medium-high-tech and medium-low-tech groups in Hungary and Slovenia or among large firms in Poland, Slovenia and Estonia are supposed to exist more autonomous subsidiaries. Furthermore, autonomy is a heterogeneous subject as we could see differences among four types of functional autonomy in the current analysis. In the latest analysis we learned that low autonomy in marketing and high autonomy in financing could stimulate the performance of subsidiaries. Export is supposed to be one of the ways (complementary to FDI) through which technology and knowledge could be disseminated. By the opinion of the authors of the paper higher export orientation (Estonia, Slovenia, and Slovakia) in subsidiaries is assumed to have bigger positive effects on technology and knowledge transfer into the local economy.

Finally, it is the question of the subsidiary management to combine the different areas of the autonomy to gain maximum from the relation with the headquarter locating in some foreign country. There is the question to adapt appropriate tacit knowledge and also material assets to local specifications and to contribute to its own innovation potential (or

absorptive capacities) through developmental works. In this development stage of countries and firms it might be reasonable to have low rates of autonomy in some fields with shortage of specific knowledge (*e.g.* management in Poland) and bigger rates of autonomy in selected fields with already appropriate tacit knowledge (*e.g.* marketing in Poland). For example in case of CEE countries the lower rate in technology is assumed to contribute more intensively to co-operation with the headquarter, and it is good. Financing autonomy is relatively high in all CEE countries that show the sufficiency of the knowledge in the financing sector in the host countries.

We conclude that from the perspective of technology and knowledge transfer through FDI and the innovation potential, neither excessive dependence and/or control by the headquarter nor excessive independence or autonomy from the headquarter is good, especially in CEE countries today. Excessive dependence impedes the potential for increasing the subsidiary's own absorptive capacity and excessive independence might leave the local unit in a circle of "internationally uncompetitive" knowledge. It is even supposed to be good to lose some autonomy and in return being granted access to the kind of knowledge and technology that was missing and parent company-specific. However, today, subsidiaries have to move from knowledge and technology adaptations towards knowledge and technology development. Having own capabilities, the subsidiary could get more mandates over individual business functions and engage into technology and product development co-operation with the parent companies (reverse technology transfer) and the local or host economy. Therefore, being constrained by a shortage of knowledge and technology, subsidiary-managers should strive be more active in their relationship with their headquarters. The relatively low technology autonomy of subsidiaries in CEECs is expected, at this stage of development, to contribute to the intensity of the transfer of knowledge and technology.

4.6. The determinants of FIE productivity growth with a particular focus on the autonomy issue in the Slovenian case

The following analysis of the CEE subsidiary database has been conducted by the Slovenian team, consisting Boris Majcen and Matija Rojec. It is focussed on the determinants of productivity growth at the subsidiary level. The determinants related to the role of the subsidiary within the parent's network are here tested. A particular interest lies in the actual role that autonomy-indices play for subsidiary development. Implicitly, subsidiary development is used as indicator of technology transfer. The analysis make use of the Slovenian part of the CEE subsidiary database with consists of 72 sample subsidiaries.

4.6.1. The objectives of the analysis

This analysis takes an interest in the processes of productivity growth and upgrading in the manufacturing foreign subsidiaries in Slovenia. We determine, how these changes happen and what determinants lie behind these changes. We try to understand these processes by analysing the developments in subsidiaries' positions in their parent companies' networks: here the issue of the impact of control patterns on subsidiaries' productivity growth is in the centre of our interest. More precisely, we are interested in the factors and processes that are related, on one hand, to the increase of productivity, sales/exports, technology and quality level in foreign subsidiaries and, on the other hand, to their functional upgrading, overall and in relation to foreign parent companies.

4.6.2. Characterisation of the Slovenian panel in the database

The Slovenian part of the CEE subsidiary database might look small at first sight. But it does represent the a very relevant part of the overall Slovenian manufacturing sector: the subsidiaries in this panel holds 11.7 *per cent* of the total manufacturing sector's fixed assets, 8.4 *per cent* of employment, 6.3 *per cent* of sales and 21.7 *per cent* of exports. The main characteristics of the Slovenian panel are:

xxviii) FIEs which answered the questionnaire, *i.e.* sample FIEs, represent 23.8 *per cent* of all FIEs in the Slovenian manufacturing and are responsible for 50.8 *per cent* of their employment, 53.6 *per cent* of fixed assets, 62.1 *per cent* of sales and 64.2 *per cent* of exports. Sectoral distributions of sample FIEs also fits well to the sectoral distribution of all manufacturing FIEs.

xxix) Sample FIEs include all sizes of firms (measured by number of employees) among which small and mediums sized FIEs prevail, *i.e.* 47.2 *per cent* of them have between 51 and 500 employees, and 38.9 *per cent* less than 51 employees.

xxx) Most of the sample firms, *i.e.* 56.9 *per cent* were registered as FIEs in the 1994-1998 period. Only in 15.3 *per cent* of cases the registration is dated before 1990.

xxxi) The vast majority of sample FIEs is majority owned by strategic foreign investors. In 41.7 *per cent* of cases FIEs are 100 *per cent* foreign owned, while in 37.5 *per cent* of cases foreign investors hold 51 - 99 *per cent* of equity.

xxxxii) Intermediate goods are much more frequent product of sample FIEs than final products. Intermediate products are produced by as much as 76.4 *per cent*

of the sample firms, while final products in 50.0 *per cent* of cases. 26.4 *per cent* of firms produce intermediate as well as final products. Such a pattern is linked to predominantly factor cost advantages-seeking motivation of manufacturing foreign investors in Slovenia.

4.6.3.The method of analysis into determinants of FIE development

Based on the data gathered through the questionnaire we performed the analysis in three steps:

xxxiii) Simple descriptive analysis of the questionnaire results using also data on technology intensity of particular sectors;

xxxiv) Analysis of relationships between the major variables from the questionnaire using two-sample independent t test, one-way analysis of variance (ANOVA), and their non-parametric equivalents, Mann-Whitney test and Kruskal-Wallis test;[11]

xxxv) For the assessment of the determinants of productivity growth, cluster analysis and ordered probit model were used.

Results of the first two steps revealed that industrial integration through FDI led to considerable increases in productivity, technology and quality, as well as in sales and exports.

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[11] i) Two-sample independent t test for testing the hypothesis that the difference between two independent sample means is attributable to chance – the samples come from populations with equal means;
ii) One-way analysis of variance (ANOVA) for testing the hypothesis that the difference exists between one or more means. Tukey method for testing the difference between each pair of means has been used when the hypothesis of equal variances was not rejected (Levene test of homogeneity of variances) and Games-Howell method when unequal variances were found;
iii) A non-parametric equivalents to the two sample independent t test, Mann-Whitney test, and one way analysis of variance ANOVA – the Kruskal-Wallis test, which tests wether several independent samples are from the same population and assumes that the underlying variable has a continuous distribution and requires an ordinal level of measurement.
The analysis of the data obtained (by Kolmogorov-Smirnov test of normality of distribution) showed that the required assumption of normal distribution was not satisfied and that the results obtained by t tests may not be reliable. Therefore we turned to non-parametric tests which are known as distribution-free tests because they make no assumptions about the underlying distribution of the data. Just as the t test compares the means of two or more independent samples, the non-parametric test compares the centre of location of samples – it is therefore based on ranks and not on parameters of normal distribution, like mean and variance. As we performed both, parametric and non-parametric tests, we analysed both results in order to find out how important was the violation of normality distribution. ANOVA offers post hoc tests for pairwise multiple comparisons between means of subgroups declared for particular answer, while non-parametric tests give only the answer about the significant differences of answers of all subgroups compared - indirect notion about, for instance, magnitude of changes, is obtained by comparing the calculated mean ranks for each subgroup. Higher mean rank in fact means higher magnitude of changes (or higher involvement of the foreign owner in the decision making process for various business functions).

In the third step, the model for the assessment of the determinants of productivity growth in foreign subsidiaries has been developed. The determinants of subsidiaries' productivity growth, used in the model, were identified by the analysis in the first two steps (level of autonomy/control, sales structure, foreign equity share, level of technology *etc.*). The standard growth accounting approach of Solow (1957) was used as a way to measure the impact of these determinants. The objective of this approach is to study various factors that affect overall productivity, including the growth of technology. This is done by decomposing total factor productivity or TFP growth into factors internal and external to the firm, including R&D investments and human capital, and different sources of international technology transfer, respectively. With differentiating the Cobb-Douglas production function and under the assumption of competitive markets, marginal products of each input are equal to its factor price and total factor productivity growth (TFP growth) is the difference between the growth of output and weighted sum of growth of inputs, with weights being the individual shares of factors used in production.

Since the technology (TFP growth) parameter is simply the regression residual, *i.e.* part of variance of output that cannot be accounted for by variance of factor inputs, it says nothing about the factors that influence TFP growth. In reality this residual may capture a number of factors that may have little in common with technology level or TFP growth. In this specification the technology parameter depends crucially on the goodness of fit of the model. This is especially true in transition economies, in which this estimation approach - due to an inefficient utilization of production factors - may return incorrectly high parameters of technology level or TFP growth. Ideally, the model should thus include those factors that determine the level of technology or its growth. Often this can be difficult since technology embodies skills and knowledge that is not easy to measure. As our main objective has been to assess the impact of control of individual business functions in subsidiaries on their productivity growth and on overall magnitude of changes, we defined the firm's TFP A_{it} as:

$$A_{it} = G_i(BF_{it}, F_i, CS_i, X_i, M_i, COMP_i, d_j, d_t)$$

where BF_{it} capture variables of control of business functions, and F_i through M_{it} capture the control variables - F_i is a dummy for majority or minority foreign ownership, CS_i is a dummy of the firm size, $COMP_i$ capture variables denoting the importance of areas of competitiveness. With X_i *and* M_i, that refer to the export propensity (exports to foreign parent company or other foreign firms to sales ratio) and import propensity (ratio of imports from foreign parent company or other foreign firms to the material costs) of the firm, respectively, we tested for alternative sources of TFP growth in foreign subsidiaries. In addition, we also allow for sector and country specific effects by including respective

dummy variables d_j and d_t. With the use of all these control variables we tried to isolate the possible impact of the control of business functions variables on the productivity growth. Due to the lack of data on capital and labour, we could not estimate differentiated Cobb-Douglas production function but directly the above equation with the variable of firm's change in productivity growth being the endogenous and all the others exogenous ones.

As the alternative answers regarding the changes in productivity have a meaning of a logical ordering (great decrease, decrease, no change, increase, great increase), an ordered probit model has been used. Estimation of the model is based upon maximum likelihood where the implied probabilities enter the likelihood function. The interpretation of the coefficients is in terms of the underlying latent variable model – a positive coefficient means that the corresponding variable increases productivity or, in terms of the effects on the respective probabilities – the probability that observed value of answer is 1 will increase, while the probability that the observed value of the answer is 0 will decrease (the effects on intermediate categories is ambiguous).

Spearman correlation coefficients between variables of control of business functions showed that all 13 variables were significantly correlated with each other and therefore not suitable to use them all in the model. To avoid the problem we created four group indicators of subsidiary's autonomy and use them alternatively as variables in the model. During the estimation procedure five alternative models were used. The difference between them is that:

xxxvi) In the first one we use only foreign equity share as a measure of foreign control/subsidiary autonomy.

xxxvii) In the second one, the variable related to overall autonomy of subsidiary, with and without foreign equity share is used.

xxxviii) In the third one the variable related to operational autonomy, with and without foreign equity share is used.

xxxix) In the fourth one, the variable related to marketing autonomy, with and without foreign equity share is used.

xl) In the fifth one, the variable related to strategic autonomy, with and without foreign equity share was used. In all the models we use the same other control variables.

4.6.4. The main results of the analysis

Empirical analysis shows that industrial integration through FDI led to considerable increases in productivity, technology and quality, as well as in sales and exports. The models suggest the following conclusions about the productivity growth and control in foreign subsidiaries:

xli) The level of foreign parent companies' overall control and the level of their control of marketing and strategic functions seem to be the most important determinants of productivity growth in foreign subsidiaries in the Slovenian manufacturing. The higher the foreign parent's control overall, as well as of marketing and especially of strategic functions, the higher the productivity growth in subsidiaries. Foreign parent companies seem to seek control of strategic and marketing business functions and leave operational control to subsidiaries themselves.

xlii) The above pattern of control and productivity growth holds regardless of the inclusion of foreign equity share dummy in the model or not. The level of foreign equity share as such is not a determinant of productivity growth, and foreign equity share does not seem to be an alternative for foreign parent companies' control of marketing and strategic business functions. The control of marketing and strategic business functions is obviously important *per se* and is probably based on factors like technology, marketing and supply channels *etc.* Foreign parent companies are eager to exercise control over marketing and strategic functions, regardless of whether they hold majority or minority equity share. In other words, the level and mechanisms of control of individual business functions seem not to be related to the level of foreign equity share.

The model points to some other determinants of subsidiaries' productivity growth. The first is subsidiary size; large subsidiaries have significantly higher average change in productivity compared to small and medium sized subsidiaries. The second is the proportion of sales to foreign parent company; subsidiaries with higher proportion of sales to foreign parent companies or to other foreign buyers experience higher changes in productivity level. The third is that, in two variants of the model, subsidiaries in high technology intensity sectors exhibit significantly lower change in productivity than subsidiaries in other sectors.

All in all, the more subsidiaries are integrated into foreign parent companies' - marketing and strategic management, and export flows wise - the higher productivity growth they experience. To keep marketing and strategic control in the hands of foreign parent

companies seems to be the main determinant of subsidiaries productivity growth. Foreign parent companies are eager to keep marketing and strategic control regardless of the equity share they have.

4.7. FIE autonomy, maturity, and potentials for technology transfer

A subsequent step into the analysis of the data generated in this workpackage is focussed on estimating the potentials for internal and external technology transfer. This part of the analysis was conducted by the Hungarian team, consisting of Judit Hamar, Attila Béres, and Ádám Mészáros. The conceptual approach for this analysis was developed in a collaboration between Judit Hamar and Johannes Stephan.

4.7.1. The method of indirectly measuring potentials for technology transfer

The analysis of potentials for technology and knowledge transfer (short: technology transfer) makes use of the complete data-set generated in field work of this workpackage. The analysis uses a variety of methods, including least-squares regressions, Spearman rank-correlations, mean ranks, and simple average and variance comparisons. Next to the statistical analysis of data generated in field work, we develop a conceptual taxonomy both from existing latest theory on MNCs and from experience drawn from the analysis of our own field-work data (the essentially deductive process of concept development was enriched and refined by empirical inductive experience). This taxonomy classifies FIEs according to the groups' theoretically deducted specific potentials for internal technology and knowledge transfer.

In this taxonomy, we distinguish between static internal and dynamic internal effects. Dynamic effects arise from the subsidiary developing own competencies in implementing and adapting foreign technology received from the parent and assuming own responsibility in deciding upon its own management. With the FIE maturing along such a learning curve, we can assume a dynamic process of technological interaction between the parent company's network and the subsidiary to evolve. External technology transfer is proxied by the level of integration of the FIE with its host economy. We hence assume that the intensity of external technology transfer increases with the size of the share of the host economy in supplying the subsidiary with inputs, with the size of its share in buying products and services of the subsidiary, with the level of importance attached to the host economy in supplying areas of particular importance for FIE competitiveness (quality control, *etc.*) and in supplying finance to the subsidiary.

In the analysis of data generated from field work, we focus on country differences rather than trying to find general characteristics across all sample countries. The objective of our analysis is hence to compare the potentials for technology and knowledge transfer via FDI between the four sample countries.

4.7.2. Conceptual framework: the taxonomy for FIEs and potentials for technology transfer

We distinguish between internal (from the parent company network to the subsidiary) and external technology transfer (from the subsidiary to the host economy). Adhering to the conceptual approach for this workpackage, we assess three criteria pertaining to the network of relationships between headquarters, subsidiary and the host economy and link those to the potentials for technology transfer.

The FIE's role in the network is conceptualised first by the management-relationship between head office managers and subsidiary managers: a dominant parent will manage the subsidiary on its behalf without much interference by the subsidiary's own management. On the other extreme, an autonomous subsidiary is characterised by the mandate of managing its own fate and the parent takes an inactive management role.

With respect to technology transfer, we can assume that the dominant parent will implement its foreign technology in the subsidiary, whereas an autonomous subsidiary will tend to take the active role in this process. In particular at early stages of development of subsidiaries, parent companies can be "adverse to technological incongruity" (Dyker/Stolberg 2003, following Ozawa 1979 and Wells 1983) and could "tend to place considerable stress on the importance of being able to impose their own technological culture on subsidiaries (...) as a way of guaranteeing control over productivity..." (Dyker/Stolberg 2003, p. 4). Installation of alien technology without the use of adaptive expertise of the incumbent, however, pertains to a rather static process. The process ends with the installation of the parent's 'best practice' in the subsidiary, regardless of whether the technology functions efficiently in the particular environment of the host economy. The technology transfer process becomes dynamic with the subsidiary maturing and gradually assuming a more active role in the adaptation of the parent's technology. In a process of technological interaction between parent and subsidiary, technological development of the subsidiary by way of technology transfer can be much more intense. In case the subsidiary however matures in respect to adaptive ability without a corresponding upgrading of its position in the management-relationship (autonomy), the institutional learning curve will remain relatively flatter, as will the

intensity of technology transfer. For our concept, we hence need the additional criterion of adaptive ability.

- The role in the parent network is hence secondly characterised by the subsidiary's ability to adapt the parent's foreign technology to work efficiently in its own environment. By enhancing its adaptive capabilities, the subsidiary establishes the process of technological interaction to the benefit of both partners, the parent and the subsidiary (Birkinshaw/Hood, 1999).

Those two criteria are used to assess internal technology transfer, *i.e.* from parent to subsidiary.

- The third criterion pertains to external technology transfer, *i.e.* between the subsidiary and its host economy. It assesses the role that the host economy plays for the operations of the subsidiary. This is a straight-forward concept, typically applied in the relevant literature.

In terms of methodology, those three criteria define the determinants of technology transfer which in turn act as necessary conditions. Hence, our indirect method allows us only to determine potentials, not the intensity of actual technology transfer.

With respect to the analysis of internal technology transfer, we simultaneously use the first two criteria and develop a two-dimensional taxonomy of FIEs to denote their transfer potentials (see figure 4.): on the vertical axis, we determine the FIE's position in the taxonomy according to its management-relationship with the parent: FIEs operating under a dominant parent are located at the bottom half of the taxonomy. In terms of technology transfer, we assume that the potentials for static effects are particularly high where the FIE has a dominant parent, willing and able to implement its own technology into the subsidiary. FIEs located at the top are more autonomous in the management of their own subsidiary.

Being autonomous however does not guarantee that the FIE management in fact reaps large benefits from its foreign investor: only if the subsidiary is able to adapt the foreign technology autonomously, can technology transfer be intense and of the more dynamic type. The ability of FIEs to adapt the foreign technology they received from their parents is depicted on the horizontal axis. FIEs located to the right have low adaptive abilities, whereas FIEs located to the left share high adaptive abilities.

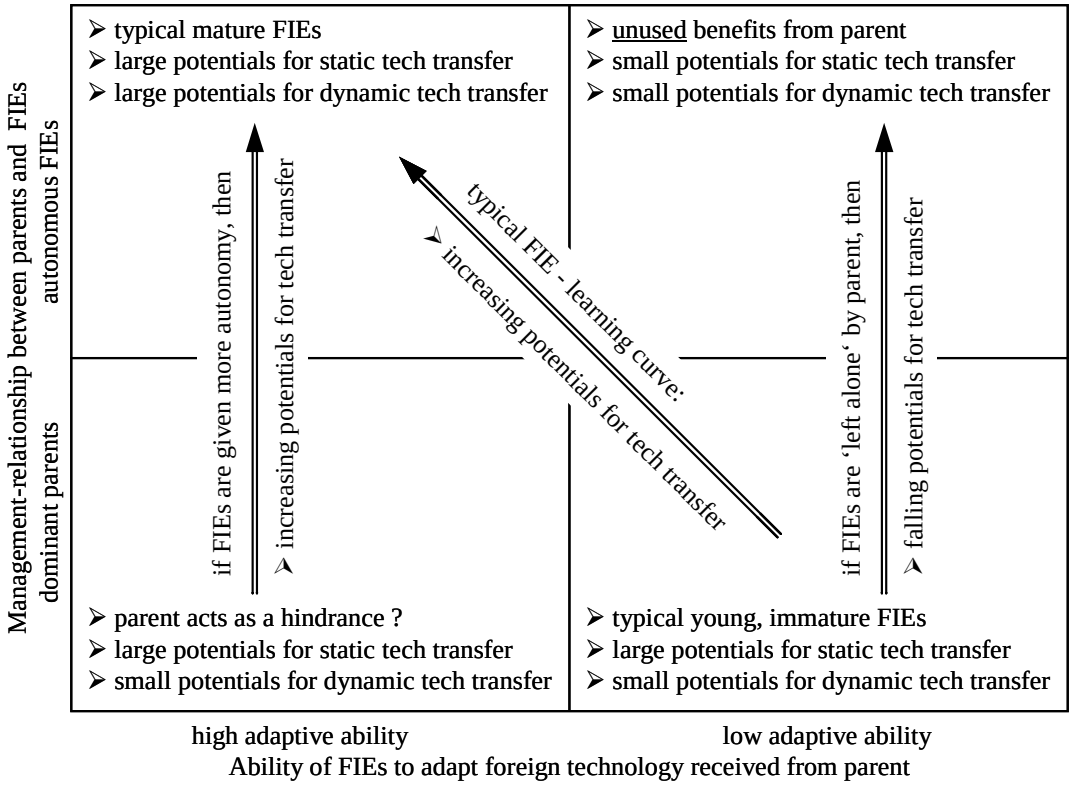
In the graphical representation of the taxonomy, FIEs at the bottom right quadrant feature the typical young and immature subsidiaries, where adaptive ability is weak and the parent hence plays a dominant role in terms of managing the subsidiary. Whilst

hence potentials for static technology transfer effects are large, the subsidiary receives the parent's technology (dominant management-position of parent), it is (so far) unable to contribute to its technological development by adapting the foreign technology.

On the other extreme, FIEs located at the top left quadrant assume the highest position in terms of potentials for both static and dynamic effects. Here, FIEs not only are more autonomous from their parent network in terms of management, they are also able to assume own responsibility for the implementation and adaptation of this technology. Due to its high adaptive ability, the FIE will make use of the parent's technology, will be able to decide which technology to choose and how best to implement and adapt it (static effect). When reporting back to the parent, a dynamic process of technology transfer between parent and subsidiary and back can emerge. We assume that with FIEs maturing, they will typically move from the bottom right to the upper left quadrant.

If a FIE however, is not granted additional autonomy in line with its increasing adaptive ability, then the parent will forego potential benefits from the dynamic interaction with its maturing subsidiary. Here, the subsidiary receives the parent's 'best practice', is however not allowed to participate by adapting it to functions efficiently in its own environment despite its ability to do so. Potentials for dynamic technology transfer remain low (lower right quadrant). FIEs located in the top right quadrant of our taxonomy face the problem of not being able to use the foreign technology of the parent. Even if parent's technology is supplied to the subsidiary, management lies in the responsibility of the subsidiary itself, yet the subsidiary's management is unable to implement and adapt the foreign technology it receives.

Figure 4. Conceptual taxonomy of FIEs and potentials for technology transfer



This taxonomy forms one of the main analytical research results of the Hungarian team. It was used to classify country and sector-specific FIEs in a comparative manner. This allows us to read what the concept would suggest in terms of country and sector-specific potentials for static and dynamic internal technology transfer.

4.7.3. The location of sector and country-specific FIEs into the empirical taxonomy

In our field work, we designed the questionnaire to provide us with the information needed to position our FIEs into our taxonomy. With respect to the management-relationship, we asked firms who undertakes FIE management in thirteen individual business functions and three distinct fields pertaining to taking initiative for changes in the subsidiary's operation (autonomy indices). Adaptive abilities are more difficult to assess in field work by use of a questionnaire. Hence, we work with the plausibility-assumption that adaptive ability in a given group of subsidiaries is typically low, if productivity growth since the advent of the foreign investor rises with a more dominant parent. That is: the more the parent is involved in the management of the subsidiary (and hence in the implementation of foreign technology into the subsidiary), the faster was productivity growth in the subsidiary. Likewise, adaptive ability is assumed to be rather high, if productivity growth was particularly strong in subsidiaries with higher

autonomy: here, FIEs which assumed more responsibility for the implementation and adaptation of the foreign technology received from the parent were also the ones to experience the most intense productivity improvements.

We depict country and sector-averages of autonomy-indices for business functions and initiatives for change individually on the vertical axis. Obviously, because our taxonomy is a two-dimensional one, we only present business functions where we could establish significant correlations with FIE productivity growth. Lacking benchmarks of typical autonomy levels, we normalise our autonomy levels around the medium levels for each category individually. This way, we locate each business function and area of initiative for change vertically around what we perceive as the 'normal' level and interpret levels as above and below average. With respect to the horizontal axis, a positive and significant correlation between FIE productivity growth and the respective FIE autonomy-indices (with 0 denoting autonomy) signifies low adaptive abilities, whereas a negative and significant rank-correlation signifies rather more developed adaptive abilities.

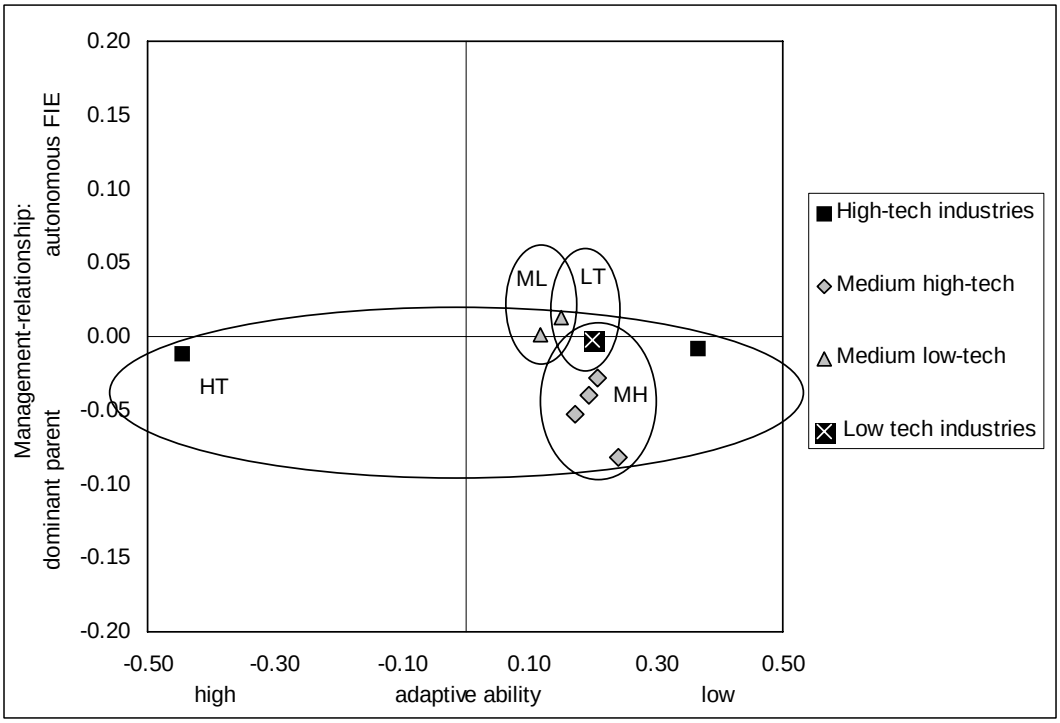
The first grouping of our sample is focussed upon a classification of FIEs according to their belonging to typical technology intensity-classes (OECD-classification, see Hatzichronoglou 1997). The class most intensively integrated into their parent networks appear to be the high technology group. This is particularly pronounced for the groups of operational and strategic types of functions and less for market-related business functions. This result is supported by the fact that the equity share of parents in FIEs of this sub-panel is higher than in the average over all FIEs. Despite their relatively low competency-mandate, our high tech FIEs have benefited relatively little in terms of productivity, technology or quality improvements: most correlations turned out to be insignificant. We could establish a strong and significant positive correlation only – among market related functions – for market research with a coefficient of 37 *per cent*, and the coefficient - among everyday operations – for operational management, which turned out to be significant but negative and even higher with 0.45 *per cent*.

The high technological FIEs assume a location towards the lower two quadrants of the figure with operational functions far left and market-related functions far right. In terms of our concept and the two criteria for technology transfer, we would hence conclude that, with respect to operational functions, the potentials for static technology transfer are large, whilst those for the dynamic technological interaction between parent and subsidiary are smaller. FIEs operate under a dominant parent and are at the same time successful in adapting the foreign technology they receive from the parent to work efficiently in the environment of their own host economy. Alas, the FIEs involved are not sufficiently autonomous to actually make full use of their adapting ability on a large

scale. The same result with respect to static and dynamic potentials appears to apply to market-oriented business functions: large potentials for static technology transfer due to intense head quarter control, yet FIEs were less successful in the adaptation of foreign technology.

With those FIEs maturing along the typical learning curve, we would expect increasing potentials for dynamic technology transfer between parent and subsidiary. Hence, further FIE development crucially depends on whether those FIEs are in fact given more autonomy in the future. If they were however rather of an OTP-type of business, then little progress can be expected. Surprisingly, however, within our high-tech group only very few FIEs can be considered of an OPT-type.

Figure 5. Empirical taxonomy of FIEs and potentials for technology transfer: sector-specific groups of subsidiaries



Note: The points marked in the taxonomy correspond to individual business functions and areas of initiative for change. We rescaled the vertical axis to present FIEs' location in their autonomy relative to the average of the total sample. The location of ellipses around the points of groups of FIEs are determined vertically by the largest and lowest values for the autonomy-indicators of all business functions and initiatives whether significant in correlations or not.

The most autonomous technology classes turned out to be the medium low technology industries with an average indicator value of slightly below 0.33, and the low technology

industry with a value of slightly above 0.33. In both groups, we could establish significant positive correlations for only very few business functions with weaker coefficients between 12 and 20 *per cent*. With medium low-technology FIEs able to develop faster under the guidance of a dominant parent, yet already being quite autonomous, we are led to conclude some unused benefits in terms of technology transfer (upper right quadrant). Their potentials for both static and dynamic technology transfer hence appear to be rather small: their intensity of head-quarter control by the foreign technology-bearing parent MNC network is low despite the fact that their level of maturity (positive correlation) would still necessitate an active parent to fully benefit from technology transfer potentials. Considering additionally that the low-wage comparative advantage of the region can be assumed particularly important for FIEs in industries with a rather lower technological sophistication, this interpretation from our concept appears to be well founded. Whether or not those FIEs mature in terms of their ability to learn to adapt the foreign technology they receive cannot be answered within this framework.

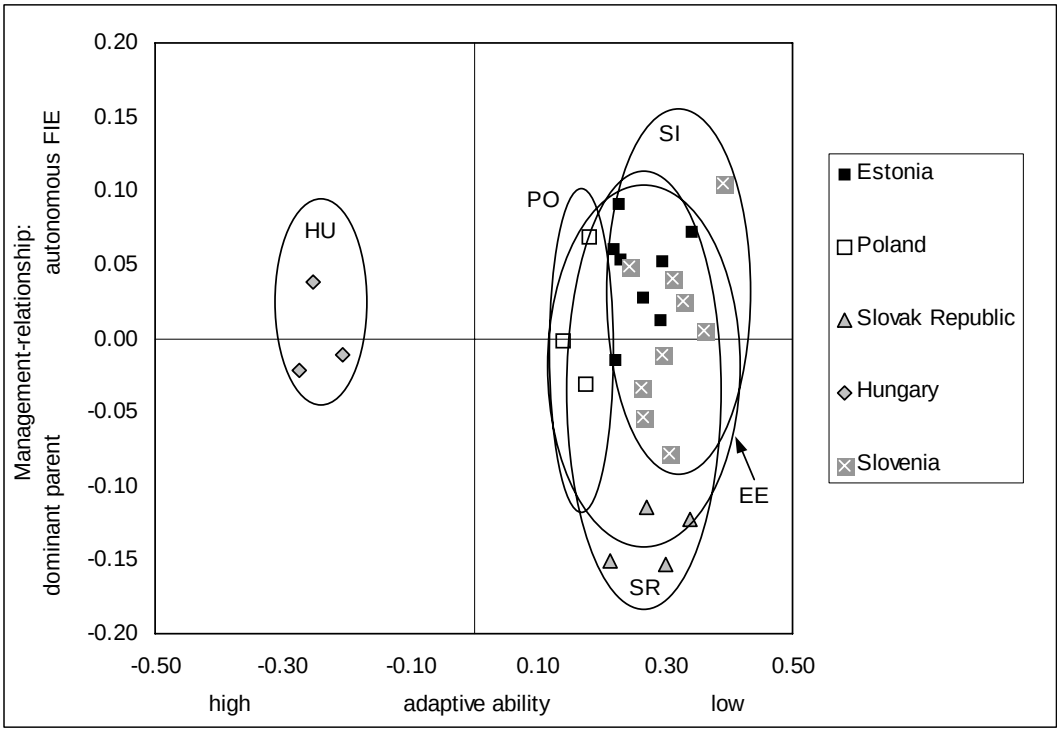
In the case of medium high-technology FIEs we could establish significant positive correlations for all market-related, some strategic business functions, and two out of three sources of initiative for change. The correlation coefficients in those business functions and sources of initiatives are in fact higher than for the average over all FIEs. With an overall autonomy-indicator demonstrating a rather low competency-mandate within the parent companies' networks (slightly below 0.37), we are here presented a typical picture of immature FIEs low on their learning curve (lower right quadrant). In terms of our concept, this suggests that significant potentials for static technology transfer are already prevalent whilst adaptive abilities of these firms are still rather low, suggesting lower potentials for dynamic technological interaction between parent and subsidiary. However, with those FIEs maturing on the typical learning curve, we would assume increasing potentials.

In a cross-country comparison of autonomy-indices, our Slovenian FIEs appear to be the most autonomous with an overall indicator of 0.30. This is particularly pronounced for operational but also true for strategic business functions. Only in the group of market-related functions autonomy is below-average, the sources of initiative for changes in Slovenia suggest more autonomy than across all countries, exceeded only by our Estonian FIEs. Our Slovenian FIEs never-the-less exhibit a strong relationship between autonomy and FIE development (particularly in market-oriented, strategic business functions and sources of initiatives) with correlation coefficients of between 25 and 39 *per cent*. Apparently, our Slovenian FIEs would be well adept to benefit from their cooperation with their parents (high correlation coefficients), only they are already considerably autonomous. We would therefore locate our Slovenian subsidiaries into the

upper right quadrant of our taxonomy. According to our concept, we can hence assume some unused benefits from the relationship and kind of interaction with the parent; potentials for technology transfer, whether static or dynamic, are rather low. We cannot, however, deduce from this interpretation whether those FIEs will in fact mature to move into the top left quadrant (thereby learning to adapt the foreign technology to the particularities of the host economy) or rather remain stuck in their current position.

At the other extreme, the Slovak Republic's FIEs seem to be the least autonomous with an average indicator over all business functions of 0.42. Here, particularly the market-related business functions and the strategic functions assume much lower autonomy as compared to the other countries. Also in terms of sources of initiatives for changes is autonomy by far the lowest amongst the country-groups. Some of this might be attributable to the fact that in the Slovak Republic, large-scale FDI are of much later origin (average age of 7.8 years since their registration as FIEs as against 8.8 years for the whole sample and 9.1-10.2 years for Estonia and Hungary). Also, foreign investment involved until recently a comparably higher extent of political uncertainty, suggesting more intense control by the parent companies. However, only market-related business functions and the initiative for changes to sales and exports are significantly and positively correlated with FIE development, the correlations for operational and strategic business functions are insignificant. This assigns our Slovak FIEs a position in the lower right quadrant of our taxonomy. Apparently, Slovak FIEs are particularly adept to benefit in market-related fields from an active parent-role in FIE management, suggesting a rather low ability to adapt the foreign technology received. According to our concept, this would suggest large potentials for static technology transfer, but rather small potentials for the dynamic effects of technological interaction between subsidiary and parent. If we assume for the future that our Slovak FIEs mature along the typical FIE-learning curve, then we would expect rising potentials for dynamic technology transfer effects.

Figure 6. Empirical taxonomy of FIEs and potentials for technology transfer: country-specific groups of subsidiaries



Note: The points marked in the taxonomy correspond to individual business functions and areas of initiative for change. We rescaled the vertical axis to present FIEs' location in their autonomy relative to the average of the total sample. The location of ellipses around the points of groups of FIEs are determined vertically by the largest and lowest values for the autonomy-indicators of all business functions and initiatives whether significant in correlations or not.

Our Hungarian FIEs appear to be higher up the institutional learning curve with above-average autonomy in a number of business functions, mainly strategic and operational, less in market-oriented functions (overall autonomy-indicator equals 0.33). However, not many significant correlations between business functions and sources of initiative for change with FIE development could be found: amongst those business functions significantly correlated with FIE development, all show negative signs, implying that our Hungarian FIEs on average were able to adapt and implement some of the foreign parent technology to the particularities of the host economy environment under its own responsibility (*i.e.* upper left quadrant). With Hungary being considered the country in the region with the oldest history of large-scale FDI, this result is not surprising and lends further support to our conceptual framework: our Hungarian FIEs are on average more mature than our FIEs in the other countries. Potentials for technology transfer appear high for our Hungarian FIEs, and involve both static and dynamic effects. The

assessment of the development of potentials in the future depends on whether the Hungarian FIEs are of an OPT-kind or are in fact allowed to improve their position not only with respect to their parent companies, but also on the domestic market.

The Polish economy, being the largest amongst our CEECs, attracted investors which apparently placed more emphasis on the large market than as a cheaper production site for products aimed at Western markets: in operational and strategic business functions, our FIEs are clearly less autonomous than in the other countries, only in market-related functions do our Polish FIEs assume more own responsibility and are able to initiate changes (to sales and exports). Additionally, little significant relationships could be found between autonomy and FIE development: significant positive correlations occur amongst market-related and more strategic business functions, however with coefficients as low as below 9 *per cent*. In our taxonomy, our Polish FIEs would hence locate at the right hand two quadrants, with market-related business functions tending to the upper right quadrant and strategic functions to the bottom right quadrant. Hence, we would tentatively conclude that our Polish FIEs until now experienced little potentials for technology transfer in market-related functions, yet larger potentials for static technology transfer in more strategic functions.

Our Estonian FIEs also assume a middle rank in terms of average autonomy with an overall level of 0.32. In market-related functions, however, autonomy is comparatively high and only surpassed by Poland, and in the sources of initiative for change, autonomy is even the highest amongst all country groupings. In contrast to the Hungarian and Polish FIEs, our analysis established a large number of positive and significant correlations with coefficients above 20 *per cent*. Most positive and significant correlations appear in market-oriented business functions. In total we would assign our Estonian FIEs rather to the upper right quadrant of our taxonomy. In the empirical application of our taxonomy, the long tail down to the bottom right quadrant originates from only one business function (investment and finance) exhibiting extremely low autonomy way below the average of the other functions. According to our concept, we would conclude that our Estonian FIEs could theoretically benefit from their parent yet are too autonomous to experience large potentials for technology transfer. This result corresponds to the fact that Estonian economy accommodates the by far largest share of low-tech and the second but highest share of high-tech FIEs.

4.7.4. The potentials for external technology transfer to the host economy

The size of potentials for vertical technology transfer is tested by assessing the share of host economy firms in procurement of the subsidiary, giving rise to potentials for backward linking effects; and we assess the share of the host economy in sales (domestic buyers) to test for potentials for forward linking effects. The analysis of backward linking effects not only focuses on the share of local suppliers in terms of material and prefabricated products, but additionally on the supply of services to the subsidiary. Those include in particular sources of finance (assuming that host economy banks may also provide a channel for technology transfer), assistance in quality control (which in CEECs is often thought of as assistance in ISO total quality control certification), the supply of patents, licences, and R&D results and ideas (which in FIEs will typically originate from the parent's network), the supply of qualified workers and their training, and finally the supply of qualified managers (whereby the latter two are typically determinants of the quality of the location).

From the data of our field work, we identify the largest potentials for purchase-driven, backward-linking technology transfer in the case of the Slovak Republic, to a lesser extent also in Estonia and Slovenia (see table 31.). In the latter, however, we cannot identify any FIEs that purchase more than 50 *per cent* from the host economy and sell more than 50 *per cent* to their parent network. The countries in which we expect the weakest backward linkages via procurement of material and semi-finished products are mainly Hungary and possibly Poland.

In regard to sales-driven forward linkages, the Slovak Republic and Estonia again appear to have comparably high shares of FIEs fulfilling our criteria of purchasing from parents and selling to the host economy. Here, however, Poland exhibits the highest shares what is not too surprising due to the large domestic market and the subsequent local market-orientation of Polish FIEs. Hungary again ranks at the bottom of the list, and this time, the assessment for Slovenia unambiguously suggests rather low potentials for technology transfer of the forward linking kind.

Table 31. Share of backward and forward linking FIEs, and OPT-type of FIEs- in percentage shares of FIEs fulfilling the criteria (all FIEs in country-groups = 100) -

	Estonia	Poland	Slovakia	Hungary	Slovenia
Backward linkages					
...50%-criterion	8.2	7.8	12.8	4.7	13
...80%-criterion	4.1	0.7	9.0	1.2	0.0
...100%-criterion	0.0	0.7	0.0	0.0	0.0
Forward linkages					
...50%-criterion	12.3	26.1	14.1	3.5	2.9
...80%-criterion	6.9	13.7	9.0	0.0	0.0
...100%-criterion	1.4	6.5	3.9	0.0	0.0
OPT					
...80%-criterion	2.7	4.6	10.3	5.9	8.7
...100%-criterion	1.4	0.7	3.9	2.4	0.0

Notes:The three criteria pertain to the share of purchases or sales directed to the domestic market or the parent network.

Additionally, the analysis of purchasing and selling structures provide us with some indication on whether OPT-type FIEs are a widespread phenomenon in our country samples: such FIEs are characterised by mainly buying from their parent networks and at the same time mainly selling to their parent networks. In this respect, we do find a significant positive correlation between selling to the foreign partner network and procuring from the parent network across all our FIEs, albeit with a low coefficient. For the identification of OPT-type FIEs, we additionally compare shares of FIEs in total country-specific FIEs that largely sell and at the same time largely purchase from parent networks. The results of this analysis establish that the Slovak panel clearly contains the largest shares of OPT-type FIEs, followed with significant distance by Hungary, Poland,

and Slovenia. The lowest share of FIEs of the OPT-type is to be found in our Estonian panel.

Two further channels for backward linkages of a rather non-material type can be assessed from our data: the role the host economy plays for supplying management areas that might be important for the competitiveness of subsidiaries, and the role domestic money and capital markets play as sources of FIE-finance. In terms of areas of competitiveness, we assume that large potentials for such vertical, non-material, and external technology transfer exist where FIEs are being supplied to a large extent by the domestic economy in such areas of competitiveness, the subsidiary itself determined as particularly important. With respect to sources of FIE-finance, we follow the usual and most straight-forward method of comparing the weights of domestic, foreign and FIE's own resources.

Institutions in the host economy constituting sources for such areas of FIE-competitiveness do not only grant the subsidiary a link to the host economy. This also induces technological development in the host economy: by supplying quality control assistance to the FIE, the local institution will learn to assess new technology and hence accumulate knowledge it can subsequently use in other local firms it supplies; in supplying patents and licences via own R&D, we can assume the supplying company or research institution to closely cooperate with the FIE to match demand; the supply of people, training and in particular management pertain to the technological development of human capital in the host economy.

Counting the number of firms that both value an area of competitiveness as particularly important and local sources to supply this area as equally particularly important, we can compare the roles of host economies across our country-samples: the share of FIEs fulfilling these criteria are largest for our Polish FIEs in all four areas of competitiveness; the average share amounts to nearly 28 *per cent*. The second largest average share is recorded for our Slovenian FIEs (19.2 *per cent*). The shares of the group of Slovak and Estonian FIEs are around 10 *per cent*, and that of our Hungarian group is lowest with only some 6.5 *per cent*. In all country-samples, FIEs are most intensively networked with the host economy in the area of quality control assistance and with a considerable gap in the area of management and people and training. In Hungarian and Estonian FIEs, the area of people and training shows comparatively weak links to the host economy, in the latter country's FIEs despite the above-average importance attached to this area of FIE competitiveness.

Table 32. Indicators for non-material external technology transfer potentials

	Estonia	Poland	Slovak Republic	Hungary	Slovenia
Areas of competitiveness [1)]					
Quality control assistance	16.4	37.9	18.0	15.3	36.2
Patents, licences, R&D	4.1	23.5	3.9	3.5	11.6
People and training	5.5	23.5	10.3	1.2	11.6
Management	12.3	25.5	12.8	5.9	17.4
Average of the four areas	9.6	27.6	11.3	6.5	19.2
Sources of finance from [2)]					
...retained earnings	0.71	0.61	0.80	0.73	0.70
...foreign parent	0.65	0.67	0.63	0.53	0.57
...other foreign sources	0.29	0.32	0.25	0.17	0.28
...domestic network FIEs	0.03	0.22	0.09	0.05	0.04
...other domestic sources	0.50	0.48	0.39	0.63	0.46

Notes:[1)] Share of firms fulfilling the criteria. The criteria are defined as FIEs both considering the respective area as an particularly important for their competitiveness (indicator ≥ 0.5), AND valuing local sources (without the FIE itself) to supply those areas as equally particularly important (average indicator for local sources ≥ 0.5).

[2)] The average country-level of importance of each source, whereby we translated the answers into: 0...not important; 0.25...little important; 0.5...important; 0.75...very important; 1...extremely important.

From the point of view of intensity of business networking of FIEs with their host economy, our field work results therefore suggest that the Polish FIEs probably contain by far the largest potentials for vertical technology transfer from this source, followed with a significant gap by Slovenia. The Hungarian economy probably benefits the least from its FIEs in this respect, and the Slovak Republic and Estonia are somewhere in the middle. In all samples, the largest benefits are set to arise due to linkages with local institutions providing quality control assistance to foreign direct investors' subsidiaries.

Finally, potentials for non-material, vertical technology transfer might also depend on the involvement of local sources of finance, like banks, domestic investors, the capital markets, and other domestic subsidiaries of the parent network. In our field work, we again asked for the importance of a set of different sources: in general, our FIE's main

sources of finance turned out to be their own retained earnings, followed by the foreign investor parent. Only in the cases of Poland was the foreign investor parent slightly more important than retained earnings. Additionally, our Polish FIEs procure finance to a significant extent also from other domestic subsidiaries of the parent investor's network. Notably in Hungary, other domestic sources (probably mostly banks) turned out to be second after retained earnings. This might be a reflection of the fact that foreign direct investors in some cases engaged in Hungary in cooperation with foreign banks. Not surprisingly, the level of importance attached to retained earnings increases with the age of the FIE (again tested for the group of FIEs younger than 5 and older than 10 years over the complete sample).

Comparing levels of importance attached to domestic and foreign sources, the latter sources (including the foreign owner company and other foreign sources like domestic banks, local investors, *etc.*) turn out to be more important than the former. This is particularly pronounced in our Estonian and Slovak firms, whereas for our Hungarian FIEs, domestic and foreign sources are nearly equally important. The highest level of importance to domestic sources is attached to our Polish and Hungarian subsidiaries, followed with some gap by Estonian, Slovenian and Slovak FIEs. In terms of the role the host economy plays for the FIEs in terms of providing sources of finance as an indicator for potentials for technology transfer from subsidiary to the host economy, we can hence conclude that potentials from this channel are probably highest in Poland and Hungary, and much lower in the other countries.

4.8. The Role of Subsidiary Strategy and Direct Technology Transfer

Part eight of the analysis of the CEE subsidiary database has been conducted by Björn Jindra (University College London). He collaborated with Slavo Radoševic and analysed the data during an internship at the IWH in cooperation with Johannes Stephan. This analysis makes use of all data-sets available in the database. The main objective is to further disentangle the autonomy-issue, *i.e.* whether FIE-autonomy is good or bad for FIE development. Following a different method than that of the previous analysis, he classifies FIEs according to strategic characteristics in the relationship between parent and subsidiary.

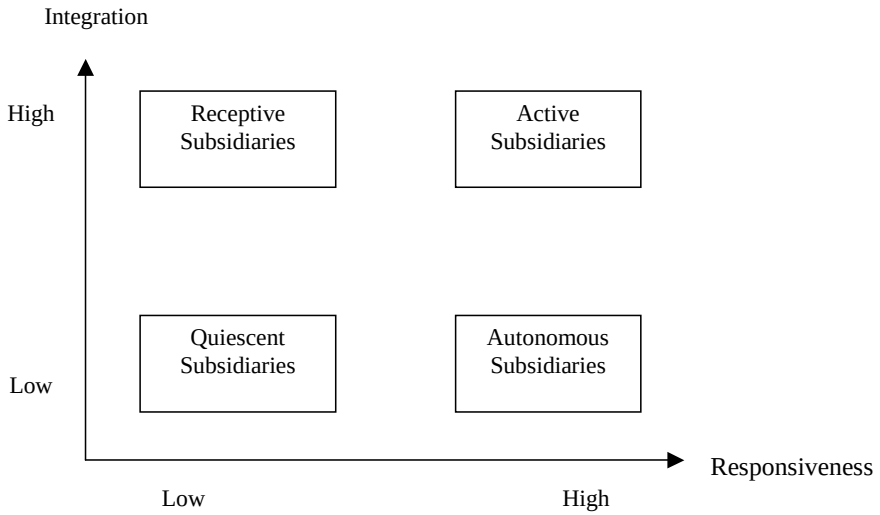
4.8.1.Classification of Subsidiaries into Strategic Groups

Strategic roles of subsidiaries can be differentiated along certain dimensions such as the flow of knowledge and resources; the scope of product, market, and value added activities; as well as the internal competences and the degree of decision making concentration. Although existing research has employed these diverse dimensions to depict the strategic context of subsidiaries, there seems to be a consensus that subsidiary typology can be modelled using two generic strategic dimensions: global integration and local responsiveness (Jarillo and Martinez, 1990; Taggert, 1997a). We adopt this 'Integration-Responsiveness' framework in our analysis to classify different foreign subsidiary strategies according to Jarillo and Martinez (1990). Thereby, we hypothesise that there exist different subsidiary strategies independent from the country of origin of FIEs in our sample.

We decide to follow the approach taken by D'Cruz (1986) and proxy global integration with autonomy of the FIE and measure responsiveness with host market involvement. However, the survey offers a wide range of variables related to autonomy and host market involvement. Therefore, principal component analysis is applied in order to test which selected set of variables can be consolidated into two components, which reflect the integration and host market involvement dimension. We arrive at six variables (see table 33.).

The factor integration is mainly driven by strong positive factor loadings for the average of autonomy in all business function, the average of subsidiaries' initiative, and the share of sales from the subsidiary to its foreign owner as well as negative factor loadings for sales of the subsidiary to domestic destinations. The factor host market involvement shows negative factor loadings for subsidiaries' purchases from domestic suppliers and positive loading for purchases from the foreign owner.

Figure 7. The 'Integration-Responsiveness' framework



The factor integration is mainly driven by strong positive factor loadings for the average of autonomy in all business function[12], the average of subsidiaries' initiative[13], and the share of sales from the subsidiary to its foreign owner as well as negative factor loadings for sales of the subsidiary to domestic destinations. The factor host market involvement shows negative factor loadings for subsidiaries' purchases from domestic suppliers and positive loading for purchases from the foreign owner.

[12] Average variable for thirteen business function: 1) operational business functions: process engineering, supply and logistics, accounting and finance of operations, operational management; 2) marketing business functions: market research, distribution and sales; after sales services, advertisement, marketing; 3) strategic business functions: technical product development, determining product price, investment finance, strategic management or planning

[13] This combines initiative in the organisation of business functions (internal initiative), the number of lines of business (product scope, internal initiative) and sales and exports (market scope, external initiative).

Table 33. Rotated Component Matrix of Principal Component Analysis

Variables	Components	
	Integration	**Responsiveness**
Share of sales to domestic destination	**-0.823**	0.079
Share of sales to foreign owner	**0.882**	0.078
Share of purchases from domestic suppliers	-0.174	**-0.830**
Share of purchases from foreign owner	0.051	**0.927**
Average over all initiatives	**0.677**	0.284
Average of all business functions	**0.707**	0.417

Note: Extraction method: Main Component Analysis, varimax with Kaiser-Normalisation, Rotation converged in 3 iterations.

Following Jarillo and Martinez (1990) we perform a cluster centre analysis in order to fit the CEE subsidiaries into our 'integration-responsiveness' framework. We use the six variables, which resulted from the principal component analysis above. The clusters are determined by maximising the differences between firms in different clusters. According to the theory outlined above, we would expect four types of subsidiaries, hence, four clusters. Therefore, we choose a non-hierarchical form of cluster analysis, which allows us to fix the number of clusters at a priori.

Table 34. presents the distribution of the FIEs across the fur different clusters using the six variables reflecting the two dimensions of global integration and local responsiveness across all firms in the sample. Cluster four contains the largest number of firms and is characterised by the highest level of FIE autonomy and FIE initiative, low trade integration with the MNC parent firm, and the highest level of local market involvement. This cluster could very well represent the type of autonomous subsidiaries.

Table 34. Final Results of Cluster Centres Analysis

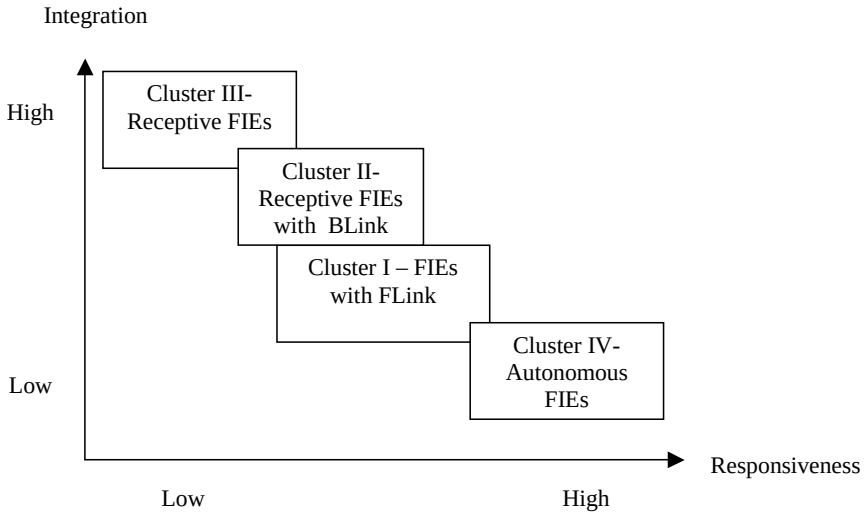
Dimensions and Respective Variables	Cluster			
	I	II	III	IV
Integration:				
Average of all business functions	0.35	0.42	**0.55**	**0.22**
Average over all initiatives	0.42	0.51	**0.58**	**0.32**
Sum of shares of sales to domestic destination	**0.79**	0.12	0.08	**0.69**
Share of sales to foreign owner	0.06	**0.66**	**0.76**	0.06
Host Market Involvement:				
Sum of shares of purchases from domestic suppliers	0.13	**0.52**	0.12	**0.67**
Share of purchases from foreign owner	**0.72**	0.10	**0.64**	0.08
Number of firms per cluster (N)	73	89	67	195
Standard deviation of distances to cluster centre	34.11	31.13	32.21	35.20

Cluster three has the lowest number of FIEs and diametrically opposed characteristics to cluster IV. It shows the most intense level of integration into the MNC network and the lowest level of domestic market involvement. This cluster could represent the type of receptive subsidiaries. Subsidiaries in cluster II are very similar to cluster III in terms of integration (autonomy, initiative) as well as (parent) export orientation. However, they source mostly from the domestic market. In other words cluster II subsidiaries are involved with the local market through a backward linkages (supplies). Subsidiaries in cluster I have levels of integration (FIE autonomy, FIE initiative, sales), which are closer to our autonomous subsidiaries. Therefore, type I FIE subsidiaries are affiliated through forward linkages (sales) to the host market. However, in contrast to type IV FIEs most of their produce is sourced from their foreign owner. In sum the cluster analysis identified two of the theoretical strategies (receptive, autonomous). The other two clusters do not fit the taxonomy and are rather new types of subsidiary strategies (see Figure 8.).

In econometric studies working with quantitative data the production function approach is usually employed to test for technology transfer. Due to a lack of data on capital and material inputs we adopt the approach taken by Majcen *et al.* (2003) and Rojec *et al.* (2004) and estimate the firm's TFP directly. Technology transfer is usually proxied by changes TFP growth. However, our qualitative survey offers two additional indicators: the level of technology applied in production equipment and level of quality of produce. We

estimate a binary probit model for all three technology transfer indicators separately as dependent variable. The model includes dummies for our identified strategic groups and other factor such as country dummies, age and size of the subsidiary, technology and R&D intensity, export and import propensity. Moreover, we repeat the binary probit estimation for all three technology transfer indicators for each subsidiary group separately. However, the model specification are change in order to include a wiser choice of variables.

Figure 8. Strategic groups Identified in the I-R framework



4.8.2. Results and main conclusions

MNC strategy matters

Subsidiary strategy is a significant determinant of technology transfer independent from country effects. The results show that highly integrated and export oriented FIEs (type III and II) are more likely to achieve productivity growth, and production technology upgrades and to a lesser extent quality improvements. Medium integrated and domestic market oriented subsidiaries (type I) show significant probability to benefit from increased levels of quality. Autonomous subsidiary (type IV) strategy has no positive significant impact on technology transfer. Within group estimations showed that coefficients of the other variables have different significance levels and/or signs depending from the strategy.

Trade as Technology Transfer Channels

Given the general trade patterns of subsidiary type II and III it can be argued that intra-MNC trade has a decisively positive impact on technology transfer. Furthermore, a higher export share for receptive subsidiaries increases productivity as well as quality. Whereas,

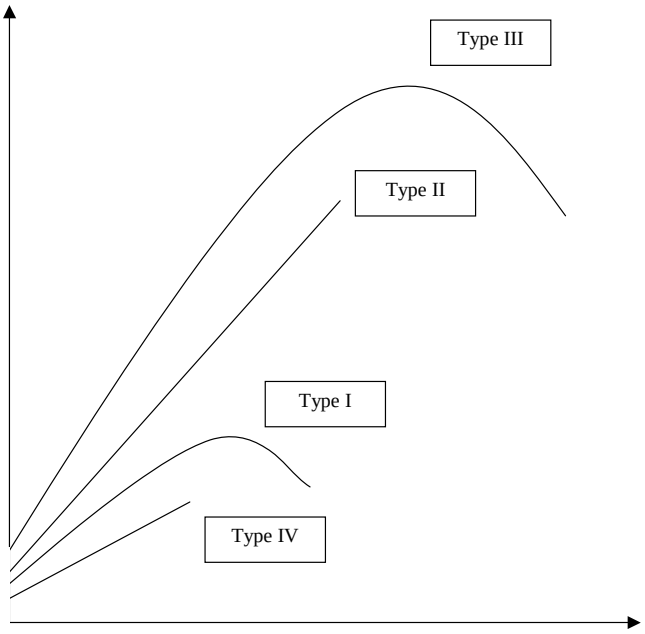
a higher share of imports increases the likelihood of productivity and technology improvements for type II subsidiaries. Given the fact that Type II and III FIEs have also on average the highest foreign equity shares, it can be argued, that FDI and international trade are complementary rather than substitutes for technology transfer.

Explicit channels for technology transfer via inward FDI or FIE initiative

The evidence shows that all areas of business functions and initiative can work as explicit channels of direct technology transfer. However, most frequently and significant is the direct technology transfer via marketing business functions and questions related to product scope. On the other hand FIE initiative with regard to the general organisation of business functions and technical product development pushes forward FIE development in terms of technology. However, there are significant differences depending on respective subsidiary strategy adopted. For type I subsidiaries marketing business functions are explicit channels for positive technology transfer. The more closely integrated type II subsidiaries benefit in addition to from foreign parents initiative in product and market scope. The difference might be explained by the export orientation of type II subsidiaries. Interestingly, for the most integrated subsidiaries (type III) dependency has a negative impact on productivity growth and technology upgrades. Low integrated type IV subsidiaries benefit from technology transfer via operational and strategic business functions as well as from parent initiative with regard to product scope.

Figure 9. The Dynamics of FIE Development

Dynamics of FIE development



From the perspective of FIE development and somehow simplified stronger foreign parent initiative and co-ordination is required for the group of autonomous subsidiaries. There is still room for stronger foreign parent engagement in medium integrated/export oriented FIEs. On the other hand higher subsidiary initiative and autonomy pays off for receptive FIEs and medium integrated and domestic market oriented subsidiaries (see Figure 9.). Our evidence shows that a differentiated approach to further FIE development depends on the current adopted subsidiary strategy (degree of integration reached), market orientation (export vs. domestic market) and the particular business function and/or area of initiative in question.

4.9. Autonomy of FIEs in Poland

The final analysis of the CEE subsidiary database has been conducted by our Polish team, including Romuald Niedzielski, Maria Kania, and Krzysztof Malik. Their analysis is focused on the polish sample (with 153 FIEs) and assess in particular the autonomy-issue in Poland.

4.9.1. Objective of the analysis of Polish FIEs

The evaluation of the autonomy level of FIEs on the effectiveness with regard to the companies and economy of the host country constitutes an important factor. The high autonomy level of the subsidiary does not necessarily bring about larger effectiveness. Both high dependence and autonomy levels bring negative results from that point of view. The recommended optimal structure for a transnational enterprise is an integrated network model flexibly adapted to local circumstances. The headquarters perform coordination and advisory roles instead of the superior controlling function. The large autonomy provides an opportunity to establish relationships between the subsidiaries with the local environment independently and promotes faster diffusion of know-how to local partners (growth of spillover effects).

Research of the Polish team focused on the level of autonomy of decision making in 153 manufacturing FIEs in Poland with regard to the fulfilment of the 13 functions. The following was taken into consideration in the analysis: size of subsidiaries in terms of number of employees (Criterion 1), date of registration as foreign investment enterprise (Criterion 2), the (current) number of business lines (Criterion 3), share of foreign investor in equity (Criterion 4), form of investor involvement (purchase of shares and green-field investment) (Criterion 5), branches with regard to technology (Criterion 6).

4.9.2. Main characteristics of the analysed group

- The features of the investigated group of enterprises reveal a large degree of conformity with the total population of FIEs in Poland. This applies to the large degree of share of foreign investors in capital, larger inclination towards establishment of FIEs based on takeover of existing enterprises, the growth of involvement of foreign investors at the time of law improvement, and the reduction of macroeconomic risk in the country.

- The target market of the investigated enterprises is local, which is accompanied by a small propensity to export.

- The investigated enterprises indicate a dependence on the supplies from foreign owners/parent companies, which results from the low assessment of the potential of local suppliers and the policy of international concerns.

- The investigated enterprises indicate a large degree of autonomy in a majority of business functions, even the ones which are predominantly the scope of competence of concerns headquarters (management and strategic planning). The

investigated group even predicts further growth of their autonomy, which is remarkable.

- The gradation of the relevance of sources of finance for FIEs directly indicates the role of foreign partner as the major source of finance for investment and development of FIEs. The financial potential of parent companies constitutes a source of competitive advantage of FIEs in comparison to local enterprises. The second source of finance in terms of importance includes the reserve funds of the enterprise. The relevance of the source contradicts the statement about the transfer of funds abroad put forward at the beginning of the transformation

4.9.3.Decision making autonomy in Poland's sample FIEs

The analysis of factors affecting decision making autonomy in investigated manufacturing FIEs in Poland leads to the following conclusions:

xliii) Although in the case of large enterprises a smaller autonomy level is observed than for any of the remaining groups; generally speaking, the results do not give a conclusive answer to the question of whether the size of subsidiaries in terms of employee number has an effect on decision making process in the context of relations between the parent and subsidiary. FIEs state a larger degree of independence in operational management than in strategic management. A large degree of dependence is observed for the case of investment finance, product price, process engineering and product development.

xliv) The longer established the FIE on the Polish market, the larger the degree of autonomy with regard to the majority of business functions.

xlv) A rise in the number of business lines imposes a simultaneous growth in the autonomy level.

xlvi) FIEs with a minority share of foreign investors enjoy a larger degree of autonomy from the parent enterprise.

xlvii) The extent of autonomy of subsidiaries depends on the form of foreign investor involvement. Autonomy with reference to business functions is lower in the case of greenfield investments than for takeovers.

xlviii) The degree of autonomy is lowest with reference to medium-high technology industries in comparison to high technology, medium-low and low technology

industries (with the exception of operational management and accounting and finance).

4.9.4. Main conclusions of the analysis

xlix) A large degree of dependence is observed in the case of investment finance, product price, process engineering and product development. The overall conclusion is that the prices affect the cash flow between the parent and subsidiary. Investment finance is an area included in a range of strategic areas of managing international concerns and is not transferred to subsidiaries.

l) This confirms the proposition that the dependence on the foreign owner decreases after the period of development of subsidiaries utilised for learning. In conclusion, the process of maturation of subsidiaries is accompanied by the growth of their autonomy and results in the rise of headquarters confidence in the management boards of local subsidiaries. An argument for confirmation of the statement is the fact that subsidiaries of foreign investment enterprises in Poland rarely employ foreign citizens in managerial positions. One fifth of interrogated enterprises declare employment of foreigners as managers or technical specialists.

li) The rise of areas of enterprise operation imposes the process of delegation of authority, which is indispensable for the effectiveness of the enterprise and is confirmed by the gathered empirical material. The enterprises with more than 10 business lines indicate a relatively higher level of autonomy in all business functions (with the exception of marketing research). In conclusion, the growth of the number of business lines affects the growth of the autonomy level, which is quite normal.

lii) The participation of national partner produces the need for taking their objectives into consideration. The smaller influence is indicated by the enterprises with minority share of the foreign investor. In this case a form of holding management is encountered, which results in the rise of the range of decentralization. A relatively large participation of local partners encourages the spread of authority to the local environment as the result of spillover effects. In contrast, in the case of subsidiaries with 100 *per cent* foreign ownership, the prospects of know-how diffusion are distinctly limited. Along with the rise of the share of foreign investor ownership in subsidiaries, a possibility of unrestrained control increases. In the conditions of transformation in Poland's circumstances, the partner for foreign investors takes the form of the State Treasury in a

majority of cases. The role of the treasury is however restricted to holding shares in FIEs (even if substantial) and to controlling the fulfilment of obligations agreed between the investor and the FIE. In the prospect of five to ten years to follow, depending on conditions of the contract, the Treasury shares are to be sold to the strategic investor. Nevertheless, the presence of national shareholders restricts the autonomy of foreign investors.

liii) Greenfield investment is characterized by larger convergence of structures and behaviours in relation to the parent enterprise, which could be associated with the stronger dependence of subsidiaries on foreign investors in terms of decision making. The Polish group includes a large number of enterprises with 100 *per cent* foreign ownership in capital. The development of greenfield investments is slow due to their character. The headquarters cautiously select local partners in terms of the adaptation to the culture of the corporation. This is later reflected in the submission of subsidiaries in relation to the foreign partner.

liv) Within the group of medium-high technology FIEs, the planning of the majority of business functions is fulfilled by foreign headquarters, in particular in production planning. This results from the protection of investor-specific know-how, the necessity to preserve the investor's technological regime (refer to Ozawa 1979 and Wells 1983), and the centralisation of research activities within the structures of multinational enterprise. The observed phenomenon is associated with a particular disadvantageous feature of capital inflows in the case of the Polish economy, namely the character of FDI for investment. In vestment under the control of foreign investors imposes ready-made solutions with regard to technology and shows strong reluctance to establish more independent research centres in Poland.

5. Workpackage 5

PRODUCTIVITY AND CAPABILITY IN THE TRANSITION COUNTRIES: A HISTORICAL AND COMPARATIVE PERSPECTIVE

Research in **workpackage 5**, conducted in a team around David Dyker, Katie Higginbottom, Leonardo Iacovone, Niels Kofoed, and Cordula Stolberg, is concerned with the social capability in transition economies with respect to technological development. transfer via FDI. The method of research included both deep-level interviewing techniques of some eleven foreign investment parent companies in the West, and a triangulation technique, cross-referencing results generated in other workpackages and the larger literature available on the subject with their own results. The aim of this

workpackage is to pinpoint the gaps in capacities of firms in technology-intensive branches of selected new member states to absorb and diffuse 'hard' (process and product) and 'soft' (management, organisational) foreign technology transferred from abroad through various channels.

The failure of Soviet-type socialism, in particular its failure to catch up with the developed industrial countries in terms of basic GDP and standard of living indicators, was in essence a failure of productivity. To a degree, low levels of productivity under socialism reflected misallocations of resources. But even in the Soviet Union itself, allocative efficiency in the broad factorial sense was not so bad (Whitesell, 1990). Basic process productivity was not so bad either. What cut average plant-level productivity to a fraction of the levels reported in comparable plants in the developed countries was the inefficient (in terms of what would be rational in a market economy) organisation of ancillary functions. Thus in the Soviet engineering industry in the early 1980s, repair, tool-making and transport/warehouse work accounted for 38% of the total workforce, compared to just 11% in the USA (Kulagin, 1982). Of course, these functional patterns were perfectly rational in the context of the classic weaknesses of central planning. Central planning is incapable of providing efficient supply networks, so that lead factories have to make the bulk of their tools and components themselves. Once central planning is gone, however, the rational for this distorted kind of Fordism goes with it. In practice, old habits die hard, and Soviet-style industrial 'do-it-yourself' has survived into the transition period. This reflects more than just conservatism and the forces of inertia. It also reflects the fact that the building of supply networks is neither costless nor instantaneous. Effective supply networks, inter alia, are based on elements of social capability, and their development is constrained by considerations of technological congruence, just like other dimensions of organisational and motivational efficiency. In purely statistical terms, there is nothing unique about the productivity problem of the transition countries. Thus, for example, productivity in the British steel industry in 1967 was only some 35% of productivity in the US and EEC steel industries (Cockerill, 1974, p.32). After some muscular restructuring and radical downsizing, the British industry largely closed the gap. What is special about the productivity problem in the transition countries are the factors that make it difficult to close the gap, therefore still difficult to catch up with the developed industrial countries. In this report we seek to shed some light on these questions, firstly by establishing an analytical framework within which we can categorise the factors hindering catch-up, then bringing foreign direct investment (FDI) into the picture as a possible catalyst for catch-up breakthrough, and finally looking at some case-study material by way of illustration of the preceding analysis.

5.1. Social capability and technological congruence

In the simple but incisive theory of catch-up put forward by Verspagen (1999) following Abramovitz (1979; 1994), the scope for catching up is defined in terms of the scope for diffusion of technology (in the broadest sense, including 'soft', organisational technology) from the advanced countries to the catch-up countries. Just as the level of GDP per head (*i.e.* the level of social productivity) in the former countries is determined by their human capital and knowledge stocks, and the efficiency with which they use such stocks, so the ultimate limits to economic growth in the latter countries are determined by their ability to assimilate those knowledge stocks and bring their own human capital stocks up to the same level. If economic development is universally dependent on the same productivity-enhancing mechanisms, and assuming no critical constraints on the supply of basic factors of production (land, raw labour and physical capital), what is to stop all countries ending up at the same level of development?

We have already identified the two main groups of factors which may inhibit catch-up through technological diffusion - technological congruence and social capability. Verspagen defines the first in terms of

> "the match between the technologies in use in the advanced country and those most fit for introduction in the backward country. If there is a mismatch between the two, the opportunities for catch-up-driven growth are reduced. The sectoral distribution of economic activity is one important factor in congruence. For example, one may well imagine that most technologies developed in the industrialized market economies are not very relevant for the most backward economies, which are often still largely agricultural societies. But there are also other factors in congruence, as in the case where the technologically leading country applies very scale-intensive technologies, for which investment opportunities and/or domestic markets in the backward country are too small. In such a situation, technological incongruence would prevent successful catch-up." (Verspagen, 1999, p.31)

The second he defines in terms of

> "institutional factors such as educational systems (which supply the human capital necessary for assimilating spillovers), the banking system (which supplies financial capital for catch-up related investment), the political system *etc.*" (Verspagen, 1999, pp.31-2).

The concept of social capability is clearly related to that of social capital. Thus Putnam (1993) argues that

> "Stocks of social capital, such as trust, norms, and networks, tend to be self-reinforcing and cumulative. Virtuous circles result in social equilibria with high levels of cooperation, trust, reciprocity, civic engagement, and collective well-being… Defection, distrust, shirking, exploitation, isolation, disorder, and stagnation intensify one another in a suffocating miasma of vicious circles. This argument suggests that there may be at least two broad equilibria toward which all societies that face problems of collective action (that is all societies) tend to evolve and which, once attained tend to be self-reinforcing." (p.177)

In the present context, however, the notion of social capital presents two critical difficulties. Firstly, it focuses on inputs rather than outputs, and offers no explanation of how social capital interacts with other inputs - other forms of capital, and with other factors of production. Partly for that reason, it says little about productivity, or indeed about any other key economic development indicator.

> "Whilst (sic) much effort has gone into examining the indices of social capital in both qualitative and quantitative terms, much less attention has been devoted to the mechanisms by which such measures of social capital lead to discernible differences at the economic level. Does more social capital, for example, lead to a higher growth rate or merely to a different growth path or the same growth rate on a higher base?" (Fine, 2001, p.92)

Because the notion of social capability focuses on outcomes, and because it subsumes the dimension of learning, it avoids these difficulties: it provides a supple framework within which issues of development and catch-up can be assessed. Vicious circles of poverty and virtuous circles of prosperity can be accommodated by the framework, but in social capability analysis no country or society is condemned to eternal backwardness. The productivity gap may be deep-seated and obdurate, but with time and appropriate policies it should be possible to remove it completely. None of this stands in contradiction to the social capital approach – it simply makes it more precise and focused.

The distinction between social capability and technological congruence is in theory clear enough. In the real world, shortfalls in social capability may constrain the establishment of technological congruence, and indeed incomplete technological congruence hamper the development of social capability, where governance is heavily technology-dependent

(*e.g.* in relation to computer and software systems). The ability of a given group of workers to cope effectively with a flexible production system is clearly a dimension of technological congruence, yet it must surely also relate to elements of social capability within the society in which the group of workers is nested. So in the analysis that follows we use the concepts as heuristic devices, rather than strictly separate, independent variables

5.2. Social capability, technological congruence and foreign direct investment

FDI is the deus/diabolus *ex machina* of international economic development. As the main vehicle for the globalisation of the activities of the multinational corporations (MNCs), it is alternately lauded as a key instrument of technology transfer, and more generally of economic modernisation, and condemned as a weapon of exploitation and socio-political subjugation. These are not, of course, mutually exclusive interpretations, and indeed some authors have integrated both elements into their analysis. Any definitive assessment of these issues is beyond the scope of this report. But we do start off with certain assumptions about MNCs as initiators of FDI which are either true by definition, or strongly supported by the standard literature. God or devil, MNCs are always exogenous. When they invest in a given country they always introduce new ideas, breaking the mould of existing patterns of business relationship and giving new impetus to dynamic entrepreneurial development. This is as true for EU countries, for the US or Japan as for any emerging or developing economy. The new ideas may not always be good ones, or the new entrepreneurial developments always profitable ones. International investment has had its failures as well as its successes, and it is only reasonable to assume that that will also be the case in the transition countries. But FDI is always a new broom, and this is particularly important in countries like the transition countries, where legacies from the past may hang heavier than in other emerging economies.

It would be wrong, however, to assume that, because MNCs always start with a clean page, that therefore their commercial and technological vistas are unlimited. On the contrary, all the literature on FDI in general stresses that MNCs are generally cautious in their assessment of socio-technological options for FDI. They usually look to invest in host industries/plants of more or less similar factor mix to the 'mother' industries/plants (Ozawa, 1979; Wells, 1983). In our terminology, they are averse to technological incongruity. That is why, automotive MNCs, for example, tend to invest in medium-developed countries with (by international standards) relatively high wages, rather than in undeveloped countries with very low wages, even though car production is relatively labour-intensive. In more positive terms, MNCs generally place considerable stress on

the importance of being able to impose their own technological culture on subsidiaries, and indeed on some categories of supplier, as a way of guaranteeing control over productivity (in this case, of course, plant productivity rather than social productivity), and thereby control over the crucial wage/productivity relationship (much more important than the level of wages as such). As far as subsidiaries are concerned, the point hardly needs elaboration. With respect to suppliers, its implications are more complex. Where the relationship is essentially a commodity one, delivery conditions are the only things that matters to the MNC. In the extreme form of outward processing, raw materials are supplied to the partner for processing and redelivery at a precontracted price. Neither wage nor productivity levels at the partner plant are of any interest to the MNC. Where there are hierarchies of supplier, as in the automotive and electronics industries, the same can be said of second- and third-tier suppliers, which generally supply components to higher-level suppliers, without any direct link to the MNC at all. In relation to first-tier suppliers, the situation may be rather different. Because first-tier suppliers are involved in the design as well as the production function, the lead firm may want to integrate the first-tier supplier into its own technological culture, in order better to integrate the latter's design function into its (the lead firm's) design function. We return to this question in our empirical section.

Finally, MNCs do not build, or maintain, schools. Indeed one of the factors that has inhibited brownfield FDI in the former Soviet Union is precisely the fact that most big formerly Soviet plants did take responsibility for most of the social functions affecting their workforce, and the expectation that a foreign buyer would in turn take over this commitment. But MNCs do build and maintain R&D units, and do spend a great deal of money on training. In terms of our jargon, they have policies on social capability, but policies that operate within constraints. Their policies are largely focused on plant- or firm-level productivity, and any impacts on social productivity are essentially side-effects. How strong those side-effects might be is one of our key research questions.

5.3. What do MNC managers say about all this?

We interviewed eleven leading international companies engaged in large-scale investment in Eastern Europe. The firms interviewed did not represent a balanced group. Most of them come from West-Central Europe (Germany, Denmark etc), and most of them are located in the middle-tech, engineering-based industries which emerged in the earlier part of the twentieth century (the automotive industry and its supplier industries, manufacture of control mechanisms etc). These are the sectors in which 'tacit' knowledge is the main form of embedded technology – tacit in the sense that it is embodied in tightly-knit groups of people rather than patents, and is difficult to transfer outside those

groups of people, and therefore outside the firm. In such a milieu, it is transfer of tacit knowledge rather than transfer of formal intellectual property rights (IPRs) that is the main vehicle for technological upgrading, and FDI is an indispensable condition of such transfer. As argued by Zysman and Schwartz (1997), there are others sectors, based on high technology and software engineering, in which tacit knowledge may be less important than IPRs in terms of embodying the state of the art in a given sector. And it is these sectors – the electronics- and software-based sectors which are the fastest-growing at present. Clearly, in sectors in which FDI is not actually a necessary condition of effective technology transfer (as it must be wherever tacit knowledge is key), the whole picture of FDI and technology transfer could change.

5.4. What questions did we ask the executives?

Our interviews, conducted in 2003 and 2004, were open-ended, but they were built around the following questions:

lv) How do lead companies specify the kind of production/technological system they wish to install in a subsidiary. Is the basic model always the company's plants in the home country? How is the basic model adjusted for variables like wage rates in the putative host country?

lvi) How do lead companies formulate their training programmes for management and line workers? How do they assess the existing levels of capability of actual and/or potential employees? Is there a training programme for everyone? What categories of worker are sent back to head office for training? To what extent are local training facilities used?

lvii) Following on from 2., how do lead companies assess local training facilities? How do they evaluate professional qualifications of the host country?

lviii) Do lead companies see in-house R&D activity as a crucial element in capability? If so, how do they rate different kinds of in-house R&D activity (basic research, adaptation, design, superficial/fundamental) as factors of capability-formation?

lix) Do lead companies see extra-mural R&D activity in the host country as a crucial element of capability? If so, how do they rate different kinds of extra-mural R&D (research institutes, universities, consultancy companies, individual consultants) as factors of capability formation? Do they have strategic goals for extra-mural R&D?

lx) To what extent do lead companies extend their policies for capability development into their supply networks? Are there training programmes for management and workers of first-tier suppliers? Are there policies on R&D activity and cooperation for suppliers? To the extent that there are policies, are they short-run, opportunistic, or strategic? Do lead companies help suppliers to move up the supply hierarchy?

lxi) Where lead firms give preference to suppliers from the home country, do they do so on general grounds of technological culture and capability, or specific, quantifiably grounds, in terms of price, quality etc? Do lead firms make strategic choices about the balance of home suppliers and host-country suppliers, or do they judge each firm on its merits?

5.5. What kind of responses did we get?

Our respondents did not always answer our questions directly. Sometimes they did not answer them at all. But because the questions were open-ended, they also sometimes answered questions we did not ask. All of the executives interviewed were anxious to start off by defined what they saw as the central activity and field of operations of the company. So we always started off talking about strategy.

5.5.1. Business strategy

One of the most striking features of the interviews was the emphasis on the global nature of the overarching strategy of the firm.

> The basic point is that XXX is a world firm. If you look at how many countries we are active in, then we must be one of the top global players. And on the competitiveness side, we recognise that this world-wide network is a real advantage, to be at the coal face in every region. If we think of Eastern Europe in this connection, when the Iron Curtain came down, then it was clear from the point of view of the firm's philosophy the direction we had to take. We had to get in there. The markets were open, we had to engage with a similar or identical concept to the one which had been used in the rest of the world, and had proved successful.

If we had not gone into Eastern Europe we would have seen our share of the global market fall.... But if you are not a world-class company to start off with, you will not become one in Eastern Europe.

This is the kind of reasoning we are used to hearing from international oil companies, for example in justifying their investments in the former Soviet Union – we are global players, we are in every region of the world, and that is part of our competitive advantage. So when a new region opens up, we have to get in there. But while the argument is transparent enough in relation to a natural-resource-based sector in which international prices are very volatile, it is less obvious, if not necessarily less compelling, in relation to engineering-based sectors. Here, the implicit argument is that, in Dunning's terms, you maximise your firm-specific advantages by being global – and therefore you maximise your scope for technology transfer by being global. Thus it is crucially important not to assume that a German firm investing in the Czech Republic is pursuing a purely regional strategy. If you do, you risk misunderstanding the nature of the technology transfer process involved, and therefore the pattern of productivity enhancement. Most seriously, you risk misunderstanding the pattern of supply networking that may flow from the initial investment, and therefore the pattern of productivity spillovers. It is not only lead firms that have global strategies. As we discovered in one of our other interviews, first-tier suppliers may also think of themselves as global players, seeking to build production complexes in particular regions (*e.g.* CEE), but with global objectives in view. As we found out, if you only ask such firms questions about their relations with local firms (including foreign-owned local firms), you may come away with the (completely mistaken) idea that they are not interested in network-building. Note, however, that within this global framework regional, specifically locational, factors may be of critical importance in terms of simple cost minimisation and managerial proximity.

> We run a regular shuttle between Berlin and [town in the Czech Republic]. And it's great that it only takes us 3½-5 hours to get there, and that we don't lose 24-30 hours like an American travelling to his subsidiary in East Asia.

Cost considerations apart, these strictly geographical considerations may make it much easier for [in this case German] firms to transfer tacit knowledge on the regional dimension. To complicate the picture even further, some firms are global players in relation to some of their products, but only regional players in relation to others.

5.5.2. Is there a productivity gap or not?

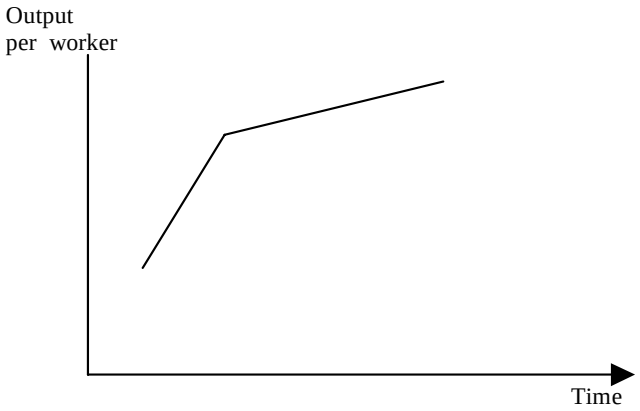
A quick reading of the transcripts might incline one to think that there is really no productivity gap at all as far as CEE is concerned, or a least none that cannot be liquidated in two or three years through the injection of Western capital, technology and marketing.

> We started with a level of productivity of 1.7 in comparison with that of the main factory, that is it took 1.7 times as long to make a given volume of value added as in the main factory. That was the initial position. And our goal is to get that down to 1 within 2-3 years.
>
> We quite quickly achieved Western productivity levels. But we did not reinvent the bicycle. We took something that we knew we could do and was a safe bet, transferred it and trained the people in it, so that they were able to handle it just like the people in the West.
>
> What was lacking was the business dimension.... But we took on the rest of the workforce one-for-one. From the point of view of qualifications, they were of the same standard as you meet in Western firms. Their education and their technical skills (Facharbeiterausbildungen) were on a par with ours.
>
> In terms of productivity, the Polish workers have a productivity of around 80% [of the Danish level] I suppose. In Lithuania it is maybe 30-40 % of the Danish productivity, but it is a learning process. Here in Denmark we have people who have cut fish for 20-25 years. In Lithuania they have as a maximum one year of experience – maybe only half a year. So our experience is that they will come relatively close to the Danish productivity within a short period.

In some cases these statements are qualified with respect to technology choice. So if a more labour-intensive technology is being used in the CEE plant because wages are lower in CEE, productivity will converge to the levels of productivity that would be achieved if you used a similar technology in the EU. Even so, the general picture is a striking one. In terms of general growth theory, we are saying that CEE is on the path to absolute

convergence, not just conditional convergence[14] – as indeed we would expect, given that the basic endowment in human capital in the region is on a par with Western Europe. Whether the gap has been completely closed as of right now, the top firms in the FDI business aim to bring their CEE subsidiaries up to the productivity levels of Western Europe, or rather onto the dynamic path of those productivity levels, and foresee no serious difficulties in achieving that aim quite quickly. The vision of the managements of those firms with respect to future productivity trends in their subsidiaries in CEE is summed up in Figure 10.

Figure 10. Productivity over time in a foreign investment enterprise



The picture is very different when we turn to transition countries outside CEE. In Romania, for instance, in a low-tech, labour-intensive traditional sector,

> there is a sort of catch-22 situation there. Because the labour is cheap but the factories are fairly primitive, the price of the raw materials is actually higher than in countries like, say, France.

This is the nightmare scenario for any foreign investor – where wages in the host country are low, but productivity is even lower. In this particular case, however, as we shall see later on, the problem did not prove to be insoluble.

The picture is also very different, even within CEE, when we start to talk about suppliers and supply networks, and here the problem turns out to be less tractable.

> In some areas of supply, we simply cannot get the components to the quality and technical specifications that we require. So we have to bring

[14] The absolute convergence theorem posits that all economies will eventually reach the same steady state, where the rate of economic growth is given by the rate of technical progress and the rate of population growth. The conditional convergence theorem allows for different steady states, on the basis that human capital endowments may differ. See Jones, 2002.

these products largely from Western Europe. But not because we want to. We would like to get more involved in the local supply market.

What were the main reasons for getting rid of a local supplier – or for failing to take one on?

Oh, quality, productivity, things like that....

The supplier base is certainly one of the biggest problems in Eastern Europe. We are always trying to solve the problem, for it makes little sense to move things from Western Europe to here and then back again – it's a long way.....

Nothing much has changed here, or very little, unfortunately. Suppliers are in any case international in our branch. I think we have taken on just one Czech supplier. I suppose we have neglected this a bit. But in the mechanical field, for instance making mechanical parts for the housings, which accounts for some 10-15% of our total costs – here it would make sense to get them from Czech firms.

Here the globalisation of supply networks theme is again clearly dominant, but it interacts with another theme, which we might tentatively dub the lack of entrepreneurial vision theme, with the aversion to technological incongruity syndrome, as discussed above, possibly lurking in the background. There are cases from more low-tech sectors where the experience with local supply network building has been more positive.

In terms of third party suppliers, we use many, such as local advertising and design agencies, market research suppliers, accountancy firms, PR advisers, recruitment agencies, office suppliers *etc.*

Regarding packing we use both local suppliers and foreign suppliers. It depends on costs – where can we get it most cheaply. Locals also do maintenance of the plants. We buy spare parts for the machines from two local companies. But in general we buy more and more in Poland and Lithuania because gradually they can produce as well as anyone else.

Even here, however, there are limits to the scope for local supply networking, and these limits are imposed less by lack of entrepreneurial vision as by the absence of the technological capability in the host countries to make a given key supply (in this latter case a type of packaging – low-tech, but with very stringent quality requirements).

That last point brings out the key importance of quality in relation to supply networks. Even in cases where investor-companies have persevered with local suppliers, they are resigned to the persistence of a significant productivity gap, if only because they have to impose (costly) quality inspections on their East European suppliers, whereas quality would be taken on trust in relation to West European suppliers. And this sharp contrast between patterns of main activity productivity and those in ancillary production facilities is, indeed, what we would expect. Our case studies confirm the picture of CEE productivity patterns that we drew earlier on the basis of historical and a priori reasoning. The problem is not one of productivity or productivity potential in main industrial activities, it is a broader problem, a problem of social productivity rather than process productivity as such. We have seen what our leading companies can do about process productivity. Can they make any contribution to the solution of the broader problem?

5.5.3. FDI and human capital formation

Do leading companies help to build social capability through a process of (asset) creation? Each one of our interview companies stressed the importance of training, of upgrading the quality of the human capital stock within their subsidiaries. And they admitted that that human capital stock, once upgraded, was free to move to other companies. But the system of upgrading differs widely between individual companies. In some cases, it takes the form of a highly formalised, in-house education system. One company has a special department at head office which deals with all matters relating to the transfer of know-how and production technology (the key elements of tacit knowledge). But all interviewees stressed the importance of on-the-job training and personnel exchanges (between the lead factory and the subsidiary), and some were scathing about the role of formal training and retraining.

> We had 10,000 men to find work for. They had to make cars, cars that would sell. That's what you have to aim for – always better products, new markets, that is the thing. I tell you, you cannot send 10,000 men back to school. That is simply not possible. And anyway, they would not learn what they need to learn there – assimilating new functions, learning about markets *etc.*...
>
> We train locally and if there's anything that can't be trained locally, the staff will come over to the UK, We try and train people up locally because retailing is local business. And you have to understand your

> local customers - you're not going to be selling a Yorkshire pudding in Warsaw.

At the same time, the companies with more formal training systems stressed that these are available for all levels of personnel, and encompass the whole gamut of production operations.

> People from (the subsidiary in CEE) come and spend a period of time at the lead factory. And they don't just come to follow courses, - they actually work in the factory as well. That includes assembly-line work, so that it includes blue-collar workers as well, right up to the management level – of course with a different orientation.

> First comes skills training, then the emphasis shifts to management development... During the set-up stage a team of specialists is sent over from the UK to set up the business and recruit the core team. This team will stay in the country for a number of months in order to transfer knowledge and directly support the local management team. Once the core team is in place and up to speed, the set-up team returns to the UK. The UK continue to support the countries both remotely and with regular trips to the country as and when appropriate.

Thus training programmes are comprehensive, focusing primarily on the transfer of tacit knowledge, on the transfer of 'things that you cannot buy on the free market'. In some cases, the learning is 'collective', in the sense that personnel from the investing firm and personnel from the subsidiary are learning together about something exogenous that they need to know about – for example EU food hygiene regulations. Even in a low-tech sector in low-wage Romania or low-wage Lithuania, you have to have a training programme, covering every job, even the humblest, because otherwise you cannot control the crucial productivity/wages relationship. And even on that scenario, you have to have a vision of the future, and a strategy for preparing your workers to face new challenges as the company climbs the technological ladder. So training programmes must help to open up channels of asset creation which cannot be expected to develop spontaneously in the process of market-based transformation.

5.5.4. FDI and local educational and R&D facilities

Foreign firms can create assets, not just directly, through measures to upgrade their own human capital stock, but also indirectly, by helping to redevelop local educational and R&D facilities within the CEECs themselves. Clearly these local facilities cannot play a role in the transfer of tacit, within-firm knowledge. Clearly their role in human capital formation must be essentially ancillary. But the interviewees did stress the importance of

local facilities, particularly with regard to the teaching of foreign languages (English and German) and the development of bespoke software. The first point hardly needs further discussion, the second is more interesting. Again, it is confirmed that software development, even for the very particular purposes of a given firm, is not a matter of tacit knowledge. Local suppliers are much cheaper as well as being closer, and their competitive advantage is clear-cut. But deep R&D coooperation between head office and CEE subsidiary does not occur in any of the manufacturing companies we interviewed. One interviewee stated bluntly that the local people simply did not at present have enough know-how for that. But in five years, he went one, it might be different..... Interestingly, but inconclusively, the only unequivocal confirmation among our interviews of the existence of two-way technology transfer came from service sector companies.

In some cases, firms have developed on-going relationships with particular host-country institutions, often universities. And these relationships tend to have a dual significance. On the one hand, much of the sub-contracted software development work goes to university people. On the other hand, the companies use these on-going links as a basis for recruitment of local people into the organisation. There are key individuals who play a central role in this dual process. Thus in one case a head of development within the subsidiary was eventually recruited by the local university as a full-time professor, on the basis of special lectures he had given while still working for the company. Thus company involvement with local education and R&D organisations can lead to multiple forms of human capital enhancement. But these effects remain fundamentally peripheral to the main process of asset creation, which is within the firm. In a number of cases, given the kinds of technology involved, this pattern is perhaps inevitable. But one interviewee noted that his firm cooperated with local universities in the Far East on a large scale, but had not yet developed this in Eastern Europe. It would be dangerous to build too much on one interview, but one can speculate that Far Eastern universities might be seen as more effective partners than their East European counterparts.

5.5.5. Does FDI every help local suppliers to raise their game?

Although all of the companies we interviewed had serious problems with their local suppliers, and all were anxious to resolve these problems, none integrated those suppliers into their own, within-company training and technology transfer programmes. To a degree, the companies sought to solve local supply problems indirectly – by operating with a much smaller number of first-tier suppliers than would be normal within Western Europe, and thus effectively devolving the problem of productivity and quality control to a limited number of first-tier suppliers. More directly, some of the interviewed companies followed an active policy of helping local suppliers to find foreign partners.

This policy was obviously based on the supposition that it is not possible for local CEE suppliers to make it as first-tier suppliers in global terms on their own, a supposition that is supported by other research (Dyker *et al.*, 2003). More specifically, one of the interviewees had a clear vision of their buying department as playing a kind of educational role *vis-à-vis* local suppliers.

> The subsidiary has its own buying department – relatively strong, with 25 people. The process always starts with the identification of suppliers, which are in general terms relevant for us, and which have the technological level we need for our products. So we have here in the buying department clear benchmarks on supplier qualifications, and we will continue to do this. We train people specially in this business of assessing suppliers....

So here is a case of the multinational company setting up a system of training the trainers, enhancing its own human capital stock with a view to helping other firms do the same for their human capital stock – though without taking on any corporate commitment to ensuring the success of the second stage of the process.

All of this is very positive, yet in the end perhaps a little inconsequential. The top firms in the FDI business do not have many ideas about raising the game of local suppliers beyond helping them to sell out to other foreign firms. So the whole cycle stays within the ambit of FDI. The key issue of linkages and spillovers outside the area of FDI remains unresolved. And it is that issue which is crucial in terms of considerations of overall social productivity.

5.5.6. Is the picture any different in the electronics sector?

We interviewed only one 'high-tech' company – from a hardware rather a software sector. Here the limitations of our methodology are starkly revealed. We found no evidence whatsoever to support the Zysman thesis, as outlined above. Rather technology transfer in this case was implemented through 'close contact, and transfer of machines and production process documentation', suggesting that the underlying technology base was embodied primarily in tacit structures and in documentation which may well not have been IPR-protected. In that context, it is not surprising that cost-driven FDI in CEE has been an important strategic element for the firm in question. All that this proves is that the question remains open. And indeed we are unlikely to resolve it unless we interview some high-tech firms which have chosen not to engage in direct investment in the region.

5.5.7. Is the picture any different in the services sector?

With only two service-sector companies in the interview set, we must again be very cautious about generalisation on that sector. It is nevertheless striking that both those companies laid particular stress on the long term in their strategic thinking. This is interesting, not only because they are in sectors which interface directly with the mass consumer, but also because both companies are British. Where systematic comparisons have been made between British firms investing in Eastern Europe and, say, German firms, a strong contrast between British short-termism and Rhenish long-termism has often been remarked (see Barz, 1999). We have certainly not disproved the proposition in the present project, but we have found no evidence to reinforce it.

In relation to training, the two service-sector companies show no significant divergences from the general picture – their commitment to training seems to be at least as strong as that of any of the manufacturing companies. But on local supply networking, the contrast is stark. Where manufacturing firms struggle to procure adequate supplies from local firms, one of our service-sector firms (a retailer) manages to procure over 90% of food supplies for its Polish subsidiary from Polish producers. This may simply be a sectoral peculiarity of the food sector, but in a part of the world where you are never far from an international border, food stores are not compelled to source everything from local producers. In the given case, the company is clearly perfectly happy with the quality of Polish supplies – in a sector where the kinds of technological congruence problems that bedevil manufacturing sectors simply do not arise.

Finally in this section, as noted above, the two service-sector companies are the only ones that explicitly confirm the presence of two-way technology transfer. With one firm in retail and distribution and the other in financial services, there can be no argument that this reflects low levels of competence or know-how on the part of the lead firms. Rather it seems to reflect a high level of fluidity and dynamism in relation to the organisation of these businesses. The two-way technology transfer is almost certainly strictly in the realm of soft technology, which is of overwhelming importance in service sectors. There is, nevertheless, a suspicion that manufacturing companies might learn something from the service sector in relation to cumulative technology transfer (see also Dyker, 1996).

5.5.8. The issue of country specificity

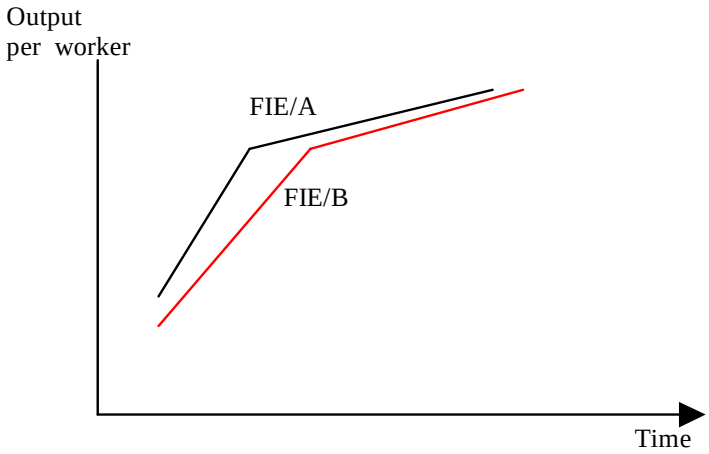
As noted in the last section, the interviews did not always confirm conventional views about the peculiarities of particular countries. More generally, however, country specificity did come through very strongly in our interviews as a factor affecting productivity trends, although we did not explicitly ask about it. As already noted, nearly half our interviewee firms were German. And the subsidiaries involved were mainly in Poland, the Czech Republic and Hungary, with a few also in Romania, Slovakia and the Baltic countries. A number of our interviewees expressed very strong views about differences between different transition countries. 'Since we set up in Poland and the Czech Republic we have been able to refine our new country entry model enormously, although it is a continuous learning curve as no two countries are ever the same.' One interviewee said quite emphatically that the process of unconditional convergence was clear-cut in the case of the Czech Republic alone. Another made the same point in relation to supply networks.

> In relation to the supplier problem, you have to differentiate clearly between countries. In the Czech Republic they are making good progress here. There also we started off with mainly German suppliers, to make the transition as fast and smooth as possible. Since then, however, we have been able to bring in a number of Czech suppliers. The situation is much more problematic in Hungary. The Hungarian supplier industry is not so well developed. Our clients have very stringent requirements, and we still have difficulty in finding Hungarian suppliers who can come up to those requirements.

This statement is clear enough, yet it raises as many questions as it answers. While Hungary has a somewhat lower level of GDP per head than the Czech republic, it has a well-developed engineering industry, and the emergence of Hungary as a major exporter of specialist supplier goods (admittedly largely on the basis of foreign capital) has been one of the notable achievements of transition. So there is little basis at the aggregate level for putting the Czech Republic in a higher league than Hungary. Is the problem that the Hungarian economy is more dualistic than the Czech, so that the difference between the foreign- and domestically-owned sectors is greater? Or is it more of a cultural issue? Should we be looking, not just at country-specific factors, but also at country-pair-specific patterns? Is there something special, perhaps historically conditioned, about the relationship between Germany and the Czech lands, which impinges on the issues we are studying? Can it be argued that cultural congruence is an important element in technological congruence? And if there is, why is that German-Czech technological

congruence seems to be so much stronger on main production lines than in component supply? And when one of our (German) interviewees says (à propos the Czechs) that 'it's still a planned economy: the managers are still different from over here', is he saying something specific about that ethnic/cultural group, or could that statement be applied to any transition country? These are questions which we cannot answer categorically. One general point is, however, worth making. Investing companies are aware of country differences, and adjust their strategic plans accordingly. That may mean slower convergence in the given economic activities for some countries. But it does not affect the basic trend towards convergence (see Figure11.).

Figure 11. Productivity over time with foreign investment and inter-country differences

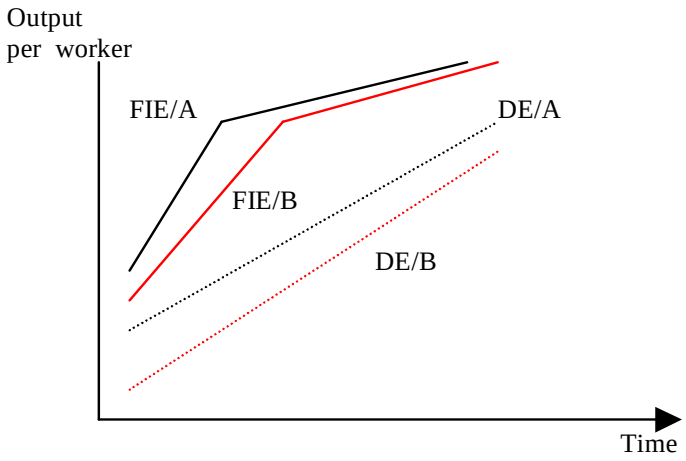


Note: FIE/A = Foreign investment enterprise, Country A

FIE/B = Foreign investment enterprise, Country B

In domestically-owned firms we must presume that there are similar, or even greater inter-country differences in productivity levels. And here there is no mechanism for ironing out those differences. The pattern that is likely to result from this is presented in Figure 12. . Under the impact of FDI, there is a strong tendency to convergence between East and West, and between CEE countries in sectors dominated by FIEs. In the domestically owned sector, by contrast, the productivity gaps between East and West, and between individual CEE countries, persist into the medium-to-long term. Because underlying social capability gaps are bound to narrow over time, and with progressive integration into the EU market, irrespective of the incidence of FDI, convergence in domestically-owned sectors is also ultimately inevitable. But the prospect is banished to the very long run, well beyond the time horizons of business managers, politicians and citizens alike.

Figure 12. Productivity over time, with and without foreign investment, with inter-country differences



FIE/A = Foreign investment enterprise, Country A

FIE/B = Foreign investment enterprise, Country B

DE/A = Domestic enterprise, Country A

DE/B = Domestic enterprise, Country B

The diagram portrays the case where initial levels of productivity are higher for FIEs than than DEs. This corresponds to the reality for most transition countries and most sectors. If we assume, however, that initial levels of productivity are the same in both sectors, or even higher in DEs, the basic analysis is not affected.

5.6. How did we check our results?

In distinction to the other work packages within the project, we have not used formal sampling techniques. The general justification for our essentially inductive approach lies not just in the inherent interest of the anecdotal dimension of case studies, but also in the scope for building theory from the anecdotes.

> While systematic data create the foundation for our theories, it is the anecdotal data that enable us to do the building. Theory building seems to require rich description, the richness that comes from anecdote. We uncover all kinds of relationships in our hard data, but it is only through

> the use of this soft data that we are able to explain them. (Mintzberg, 1979, p.587)

In a nutshell, 'the explanation of quantitative findings and the construction of theory based on those findings will ultimately have to be based on qualitative understanding.' (Meredith, 1998, section 7.3)

At the more specific level, the justification for our approach lies in the experience and outcomes of research on international technology spillovers and linkages.

> Existing estimation techniques simply do not provide sufficient potential for detecting the fundamental relations (that is, whether foreign firms learn from domestic firms, whether domestic firms learn from foreign firms or whether there are mutual advantages from interaction), and should be supplemented with case studies which focus on imitation of technologies, engagement of workers trained by MNEs, the extent of innovation networks and co-operation projects between foreign and local firms, as well as spin-offs in the form of new domestic firms. (Kvinge, 2004, pp.3 & 59).

The results of the interviews have been analysed on the basis of replicative logic, *i.e.* 'the logic of treating a series of cases as a series of experiments with each case serving to confirm or disconfirm the hypothesis' (Eisenhardt, 1989, p.542). The case-study firms cannot be taken to be strictly representative of any larger group, but they can be taken as benchmark firms. Every one is at the leading edge of the technologies used in its sector, and every one is heavily committed, in human and financial terms, to investment in CEE. By studying what they do, we can obtain an understanding of what is possible, an understanding of what might be termed the state of the art in technology transfer through FDI to transition countries. We should add that a number of these firms are very large firms. In those cases, even if ultimately they are only representative of themselves, that in itself carries a good deal of significance.

While case-studies are, in the first instance, by their very nature, stand-alone studies, there are strong arguments for seeking to establish points of comparison with other methodologies and other bodies of empirical evidence. The case-study approach has great merits, but is also prone to serious pitfalls. On the one hand,

> The results of case research can have very high impact. Unconstrained by the rigid limits of questionnaires and models, it can lead to new and creative insights, development of new theory, and have high validity

> with practitioners – the ultimate user of research. (Voss *et al.*, 2002, p.195)

On the other hand,

> People are notoriously poor processors of information. They leap to conclusions based on limited data, they are overly influenced by the vividness or by more elite respondents, or they sometimes inadvertently drop disconfirming evidence. (Eisenhardt, 1989, p.540).

The best way to handle these problems is through a process of triangulation, i.e 'the use and combination of different methods to study the same phenomenon. Such methods can include interviews, questionnaires, direct observations, content analysis of documents, and archival research.' (Voss *et al.*, 2002, p.206). Triangulation is essentially an extension of the primary principle of replication. The most basic form of triangulation is to check case-study insights against quantitative material and analysis which 'can indicate relationships which may not be salient to the researcher. It also can keep researchers from being carried away by vivid, but false, impressions in qualitative data, and it can bolster findings when it corroborates those findings from qualitative evidence.' (Eisenhardt, 1989, p.538) In the present context, the obvious way to pursue that form of triangulation was to check our findings against that of other work packages within the project that used standard quantitative approaches. Another key method of triangulation is literature survey. Where case-study findings conflict with those of the established literature, the explanation may be that the findings are incorrect, or simply idiosyncratic. Either way, the new information generated by the triangulation process is vital. Where case-study findings are in harmony with those of the established literature, the new information is equally vital, because 'it ties together underlying similarities in phenomena normally not associated with each other. The result is often a theory with stronger internal validity, wider generalizability, and higher conceptual level.' (Eisenhardt, 1989, p.544) We have pursued this form of triangulation through a survey of global literature on FDI and technology transfer, including some material from one or two key case-studies from non-transition countries. (See full report for a detailed exegesis of the triangulation exercise.)

5.7. Conclusions

- The experience of FDI in Eastern Europe, as documented through our interviews, provides strong evidence that the East-West productivity gap on main production lines is relatively small, and can be closed quite quickly. That means that, as long as wages in the host countries remain well below West European levels there

should be ample scope for further, profitable investments. The triangulation process has thrown up nothing to contradict this conclusion.

- The implication is that social capability and technological congruence have not been critical problems on these main production lines.

- It should be stressed that these strong conclusions emerge from a set of interviews involving exclusively West-Central European investor-firms and largely East-Central European host countries. It would be dangerous to extend them to the whole transition region. Our global triangulation exercise reinforces this caveat.

- Investor companies have invested massive resources in training programmes, ranging from full-time secondments to on-the-job training, sometimes on site in the host country, sometimes back at headquarters. These programmes have covered blue-collar as well as white-collar workers. This suggests that one of the reasons why social capability has not been a critical problem is simply that it has been seriously addressed by the companies involved. This conclusion is generally confirmed by intra-project triangulation, though other WPs do raise doubts as to whether training is a factor which significantly differentiates one firm from another.

- The positive experience with main-production-line productivity is not matched by performance in relation to ancillary sectors. Investor-firms have generally struggled to build adequate supply networks in the host countries. Where they have persevered, they have done so in the face of a stubborn productivity deficit. Given that lead-company programmes for building social capability have been largely restricted to the in-house dimension this is, perhaps, hardly surprising. There is also a hint that technological congruence problems may be much more stubborn once we move beyond the sphere of Fordist and post-Fordist production lines. Whether that is primarily an effect of fear of technological incongruity on the part of investing firms, or of more objective technological factors, remains unclear. The global literature suggests that the latter factor may be the most important, with the impact of FDI on growth in developing countries strongly and inversely correlated with the size of the 'objective' technology gap between home and host country. Comparison with other work packages within the project confirms our overall conclusion here, but urges caution in relation to its generality. Individual country studies reveal wide differences in precise patterns of linkage, possibly related to differences in underlying resource endowments and related differences in corporate strategy.

- Investor companies have been eager to exploit local training and R&D facilities, but have done so on an essentially casual basis. Teaching of foreign languages and software development are the only two areas where local educational/research expertise is brought in systematically. The implication is that local human capital formation organisations are not playing the role they ought to be playing in the solution of social capability problems in CEE. This is confirmed by intra-project triangulation.

- While investor companies have shown great willingness to help local suppliers to raise their game, they have been short of ideas as to how to actually do it. In practice, help often reduces to simply helping the local supplier to be taken over by another foreign company. This pattern is strongly confirmed by the global literature.

- With strong FDI impacts on productivity trends in FIEs and weak impacts elsewhere, the overall effect of FDI on productivity convergence is likely to be mixed. In FDI target sectors, the tendency to convergence, East-West and inter-country, will be strong. Elsewhere, convergence to West European levels will be slow and difficult, and significant differences between individual East European countries will survive into the long term. This mirrors the global experience.

- The pattern of supply hierarchy in CEE whereby local companies are largely relegated to the status of second- and third-tier suppliers, with first-tier suppliers usually wholly or partly foreign-owned, is not universally reflected in global experience. Indeed, in China the problem is exactly the opposite – domestically owned first-tier suppliers (in this case to the auto industry) are strong, but second- and third-tier suppliers are weak. This in no way invalidates our conclusion on CEE, which is strongly supported by other research on CEE. But it does suggest that patterns of strength and weakness in supply hierarchies may be as much a function of specificities in development paths as of any universal developmental tendency. It is noteworthy that the pattern in Portugal has been more like the East European than the Chinese experience.

- The global experience strongly confirms the case-study results on the importance of two-way technology transfer, or rather on the reverse technology transfer element within that. It does, however, raise serious questions as to whether reverse technology transfer is a positive factor of host country development.

These conclusions are, in a sense, not surprising. It is not surprising that Czech and Hungarian production-line workers can quite easily be brought up to the standards of

German workers, and it is not surprising that companies with shareholders to keep happy are not prepared to take on the job of retraining whole nations. There are, nevertheless, critical problems and gaps in the FDI-driven process of catch-up in Eastern Europe. These problems are as much a function of weaknesses in local infrastructure (especially R&D) as of any shortcomings in the management of major foreign investments. The fact remains that, in the outcome, the countries of Eastern Europe may experience uneven, dualistic development, rather than the smooth convergence to West European levels of development which catch-up theory (in principle) predicts. It is now common in Eastern Europe for levels of productivity and real wages in related sectors to vary by a factor of 2:1 and above, depending on whether the companies in question are foreign- or domestically-owned. This is clearly sub-optimal for the host countries themselves. To the extent that it generates social tensions and ultimately impacts on political stability, it could also significantly change the outlook for further foreign direct investment in this critically important area of the 'new' Europe in ways wholly beyond the control of the firms concerned.

Finally, let us return to the main 'unexpected' result of our interviews. The strategies of the companies we talked to are predominantly global strategies. This does not prove that global strategies are generally dominant among firms investing in CEE, but it does suggest that the global outlook is significantly represented among them. Intra-project triangulation strongly confirms that conclusion.

How is this likely to affect the impact of EU accession on the CEECs? To the extent that multinational investments in the region are cost-driven, and to the extent that enlargement tends to increase real wages in CEE, it will tend to mean a higher degree of onward mobility of investment, which means less FDI in the region. To the extent that the investments are network-building (if, in principle, on a global scale), the removal of frontier barriers and the (putative) improvement of infrastructure, particularly transport, in the new member-states may swing the balance of effectiveness towards pan-European strategies. To the extent that eastwards enlargement unleashes rapid growth in GDP and a boom in consumption in CEE, and to the extent that the new member-states retain significant peculiarities of taste, specifically CEE strategies may emerge – for the first time – in the case of some consumer-oriented companies. In a word, the net impact on levels of FDI could go either way. In that context, we should be that much more cautious about our assessments of the likely overall impact of FDI on productivity in the new member states.

6 Workpackage 6

FIRM-SPECIFIC DETERMINANTS OF THE PRODUCTIVITY GAP: A MATCHED PAIR-APPROACH INVOLVING SELECTED MANUFACTURING FIRMS IN WEST GERMANY, EAST GERMANY AND THREE CEE ECONOMIES

The objective of **workpackage 6** is to pinpoint the most important determinants of labour productivity[15] gaps between Central East European firms and West German firms as a benchmark, *i.e.* we assess firm-specific determinants. West German firms are natural benchmarks for CEE firms: showing on average higher levels of labour productivity, they sell on the same integrated European market and have access to the same technology (in as far as this technology is not firm-specific). In Central East Europe, we focussed on Polish, Hungarian and Czech firms. Additionally, we included East German firms in our panel, because the comparison of CEE firms with firms in East Germany yields a picture of what adjustments and developments would have taken place, if CEE firms would have endured a comparable shock-therapy of instant and complete integration of their markets with the West (in our summaries, we use 'country' as a connotation for East and West Germany to simplify the description of analyses and results). Because the data needed to follow our research-objectives is not available in the necessary form, we had to compile an own firm-specific dataset by way of field study.

The summaries of the contributions from each participant in this workpackage are confined to the most important results including a brief description of methods and concepts applied. The analysis of the data generated was organised in a way that each participant applied a different method using the data from each sub-panel. The comparison of results of each participant hence provides more insight than if all partners would have followed the same method.

Following an introductory chapter on conceptual framework, the design of field work and the questionnaire, as well as the database generated, the representation of these contribution-summaries starts with the analysis of the Czech team: here, methods of firm-performance measurement are tested on our dataset. This analysis yields the identification of efficient firms within each country, size, and industry group. This analysis represents the most aggregate analysis of the four teams, and can serve the workpackage by providing a test of our underlying assumption that we can use the West German firms as a benchmark. Having found sufficient support for this assumption, the

[15] This research again focuses on labour productivity; the efficiency of use of capital has not been assessed, mainly because firms were reluctant to provide that kind of data, and because of difficulties in the valuation of capital stocks.

second representation of results is that of Johannes Stephan. This analysis applies the method of matching pairs with West German firms as benchmark in the same model specifications across all country, size, and industry groups. Whilst testing all firm-specific determinants of observed productivity gaps and whilst it is able to provide an indication of their relative weight in explaining productivity gaps, this analysis is rather restrictive in terms of implying the same structures in all industry, and size-panels. Hence, part three steps back from the explicit use of West German firms as benchmark and focuses its matching analysis to a comparison between the 'best' performing and the 'worst' performing firms of the industry, and size-panels (*i.e.* irrespective of their country of origin). The description of results of workpackage 6 closes with the analysis of the Hungarian team. In a very comprehensive research, their analysis uses a large variety of different multivariate methods including principle component, factor, discriminant, and regression analysis. The team places some particular additional effort in assessing the role and determinant of process and product innovations. In comparison to the benchmark-version of the matched-pair approach, the latter two analyses provides a more general picture of firm-specific determinants of productivity levels amongst the firms we interrogated, and can hence claim more generality.

6.1. The conceptual framework

In our conceptualisation, we follow the typical production-function methodology applied here to the firm level: we assess the determinants of firm-productivity levels, namely capital and labour stocks, human capital, and a variety of additional determinants which are subsumed under the 'technology' catch-all in production functions. Hence, firm-specific productivity gaps typically root either in a rational choice of strategies (*e.g.* the decision to produce with a higher labour intensity, because labour costs are lower: the capital/labour ratio), or root in a lower quality of human capital, or in firms using less advanced technology (or use the same technology less efficiently). We are hence interested in the particular conditions of the production, management, and marketing processes of individual firms.

Previous research into the determinants of the productivity gap between East and West Germany has shown that the so-called 'soft factors', *i.e.* differences in the organisation of production processes and differences in the management of firms (marketing, inadequate market position, networking, *etc.*) account for a large fraction of the productivity gap (see *e.g.* Bellmann/Brussig, 1998; Ragnitz *et al.*, 2000).

The researchers in this workpackage developed a two-group classification of criteria for the questionnaire to make the results accessible for empirical and econometric analysis.

These two groups consist of inputs and outputs. The basic idea of our application of methods is first to identify (the most) efficient input-output-relations (input-output-relations include *e.g.* number of employees and value of capital stock as inputs and total value added as output). Second, input-vectors (explanans) can then be compared with productivity levels (explanandum) to derive a picture of firm-specific determinants of productivity levels (duly sorted in classes of homogenous firms). Third, our analysis yields the identification and ranking of firm-specific determinants of productivity gaps *vis-à-vis* West German firms by comparing the performance of level-determinants between East and West.

6.2. The design of the field work and the questionnaire

The field work was conducted by four country-teams with the German team covering both East and West Germany. We designed a questionnaire and focussed the questions on: the effective, not necessarily formal, qualification of all groups of firm-staff and the intensity of training of staff, on the intensity of strategic planning on behalf of firm managers or owners (as an input-variable); on the intensity of networking with contractors and partners of the firm, on the use of a variety of modern communication technologies, and on one particular management-strategy, namely product specialisation *vs* diversification (as output-variables); and on the management's perception about the intensity of competition, the intensity of use of capital *vis-à-vis* labour, and the intensity of investment (as control-variables). Finally, we cross-tested our results by asking firms to select from a given list their most preferred strategies to increase their own productivity and to cope with intensifying competition. We targeted the construction industry (NACE F) and four manufacturing industries with our questionnaire, namely machinery manufacturers (NACE 290), Furniture manufacturers (NACE 361), Electrotechnical manufacturers (NACE 310), and Cosmetics manufacturers (NACE 245).

Machinery manufacturers are producers of typically non-mass products. Whilst their final products are often not comparable between firms, their production processes are. Hence, the method of matching comparable pairs is viable. Machinery manufacturers often produce a small number of very specified, non-standardised products, tailored to the demands of the customers. This is particularly pronounced in smaller firms. In the new WIFO taxonomy, machinery manufacturers typically employ highly qualified personnel (Peneder 1999, p. 36-37). In terms of competitive management strategies, such industries would typically focus their attention on horizontal integration, and innovation by new technology (Kaniovski/Peneder 2001). Within our sample, firms mainly produce special purpose machinery for *e.g.* packaging, harnessing of material, for printing and publishing, as well as equipment for production lines.

Furniture manufacturers and cosmetics manufacturers typically produce more standardised products, in some cases probably even mass-produced, large-scale products. Firms in the electrotechnical industry are producers of rather mixed products, yet most are also specialised on mass-produced, large-scale products. In those industries, products and production processes are sufficiently comparable to warrant the use of a comparative analysis. Furniture manufacturers are typically considered rather labour intensive with a comparatively less skill-intensive personnel, and typically derive their endogenously created firm-specific advantages from intangible investments into marketing (Peneder 1999, p. 36-37). In terms of their competitive strategy, firms in this industry can be expected to favour innovation by variety, brand creation, as well as vertical integration, either within the firm or via networking (Kaniovski/Peneder 2001). Within our sample, firms mainly produce goods as *e.g.* kitchen furniture, office furniture and other furniture like mainly living room chairs and tables. Cosmetics and electrotechnical firms are more marketing-driven, employ medium-skilled labour (Peneder 1999, p. 36-37), and are characterised by high inputs for retail and advertisement (Kaniovski/Peneder 2001). In our cosmetics sample, the main products are detergents, toilet articles, washing liquid and the like. Our electrotechnical firms are mainly producers of cables and wires, of light-bulbs and lamps, of electrical generators or parts thereof, and of electrical heaters.

6.3. The 'CEE firm-specific productivity determinants database'

In three main waves of collecting data with our questionnaires during 2002 and 2003, we interrogated a very large number of firms across a selection of the countries of our interest. The first year questionnaire asked firms not only to specify their performance for a large selection of inputs and outputs. It also asked firms to assess their own performance for the current year (2001), for 1999 and additionally 1997. This would have allowed us to compare the performance of firms over a longer period of time; for the analysis, this would have allowed us not only to use cross-sectional methods. We also selected a large number of branches and industries to allow our field work to represent a fair share of the economies. This would have granted a larger generality of results. However, the rates of return for all partners were clearly far too low to continue our field work on such a comprehensive scale; we had to focus on a lesser number of questions, referring only to the current year, and on a lesser number of industries. The second and third year field work generated the necessary size of data to meet our objectives and test our hypothesis.

Table 35. Distribution of sample-FIEs according to industry, country/region, and size

	Machinery (NACE 290)			Furniture manufacturers (NACE 361)		
	small firms	**large firms**	**total**	**small firms**	**large firms**	**total**
West Germany	22	20	42	28	25	53
East Germany	22	25	47	29	20	49
Poland	17	23	40	22	20	42
Czech Republic	21	22	43	20	19	39
Hungary	69	35	104	27	21	48
Sum	151	125	276	126	105	231

	Cosmetics manufacturers (NACE 245)			Electrotechnical manuf. (NACE 310)		
	small firms	**large firms**	**total**	**small firms**	**large firms**	**total**
West Germany	20	16	36	17	19	36
East Germany	20	11	31	20	15	35
Poland	25	25	50	28	22	50
Czech Republic	20	19	39	19	24	43
Hungary	13	7	20	57	21	78
Sum	98	78	176	141	101	242

Note: Small firms are such with less than 50 employees, large firms employ at least 51.

In our field work, we additionally collected filled out questionnaires from some construction firms (38), computer retailers (3), meat processing firms (12), transport (logistics) firms (23), textile manufacturers (1), and hotels (15). Because of their low number and because we adjusted the questionnaire, those do not form part of the 'CEE firm-specific database'.

Most of the interrogations were done via the telephone, some firms preferred to fill out the questionnaires on paper. In any case, full confidentiality was guaranteed.[16] In total, we collected data from 925 firms which form the **'CEE firm-specific productivity determinants database'**. We set ourselves a target to collect at least 20 filled out questionnaires in each of the 40 sub-panels (which was impossible in 8 cases) to provide sufficient data for econometric analysis. In general, the rate of return was very low across all samples.

6.4.1.The methods of firm-performance measurement

The Czech team, consisting of Petr Fiala and Josef Jablonský, applied several quantitative modelling frameworks for performance measurement. There are several principles that emerge from suggested performance measurement frameworks. Different perspectives must be considered in contrast to a traditional single focus on *e.g.* financial performance. Many authors have suggested including non-financial measures in production performance measurement systems, in order to control for the correct implementation of the production strategy with respect to all competitive priorities. But the use of non-financial performance measures makes it difficult to assess and compare the overall effectiveness of each decision making unit in terms of support provided to the achievement of the production strategy, since to this aim it is necessary to integrate performance measures expressed in heterogeneous measurement units. The first step into analysis by the Czech team was a descriptive analysis which yields an impression of what indicators might serve as determinants for the productivity gaps at the firm level. This analysis was focused on averages, standard deviations, and correlation coefficients. Next, the general production functions methodology was used to estimate the impact of different determinants on the productivity of firms.

Finally, the Czech team based most of its effort on applying performance evaluation models based on data envelopment analysis (DEA) and multi-criteria analysis. The DEA encompasses a variety of models and methods to evaluating performance. In this analysis, we consider n decision making units U_1, U_2, …, U_n. Each of them produces r outputs and for their producing spent m different inputs. Let us denote $X_j = \{x_{ij}, i=1,2,\ldots,m\}$ the inputs and outputs for decision making unit U_j a similarly $Y_j = \{y_{ij}, i=1,2,\ldots,r\}$ the outputs for U_j. X is the (m x n) matrix of inputs and Y the (r x n) matrix of outputs. The efficiency of the decision making unit U_0 is given by the ratio

[16] In the cases where firms had several establishments, we asked interview partners to answer from the perspective of their immediate establishment only.

$$\frac{\text{weighted sum of outputs}}{\text{weighted sum of inputs}} = \frac{\sum_i u_i y_{i0}}{\sum_j v_j x_{j0}}$$

The formulation of DEA models consists in the maximization of the above ratio under the conditions the efficiency of all other units being less or equal to 1. The modification of the standard CCR model is the model known as BCC model. These two models belongs to the most often used DEA models.

Multicriteria evaluation methods compare firms by their value of inputs and outputs as performance criteria. There are many multi-criteria methods and most of them use weights as subjective preference information. The methods use an exogenously specified set of weights. The aim of the multi-criteria analysis can be the selection of the set of "good" firms, the selection of the best firm, or a ranking of all the firms.

Multicriteria analysis methods are introduced to meet various judgments of firms, branches, and countries. The general formulation of multicriteria decision problem can be expressed by the criterion matrix as follows:

$$\begin{array}{c} \\ a_1 \\ a_2 \\ \vdots \\ a_p \end{array} \begin{array}{c} \begin{array}{cccc} f_1 & f_2 & \dots & f_k \end{array} \\ \begin{bmatrix} y_{11} & y_{12} & \cdots & y_{1k} \\ y_{21} & y_{22} & \cdots & y_{2k} \\ \vdots & & \ddots & \vdots \\ y_{p1} & y_{p2} & \cdots & y_{pk} \end{bmatrix} \end{array}$$

where A = $\{a_1,a_2,...,a_p\}$ is the set of decision alternatives and F = $\{f_1, f_2,..., f_k\}$ are the criteria. The elements of the criterion matrix y_{ij}, i=1,2,...,p, j=1,2,...,k, express the evaluation of alternatives. In our problem formulation the alternatives can be firms and the criteria are inputs and outputs.

There are many multicriteria methods based on different assumptions and approaches. The methods can be classified upon different forms of preference information on attributes and alternatives. The different preference information can vary from aspiration level, ordinal, cardinal to marginal rate of substitution. The methods 'weighted sum approach (WSA) and PROMETHEE were used in our evaluation of firms.

In the WSA, the decision maker assigns a set of importance weights to the attributes w = $(w_1,w_2,..., w_k)$. Then the most preferred alternative a^0 is selected such that

$$a^0 = \left\{ a_i \middle| \max \sum_{j=1}^{k} w_j y_{ij} \right\}$$

where y_{ij} is the outcome of the i - th alternative about the j - the attribute with numerically comparable scale.

The PROMETHEE class methods use preference functions expressing the measure of preference of one alternative for another for the criterion. This method offers six types of preference functions for the user to choose. The complete ranking of all the alternatives is obtained by their descending ordering according to so called net-flow values.

6.4.2. The main results of the Czech team

The DEA provides a comparison of firms, branches or countries by efficient scores. Their summarisation based on the results of the CCR and BCC model is given in following two tables (results are based on the whole set of firms – all the firms from all the branches were evaluated simultaneously). The computed weights by the DEA approach can specify the most important determinants of productivity.

Table 36. Average efficiency scores of firms given by CCR model

Branch	CZ	GE	GW	HU	PL
Furniture/large	0.2384	0.4026	0.5915	0.1212	0.1906
Furniture/small	0.2610	0.4389	0.4689	0.0994	0.3911
Furniture/all	*0.2500*	*0.4242*	*0.5265*	*0.1086*	*0.2956*
Investment/large	0.1818	0.4545	0.6694	0.1625	0.2687
Investment small	0.1860	0.5072	0.5936	0.2456	0.3644
Investment/all	*0.1838*	*0.4792*	*0.6297*	*0.2207*	*0.3094*
Country	0.2161	0.4533	0.5741	0.1877	0.3023

Table 37. Average efficiency scores of firms given by BCC model

Branch	CZ	GE	GW	HU	PL
Furniture/large	0.2463	0.4593	0.7115	0.1296	0.3097
Furniture/small	0.2933	0.5298	0.5525	0.1752	0.7216
Furniture/all	0.2704	0.5013	0.6271	0.1561	0.5255
Investment/large	0.2046	0.5107	0.7588	0.1727	0.4355
Investment small	0.2032	0.5712	0.6789	0.2991	0.4338
Investment/all	0.2039	0.5390	0.7170	0.2612	0.4348
Country	0.2364	0.5212	0.6686	0.2303	0.4812

Tables 36. and 37. show that the higher efficiency score were given for GW (Germany West) firms. This domination was stronger for large firms. The further results demonstrate very good results for GE (Germany East) firms and poor efficiency for Czech and Hungarian firms. Of course, the tables show only the average results and there are several Czech or Hungarian firms with very high efficiency level but the number of such firms is very small in comparison to firms from Germany. The results of the models are not surprising – only the higher efficiency of Polish firms comparing to the Czech and Hungarian ones can be difficult explained. Probably the original data sets and their credibility can be discussed.

Table 38. Average efficiency scores of firms given by BCC model - 4 inputs and turnover as one output -

Branch	CZ	GE	GW	HU	PL
Cosmetics/large	0.6289	0.8547	0.7305	0.7511	0.7640
Cosmetics/small	0.5913	0.7990	0.7818	0.7940	0.7558
Electrotechnical/large	0.4494	0.6503	0.6413	0.5825	0.5932
Electrotechnical/small	0.4979	0.5748	0.5390	0.4349	0.4972

Tables 38. and 39. show similar results for the second wave of analysis (cosmetics and electrotechnical firms). Comparing to previous result the efficiency scores are much higher, because the firms from different branches were evaluated separately.

Table 39. Average efficiency scores of firms given by CCR model - 8 inputs and turnover as one output -

Branch	CZ	GE	GW	HU	PL
Cosmetics/large	0.3439	0.6618	0.6780	0.4687	0.5379
Cosmetics/small	0.5643	0.7539	0.7503	0.4321	0.4130
Electrotechnical/large	0.2532	0.4980	0.6340	0.1416	0.2991
Electrotechnical/small	0.4583	0.6818	0.6750	0.3227	0.4613

As in the first wave of analysis the results show the dominance of Germany firms. In this case the results are almost the same for GE and GW firms. The worse efficiency was given again for Czech and especially Hungarian firms.

Multicriteria methods were applied especially in the first year of the project because they can compare the firms only and it is not possible to identify by them the sources of inefficiencies as the DEA models can.

Results provided by multicriteria methods can compare firms, branches and countries. We used the WSA and PROMEETHE methods for comparison of countries and branches. The methods use the weights for aggregation of factors. The weights express the importance of determinants for total productivity. The summarisation of results by countries and several branches are given in tables 40.. and 41.

Table 40. Country summarisation of the WSA and PROMETHEE results

Country	Total # of firms	Average utility (WSA)	Average util. (Promethee)
CZ	42	0.615	0.352
GE	16	0.642	0.424
GW	23	0.670	0.419
HU	17	0.619	0.352
PL	15	0.593	0.343

Table 41. Branch summarisation of the WSA and PROMETHEE results

Branch	Total # of firms	Average utility (WSA)	Average util. (Promethee)
Construction	38	0.646	0.406
Computers	3	0.572	0.337
Furniture	21	0.612	0.350
Hotels	15	0.639	0.361
Meat	12	0.674	0.419
Transport	23	0.585	0.331
Textile	1	0.712	0.510
Total	113	0.628	0.375

The results in tables for multicriteria analysis confirm the findings from DEA analysis. The average best efficiency was found out for Germany (West and East) firms. Among branches the most efficient is again meet industry and building (except textile industry but there is only one firm).

6.5. The matched-pair approach with West German firms as benchmark

The method used by Johannes Stephan is an application of the matched-pair approach. The method of 'matching pairs' originates from clinical surveys in which treatment effects are controlled for by use of a non-treatment control group. It is a non-parametric approach which allows us to analyse field data without prior assumptions on functional distributions. For a description of the method, and an early application for British and German manufacturers, see *e.g.*, Daly/Hitchens/Wagner (1985). The matched-pair method can either group several pairs of firms from the West and the East to test the set of hypothesis. This, however, would necessitate a careful selection of firms to be assessed in deep-level interviews. The results largely depend on the selection of firms. We therefore decided to rather spread our field work as wide as possible within selected industrial branches, so as to reduce the selection-bias on results. Even if, strictly speaking, results are methodologically not generalizeable, they do offer valuable insight into the firm-level conditions within the selected manufacturing branches. So long as our sample of firms, on average, achieves a productivity gap comparable with the one for the whole industrial branch, our results can claim some weight. In any case, an assessment of all firms is impossible even in selected industrial branches, as such data is simply not collected by statistical offices.

Our matched pair analysis proceeds in four steps: we first test whether the shape of the candidate determinant is positively correlated with the productivity level between all firms in one panel (East and West of one product and size group). A statistically significant positive correlation would tell us that the candidate is in fact a good firm-specific determinant of the productivity level. What remains to be assessed in the second step is the distribution of the shape of determinant between firms in the West and in the East. In case the Eastern firms are in fact weaker with respect to this determinant candidate, we positively tested this candidate as a firm-specific determinant of the productivity gap between the Western and Eastern firms within our samples. The correlation analysis hence tells us which factors are in fact determinants of productivity gaps within the different sub-samples of industry and firm size and between the individual Eastern country-samples and West Germany. The method, however, does not take into considerations the interactions between the different determinants: to determine the ranking order of determinants and to compare the respective relevance of determinants across our sub-samples, we use a linear regression analysis with productivity levels as dependent and a set of determinants as explanatory variables. We finally test whether the variable in fact takes a lower shape in our Eastern panels.

6.5.1. Results of the matched-pair approach

We tested a set of nine hypothesis: (1) Intensity of use of capital *vis-à-vis* labour as a control variable. Do managers in firms where labour is relatively cheaper than in the benchmark region substitute capital by labour, hence deliberately and in conformity with market conditions choose a more labour-intensive production technology resulting in a lower level of labour productivity? If we were to establish this, then the labour productivity gap between East and West Germany should not be perceived as a deficiency but rather as a management strategy. (2) Product specialisation: the decision on the scope of products is firm-specific and we expect firms with a narrow line of products (*i.e.* strong concentration) to enjoy specialisation benefits. This does not necessarily equal with higher profits or sustainability on the market, however, as diversification can be a method of risk-reduction in case of demand-shocks. (3) Extent of qualification of personnel (higher formal qualification or extraordinary work experience). Staff was categorised in two groups (management, administration and workers). Whilst it goes without saying that the level of efficiency of the firm will tend to increase with the relevant qualification of its staff, we are interested in the respective relevance of the two categories. (4) Intensity of training of personnel. We assume that not only the improvement of qualification profiles will affect productivity levels positively. We also expect that such a personnel policy will develop a heightened consideration of individual qualification profiles and hence result in more efficient allocation of labour to the heterogeneous tasks in the firm and improved quality of selection in the procurement of new staff. (5) Intensity of investment into fixed assets. We assume that with investment outlays assuming a large share of total costs, firms strive to reap efficiency benefits stemming from complementarities between the use of capital and labour. Of course, investment activities of firms not only reflect the firms' attempts to increase production efficiency, but also the necessity to replace or renovate outdated machinery or buildings. The typically discontinuous character of investment at the firm level demands particular care when assessing this determinant. (6) Intensity of product innovations. Innovative products grant the firm a monopolistic 'head-start' on the market. With prices being higher, nominal productivity can likewise be higher. (7) Intensity of strategic planning by the management, *i.e.* the share of time invested by firms' managers to strategic planning. We assume that the ability of firm managers to think strategically, *e.g.* if firms have a sufficient degree of division of labour to allow managers to reflect on future opportunities in a strategic manner, will typically improve the firms' performance. (8) Intensity of networking with suppliers, customers and other stake-holders. Networking was further specified as contractual relationships with a history of at least two years. Firms balance inner-firm coordination costs with transaction costs in their relations with

other firms (*e.g.* contracts). A high intensity of networking allows firms not only to reduce transaction costs, but also to sharpen division of labour within the firm and with networking partners. Specialisation advantages can be assumed to translate into productivity increases. (9) Intensity of use of modern communication technologies, in particular Email, internet, and e-business. In order to efficiently network, partners can make use of modern communications technologies. We assume firms that use such technologies more intensively to also benefit more from the advantages of networking - hence also to achieve higher levels of productivity.

From the characterisation of main features of these industries presented in the introduction to this workpackage, we expect firms in all industries to particularly benefit in terms of productivity levels from a highly specialised product-strategy (hypothesis 1). Highly qualified personnel could be expected to make a difference in particular for the machinery manufacturers and less so for the other industries (hypothesis 2). In the machinery and electrotechnical groups, we expect firms to benefit from upgrading of obsolete fixed assets (hypothesis 3). In the machinery group additionally from intense product innovation (hypothesis 4). In all firms, we expect the "soft" management variables of strategic planning (hypothesis 5), intense networking (hypothesis 6), and the use of modern technologies for communication (hypothesis 7) to play a relevant role in explaining productivity levels and gaps.

We test those hypothesis by our four-step application of the matched-pair approach. The results of the first two steps are depicted graphically in the table "Results of Spearman rank-correlation analysis and comparison of averages: performing firms-specific determinants". Two kinds of positive results are represented: empty dots where the candidate determinant proved to be a significant determinant of productivity levels; full dots where the determinant of productivity levels also performs as a firm-specific determinant of productivity gaps. Here, the average size of the determinant in East is in fact lower than in West Germany.

Table 42. Results of Spearman rank-correlation analysis and comparison of averages: performing firms-specific determinants

	Machinery								Furniture								Cosmetics								Electrotechnical							
	large				small				large				small				large				small				large				small			
	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H
1 Control variable								●		●												●		●		●		●		●	●	●
2 Specialisation				●	●							●		●					●				●						○			
3 Qualification																																
3a Qual. management	○				○				○				●														●					
3b Qual. workers	○				●				●		●		●				●		●								●		●	●	●	
4 Training																																
4a Trai. management	●	●	●	●		●	●	●	●	●	●	●		●	●	●						●		●		●				●	●	●
4b Trai. workers																	●	○			○	●		●	●	●			●	●	●	●
5 Investment		○		●		●	●			●		●			●	●							●	●						●	●	
6 Innovations		●	●	●													○								○				●	○		●
7 Strategic planning	●	●	●	●	●	●	●	●		●	●			●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●	●	●
8 Networking intensity																																

8a Netw. suppliers	●	●			●	●		●	●	●			●	●	○	●	○	●		●	●	●	●		●	●	●	●	●	●	●	●
8b Netw. customers	●	●			●	●			●	●			●	●	●	●	○		●	●	○	●	●	●	●	●	●	●	●	●	●	●
8c Netw. stake-holders	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
9 Communication tech.																																
9a Email	●	●		●	●	●		●	●	●		●	●	●	●	●	●	●		●	○	●		●	●	●	●		●	●	●	●
9b Internet	●	●		●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	○	●	●	●	○	●	●		●	●	●	●
9c E-business	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●

Notes: Small firms are such with less than 50 employees, large firms employ at least 51.

E...East Germany; P...Poland; C...Czech Republic; H...Hungary.

Training of personnel did not distinguish between "management and administration" in the panels of machinery and furniture.

○ denotes a significant Spearman-rank correlation with the correct sign between the determinant and productivity levels within the group (hence interpretable as determinant of productivity levels).

● denotes additionally a gap for the average Eastern firms *vis-à-vis* the average over West German firms (hence interpretable as firm-specific determinant of productivity gaps).

Table 43. Results of regression analysis and comparison of averages: the ranking order of firms-specific determinants (composite indicators)

	Machinery								**Furniture**								**Cosmetics**								**Electrotechnical**							
	large				small				large				small				large				small				large				small			
	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H	EG	P	C	H
1 Control variable																	27.3	28.5	31.8	32.7					14.5	26.2	26.2	26.2	0.8	29.0	28.7	29.4
2 Specialisation									*-3.0*	2.1	*-2.9*	14.6									6.6	3.4	8.2	3.1	*-4.8*	2.4	2.8	*-3.2*				
3 Qualification																																
3a Qual. management																					*-0.1*	*-0.1*	0.7	*-3.5*								
3b Qual. workers									1.7	*-1.1*	2.0	0.4																	4.5	9.7	7.9	*-3.4*
4 Training																																
4a Trai. management	0.7	2.4	1.6	3.8	0.1	1.9	2.4	0.2	2.3	4.2	2.2	5.3																				
4b Trai. workers																													0.9	1.4	1.2	1.6
5 Investment	*-8.*	9.5	*-1*	7.2	0.4	11.	10.	1.6	*-1*	23.	*-9.*	2.9	3.0	*-1*	22.	15.	0.7	17.	17.	*-1*	*-1.*	8.1	5.6	9.5	6.4	8.7	12.	12.	*-6.*	11.	12.	8.2

	9		*2.3*			5	6		*4.4*	3	*2*			*0.6*	5	6		2	4	*0.4*	*3*						3	8	*1*	4	5	
6 Innovations	0.9	2.7	3.1	3.3																												
7 Strategic planning	0.3	10.4	12.2	13.6	8.0	33.0	23.0	23.8	0.4	3.4	3.0	2.0					0.9	2.1	2.1	3.0	10.9	37.0	30.0	29.1	2.2	16.9	11.5	13.2	1.6	17.1	15.2	13.3
8 Networking intensity	0.3	2.3	0.1	1.2	0.7	3.9	0.3	1.9					1.8	6.1	1.0	2.9					0.2	4.5	2.4	1.6					0.5	3.7	2.1	1.7
9 Communication tech.	2.1	8.6	3.2	6.3					0.9	4.2	0.5	2.7	2.7	10.9	3.9	8.0	1.2	6.4	1.8	3.4					0.9	18.5	4.5	2.6				
Regression: R^2 adj.		0.55				0.33				0.46				0.50				0.39				0.79				0.67				0.71		
DW		1.85				0.86				1.29				1.63				1.07				1.66				1.41				0.99		
n		89				104				70				68				35				48				44				55		

Notes: Small firms are such with less than 50 employees, large firms employ at least 51. E...East Germany; P...Poland; C...Czech Republic; H...Hungary.

The composite indicators are calculated as regression coefficients times the gaps in performing determinants: the higher the coefficient (elasticity) and/or the gap, the higher is the composite indicator, interpreted as the more important the firm-specific determinant. Negative values result from the Eastern panel exhibiting a lower value of the determinant even if the regression sign was positive. Counter-intuitive regression signs are not reported here, and occurred only in the human capital proxies of qualification of personnel. Regression models were estimated for all large or small industry groups individually (a total of 8 different regression models). The regression model for small machinery firms is not as robust as the other regressions: the Durbin-Watson and Q-statistics tests suggest some heteroscedasticity problems. Test of normality of residuals, however, confirmed the regression model.

The most obvious result is that across all country-pairs and all industries, the use of modern communication technologies proved to perform most often as firm-specific determinant. This in the decreasing order of use of e-business, internet and e-mail. The second most frequent group pertains to the intensity of networking, with regularly contracting over at least two years, with stake-holders of the firm being more often a performing determinant than networking with customers or suppliers. Next, strategic planning turned out to be a relevant determinant of gaps, followed by training of personnel and in particular of workers, and then the intensity of investment. Notably, the level of qualification of management and administrative staff turned out to often negatively correlated with productivity levels, a result that was also obtained in other studies on a comparison between East and West Germany. It roots mainly in East German entrepreneurs having a high level of formal qualification in technical fields which, however, prove to be of less relevance as compared to marketing and management expertise.

Intensity of innovations only turned out to be significant as firm-specific determinant of productivity gaps in a few cases. The diversification *vs* specialisation issue also produced significant results only in few cases and, noteworthy, in all but one case with a negative sign, suggesting that concentration on a fewer number of products is positively associated with productivity levels in all but the electrotechnical industry.

Finally, the control variable, here defined as the correlation between "labour costs per employment" and either the "rate of automatisation" in the machinery and furniture panels, or "value of fixed assets per employment" in the cosmetics and electrotechnical panels suggests only in very few cases and mostly amongst electrotechnical firms, that lower labour costs triggered substitution of relatively more expensive capital with labour. Only in these cases is some of the productivity gap accountable to a rational strategic decision of the managers.

To discriminate between the performing firm-specific determinants and in order to infer the ranking order within industry and country-groups, we test regression models and compare country-averages in the two final steps in our analysis. In total, eight regression models were estimated: one for each of the two size groups and for each of the four industries. This adheres to the concept of matching pairs: we sought a common model for *e.g.* all small machinery firms, regardless of their country or region of origin (this obviously implies that in the regression analysis, we must not control for country-differences). A composite indicator is developed by multiplying the regression-coefficients and the gaps in determinants for each of the 40 sub-samples: the higher the regression

coefficient (duly interpreted as elasticity, because the data was used in logarithmic form) and/or the higher the gap, the more important is the firm-specific determinant. Only in this framework of analysis are we able to test our hypothesis. The results are represented in the table "Results of regression analysis and comparison of averages: the ranking order of firms-specific determinants (composite indicators)".

The first set of results pertains to the kind of determinants that turned out to be significant in the size-and industry-specific regression models: the control variable, here defined as an interaction terms between labour costs per employment and either one of the two capital intensity measures, positively tested for substitution of labour in only three cases, namely amongst both size-groups of electrotechnical manufacturers and large cosmetic manufacturers. In all other samples, productivity gaps have nothing to do with a strategic decision of firms to exploit the comparative advantage of lower levels of wages. Investment intensity could be included as significant regressor in all eight models and typically ranks very high in terms of regression coefficient. Second, strategic planning turned out to significantly explain productivity levels in all but one model with elasticities reaching 0.45. Intensities of networking and the intensity of use of modern technologies (both averaged to reduce the number of regressors) were significant both in five of eight cases, however, with lower coefficients. All human capital proxies and the specialisation vs diversification issue are significant explanatory variables in a lesser number of industrial and size-panels and with lower coefficients. Surprisingly, the intensity of product innovations turned out to be significant only in the regression model for large machinery firms. This, however, might be due to the difficult definition of innovations and hence their comparison between firms. These results compare well with the results from the correlation analysis, the remaining differences are due to interaction between the determinants and due to the fact that in the regression analysis, not all firms could be included due to missing values in at least one of the regressors.

Not all of the hypotheses tested positively in terms of constituting a significant determinant for productivity gaps. We expected all four panels to particularly benefit in terms of productivity levels from following a highly specialised product strategy (hypothesis 1). This, however, was only true for large Polish and Hungarian furniture manufacturers, for all small cosmetics manufacturers, and for large Polish and Czech electrotechnical manufacturers. We expected in hypothesis 2 that human capital would play a particularly important role in the group of machinery manufacturers: in fact, qualification of personnel did neither perform in the correlation analysis, not could we establish a significant coefficient in the regression. Even though, training of personnel did turn out to be important, and also more so than for the cosmetics and electrotechnical manufacturers, however, not any more than for the furniture industry. Hypothesis 3

assumed that investment was particularly important for the machinery and electrotechnical industry. Whilst this might be true for more mature market economies, the performance of furniture and cosmetics manufacturers in transition economies depends not less on investment. Hypothesis 4 on product innovations in particular in the machinery industry tested positively: only amongst large machinery manufacturers could we establish a significant regression coefficient, innovations are most important for the large Hungarian and Czech machinery manufacturers, a bit less for the Polish ones, and even much less for the East German ones. Hypothesis 5, 6 and 7 were targeted at the "soft" management variables: strategic planning turned out to be of very high importance both to explain productivity levels within groups and productivity gaps *vis-à-vis* West German firms. This is particularly pronounced in small machinery firms and small cosmetic firms, and to a lesser degree in small and large electrotechnical firms and large machinery firms. Noteworthy, in all groups, this determinant played a lesser role for East German firms. In terms of the hypothesis 6, the intensity of networking is important in a large number of groups, yet to a lesser extent: composite indicators range between 0.1 and 6.1. For the use of modern communication technologies, composite indicators are much higher and range up to 18.5.

In general, the intensity of investment, of strategic planning, of long-term contractual networking, and of the use of modern communication technologies turned out to be good determinants of both productivity levels and productivity gaps for most of the industries and size-groups assessed here.

6.5.2. Firm-specific strategies

Finally, we asked firms in the cosmetics and electrotechnical manufacturing industries to specify which of the proposed strategies they prefer to:

lxii)t o improve productivity levels in their own firm, and

lxiii) to cope with intensifying competition.

The analysis has been conducted by comparing percentages of all firms stating that the named strategy is important. The analysis was conducted within, and is comparable across country, size, and industry-specific panels. The presentation of results follows in the form of figures (Figures 13 to 18)).

Figure 13. Machinery manufacturers

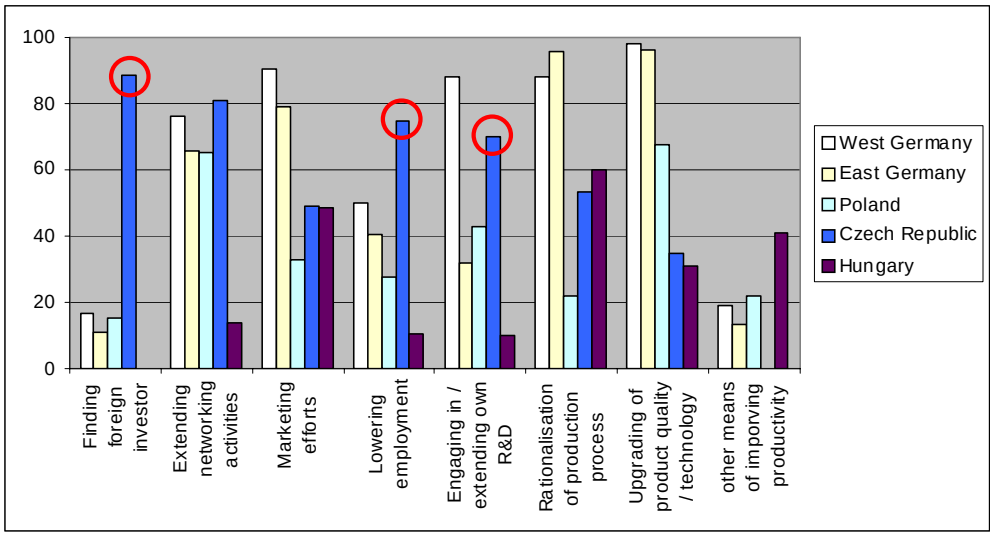
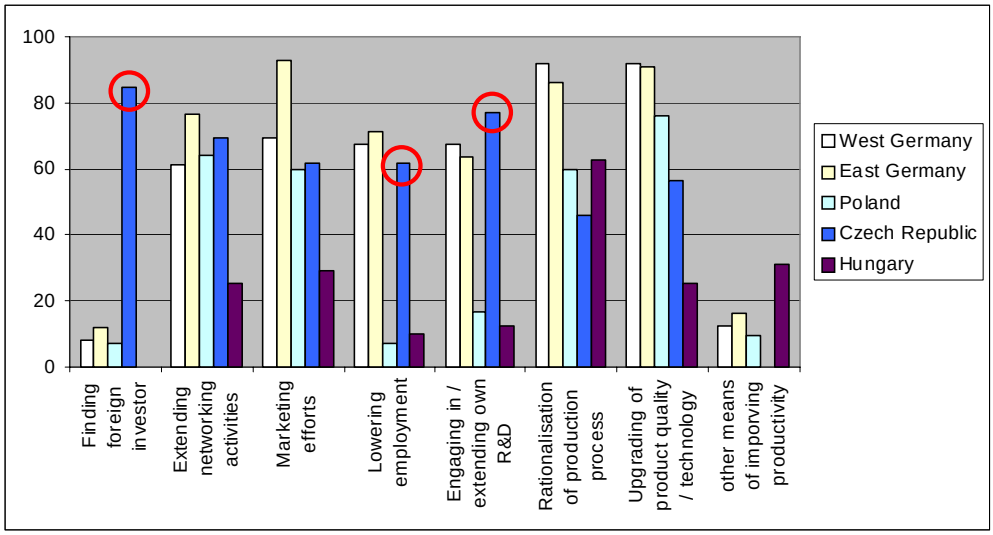


Figure 14. Furniture manufacturers



The first, most important results is that our questions appear to have covered most of the strategies relevant to firms: the control-group of "other means" is sufficiently low. Second, another obvious result is that the answers can neither be grouped homogenously across manufacturing industries or across size-groups. Rather, common structures emerge at the country-level: East and West German firms seem to prefer quite similar strategies, only with respect to "engaging in/extending own R&D" appear to exist significantly different views, even if only amongst machinery manufacturers. We would have expected that the well-established financing-gap might well have produced a clearer distinction here. Additionally, East and West German answers appear to be closer to each other than to any CEEC.

Figure 15. Cosmetic products manufacturers

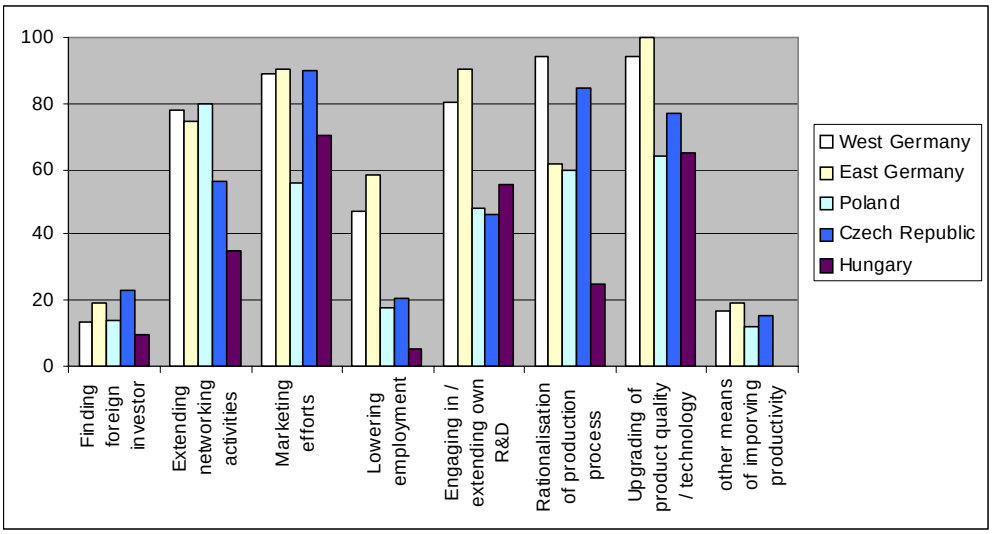
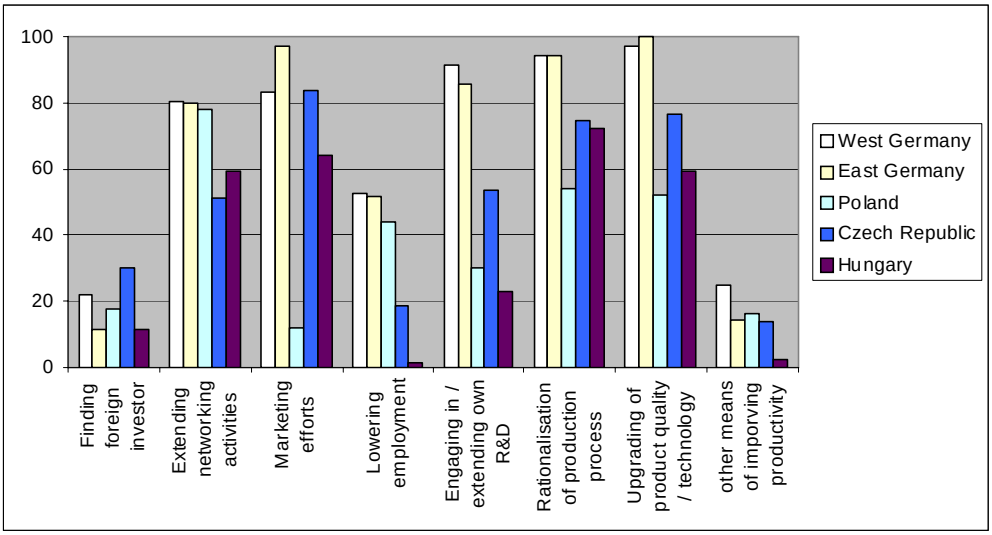


Figure 16. Electrotechnical products manufacturers



Across all samples, the recognition that a given strategy is important is highest for networking; here, in particular the Hungarian firms, show a larger gap (mainly in machinery and furniture manufacturing). Additionally, we identified recognition-gaps in Hungary for 'own R&D'. The largest gaps, however, can be observed for Poland, and mainly amongst marketing in the cosmetics industry. In comparison to East and West Germany, the largest gaps are identified for the Czech firms in general (this view is further strengthened by the question-mark we have to put to the rather difficult to motivate results marked with red circles in the figures).

Across all industry, size, and country-groups, the most preferred strategy to improve productivity levels are positive and active strategies (not including "finding a foreign investor" or "lowering employment"), but rather feature networking and marketing

activities, production-process-rationalisation, product quality issues. Interestingly, "finding a foreign investor" did not turn out to be a widely preferred strategy despite the potential technology transfer (which may be due to a large number of firms already having a foreign investor).

With respect to firms' strategies to sustain intensifying competition, East and West German firms are clearly under the pressure of high labour costs (or *vice-versa* in competition with lower labour (unit) costs in Central East Europe). In the distinction between unit labour costs and wage levels, a strategy favouring innovations would equally better competitive positions by increasing productivity. This, however, was not the preferred strategy in either parts of Germany.

Figure 17. Cosmetic products manufacturers

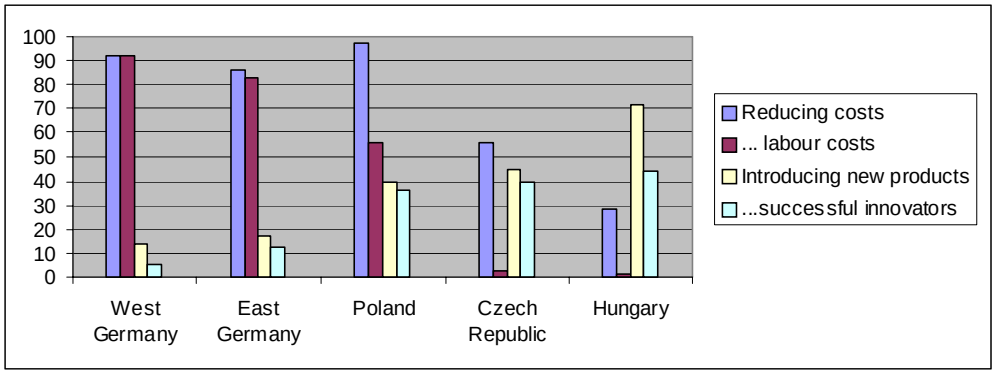
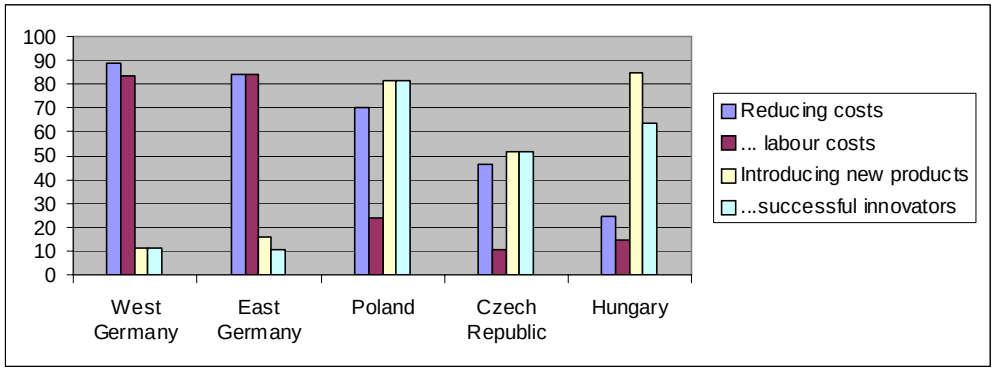


Figure 18. Electrotechnical products manufacturers



Here, the Czech Republic and Hungary appear to be more inventive in their strategies; Poland is somehow stuck in the middle without a clear preference between costs and innovation, even if labour costs do not seem to play an important role here either. In fact, the Polish and the Czech firms (and large Hungarian firms) were largely successful in producing innovations. In a comparison between size-groups, again no significant differences emerged.

6.6. The method of the matched-pair analysis between industry, and size-specific 'better' and 'worse' firms

The analysis of the Polish team, consisting of Malgorzata Jakubiak and Anna Wziątek-Kubiak, centres around the matched-pair method. It divides the size, and industry panels into the 'better' performing and the 'worse' performing firms (with the criterion being firms' apparent productivity levels), irrespective of their country of origin. This method is more general than the prior specification of the matched-pair analysis with an explicit and pre-determined benchmark. Additionally, the Polish team applied a cluster analysis endogenously classifying all firms of the cosmetics industry.

The surveyed branches include the construction industry (interrogated during the first year), the furniture and machinery industries (second year), and the electronics and cosmetics industries (third year). Some more effort in research was invested into the analysis of the cosmetics industry, because this sample proved to be much more homogenous than all other samples, and the most robust results are expected here.

6.6.1.The main results of the Polish team

The results of the analysis of comparison between the better and the less well performing firms can be summarised in mainly six points listed below.

lxiv) In a first step in the analysis, we compared firms from the new member states to such in Germany (East plus West). The objective of this exercise is to identify the main reasons for lower levels of firm-level productivity.

- We find an extremely high differentiation in productivity levels among firms in the large and small samples, much larger differences indeed than between the two samples. This can be explained by the process of shaping the market structure in the new member states, which is a major part of their transition. The productivity gap between firms in the 'worse' sub-samples of the new member states including Germany was far greater than in the case of the 'better' firms' sub-samples. The major problem of the new member states is hence not the lack of highly productive firms but the continued operation of many very low productive firms (the so-called 'long tail'). This means that the market selection process among the firms in the surveyed countries will still have to eliminate the least efficient firms in the three new member states in the future.

- Further, we found very a low productivity level of the small firms' samples for the new member states *vis-à-vis* comparable firms in Germany. In

particular, productivity levels of the 'better' sub-samples of small firms of the new member states was still lower than those of Germany's 'worse' sub-sample. Since the investment rate of the former was much lower than that of the latter, we expect a continuation of the process of deep and wide selection and the squeezing out of small firms in the new member states.

- Large firms in the new member states produce comparable products, serve mass markets and are highly productive. The most productive were Polish firms and the least were their Czech and Hungarian counterparts. In-depth analysis of 'worse' firms' sub-samples shows that Polish and German firms will likely move up the productivity ladder. This indicates increasing competition between the Polish and German surveyed firms from today's 'better' and 'worse' sub-samples, and increasing competitive pressure on Czech and Hungarian firms.

- Firms in the new member states produce more labour intensive and share a higher intensity of work per employee than the German firms. The lesser role played by R&D in the competitive strategies of these firms indicates that they will focus on a low technology type of production.

- Especially in Polish firms, we found a very low capital intensity and a low investment rate. This implies low substitution of labour by capital, in contrast to German firms' strategy.

- Again especially in Poland, we identified exhausting possibilities to lower employment in the firms' attempts to increase productivity.

- Amongst the firms from the new member states, we found a lower share of managers' daily time spent on strategic planning, which indicates to us a less stable business environment (rather than *e.g.* management deficiencies as suggested by the interpretation by Johannes Stephan).

- Finally, we identify an extremely low intensity of use of modern communications technologies amongst Polish firms.

lxv) The following more specific conclusions for firms are based on a comparison between the 'better' and 'worse' firms' sub-samples, irrespective of their country or origin. Lower productive firms are characterized by lower fixed capital intensity and a lower investment rate, higher unit labour costs, a lower share of employees improving qualifications, and a lesser intensity of the use of modern communication technologies.

lxvi) Our research furthermore indicates that the higher the productivity, the lower the role of fixed capital intensity and unit labour costs. It was shown in the clustering analysis that in spite of the "hard" determinants of productivity (like labour costs and investment), achieving higher productivity is also a question of sets of other, more 'soft', factors related to good management. These include: the ability to compete by being innovative and at the same time securing long-term contracts with clients, and being up-to-date with modern communications technologies. Moreover, the correct assessment of a firm's strength and weaknesses helps very much in the efficient use of factors of production.

lxvii) The clustering analysis also confirmed that small and large firms from the cosmetics industry operating in the three new member states and in Germany have indeed different productivity determinants and face different constraints. While it is possible that the productivity of the small firms was influenced by factors not accounted for in the survey, the results obtained for large firms are straightforward. Clustering analysis performed on the group of large cosmetics firms shows that low labour costs are still a competitive advantage in the new member states, especially in the Czech Republic and Poland. If coupled with adequate investment and wise management, they can lead to higher labour productivity than in the West German firms.

lxviii) The firm-level analysis also shows that small firms are more aware of their business environment and more adequately assess their own competitive strategies than large enterprises. Views about ways to improve productivity among the group of large enterprises are more blurred and only the most productive large firms evaluate correctly what they should do in order to be more productive.

lxix) There exist differences in productivity performance of rural and urban firms, irrespective of whether they are large or small or whether they are from CEE or Germany. Firms located in urban areas – which enjoy better infrastructure, better access to a qualified labour force and modern technologies – are much more productive. In addition, smaller firms located in urban areas have productivity levels no different from the levels of large enterprises.

6.7. The methods of the Hungarian team's multivariate analyses

The Hungarian team, consisting of Ilona Cserháti and Tibor Takács, examined the collected data on the selected industries by a variety of different multivariate statistical methods. The objective of this analysis is to identify the areas in which firms in the new member countries still have some way to go in terms of catching up. The firms of the machinery, electrotechnical, cosmetics, and furniture industries formed part of the analysis, because here, the number of observation units for analysis (*i.e.* firms) was large enough to warrant the use of more sophisticated econometric methods.

Before applying their multivariate methods, the team examined the dataset by descriptive statistics in order to get a general picture of the information and to filter the outliers and unreliable information[17]. As a first multivariate analysis, the team ranked all interrogated firms by creating a complex indicator that is able to reflect all or most of the information gathered about the firms. This complex indicator was constructed in two steps, first using a more subjective method of ranking weighted means, second by applying the principal component analysis and factor analysis. Because the resulting ranks can be considered to be of an interval scale and not only of the ordinary scale, the analysis to is able to use a larger selection of econometric methods.

The second multivariate method applied to the dataset is the cluster analysis. The firms can be clustered either by their original values of variables or by the factor scores resulting from the factor analysis; also different types of distances can be considered in the cluster analysis. In the case of the 'CEE firm-specific database', we can identify 'natural groups' of firms, *i.e.* firms belonging to different countries, size-groups, and to different industries. Third, the discriminant analysis identifies the variables that are most characteristic for these groups. Forth, some (linear and non-linear) regression models have been tested by use of stepwise, forward, backward, *etc.* specifications. As regressors, either the original variables and/or the principal components (or factors) were used.

We were particularly interested in the role and performance of innovation in our dataset. The team hence finally examined firms in selected industries with respect to the determinants of product and process innovation. Since the innovation activity has been measured by the number of new products/processes, this was an integer variable. The

[17] In this particular analysis, not only firms were filtered but also indicators, because some of the questions were not formulated in sufficiently unambiguous manner, or they contained too many subjective elements which could have distorted the analysis.

stochastic effects on such a type of variables can be examined by probit or logit regression models.

6.7.1. The main results of the multivariate analyses

In the case of four industries field work generated enough information to warrant a meaningful and robust mathematical statistical analysis. This analysis covered therefore furniture manufacturing, machinery manufacturing, the cosmetics, and the electrotechnical industry. There are several companies in these industries in all the examined countries, and the productivity gap in these industries seemed to be relevant.

Furniture manufacturers

In the case of large companies the productivity advantage of the West German ones is very characteristic. The results of the factor analysis showed that there have been three main groups of indicators that explain the difference. The main indicators of productivity appeared in the first factor together with innovation and the unit labour cost (UCL). This underlined the role of the innovation and highlighted the typically positive correlation between wages and productivity levels. Companies employing highly qualified workers with relatively higher wages also tend to be more productive. The importance of qualification was highlighted by the fact that the qualification indices had the highest scores in the second factor, which we could call therefore the factor of qualification. It was somehow surprising to observe that the qualification of physical workers is more important than that of the management.[18] The third factor could be interpreted as the one of networking. The firms have been ranked according to the factor scores for each factor. Normally, the scores in the first factor are accepted a complex indicator of the examined phenomenon, *i.e.* of the productivity in our case. The rank according to the first factor showed the dominance of the West and East German firms. This means that the gap between (East and West) German firms almost disappeared in this group of companies. The Polish companies had the lowest values in this list. The ranking has been made also for the second factor. In this rank list, the Polish firm assumed better positions.

The clustering of companies reaffirmed the above results. The firms have been clustered according to the factor scores and according to the original (but standardised) variables.

[18] Research on East Germany suggests that this effect might be due to high formal qualification levels amongst managers which, however, are more of a technical kind and not necessarily match the demands in a competitive market economy.

The two methods yielded similar results. Filtering the outliers, the separation of the East and West German companies was apparent.

In the case of small companies of this industry, the results are similar. The factors could be interpreted similarly. The only difference was that also the indices of e-business appeared in the first factor with high scores. This underlines the importance of use of IT in the smaller companies. The second factor in this group was again determined by the indices of qualification, and the qualification of workers was again more important that that of the management. The ranking according to the first factor was a bit different from that observed in the group of large firms. Several West German companies could be found in the top ten again, but instead of East German ones, some Czech companies appeared here. This might suggest that the productivity gap among smaller companies of this industry is not that large. A sharp polarisation could be observed among Polish firms, while the Hungarian ones appeared typically in the second half of the rank list. In the ranking according to the second factor, the Polish firms have not reached such good positions than in the group of larger companies.

The clustering showed that the distance between smaller (East and West) German firms and other companies is not so large than that observed for larger companies.

Machinery manufacturers

The results for the machinery manufacturers were rather similar to those observed in the furniture manufacturing. The results were even more characteristic. The first two factors in the group of larger companies could be interpreted similarly. This might suggests that the qualification plays an important role in all industries. The fact was highlighted again that the qualification of physical workers and of the administrative personnel is not less than that of the management. When ranking firms according to the first factor, the West German firms occurred again in the top ten. The Polish companies proved to be the less developed again. Generally, the polarisation of the observation units is more characteristic than in the furniture manufacturing. Among the firms of the Central and Easter European countries, the position of the Czech companies are relatively the best, but these companies are rather evenly distributed after the German ones. The heterogeneity of this group might explain this phenomenon.

The results of the cluster analysis in general reaffirmed the above results, but the East German firms are distributed between the clusters of the West German ones and of the rest.

The group of smaller companies showed only a different factor structure. Here the qualification also appeared as an independent factor, but this is only the third. The second one is the factor of networking. The first one can be interpreted in the same way, but the indices of the use of IT are distributed between the first two factors. It could be observed in the ranking that the scale is broader, *i.e.* the interval is larger between the lowest and the highest score. The West German firms are the best again. There are still three Hungarian firms among the best ones, but other Hungarian appeared only in the lower part of the list. This shows that even within a country there can be sharp differences, especially among the smallest firms. The East German and the Czech companies proved to be average, and the Polish ones could be found typically in the second half of the list.

The cluster analysis by factor scores and by standardised original variables showed a slightly different picture. In the first case, the German firms and the rest have been separated in two characteristic groups. In the second case, the Czech ones seemed to be closer to the cluster of the German firms.

Electrotechnical industry

In the third round of the project we used a slightly different questionnaire to examine the productivity in the electrotechnical and in the cosmetics sector. Some new information was requested primarily on the infrastructure (accessibility by transport, *etc.*). Since the provided information seemed to be rather uncertain, we filtered some of the information on the basis of the correlation matrix; the statistical analysis was conducted only for the rest of the information.

Now we ranked again the observation units (firms). Firstly, we determined the classical index of productivity (*i.e.* value added divided by the number of employees), and we compared it with the ranking list according to the first factor. We find that in these two industries the factors could not be so clearly interpreted than in the case of the previous two industries.

In the case of the large electrotechnical companies, the results of the two rankings are very similar. There are eight German companies in the top 10 and five German companies in the bottom 10 of the two lists. In general one can observe that the advantage of large West German is comparable to the advantage in the case of small companies, while the less productive firms are mainly Hungarian. In the rank-list according to productivity levels, all German companies are in the upper third, and the West German firms are ranked higher than the East German ones. Less than one fifth of the Hungarian companies can be found in the first half. 33 *per cent* of the Czech and 58

per cent of the Polish companies are in the first half. The situation is similar in the case of the second rank-list. This means that unlike Hungarian companies, the Polish and Czech ones have already begun to catch up, while the Hungarian companies might preserve their disadvantage.

The cluster analysis did not provide any astonishing result. It just showed that the German firms belong into a separate group. This, however shows that there is no wide gap between East and West German firms. Most of the other firms could be found in one group, except for the Czech ones. This might suggest that they have the lowest disadvantage.

Since one of the main focuses of the project was to compare the productivity of earlier West German and Central and Eastern European companies, we first examined two characteristic groups in the discriminant analysis. We considered consequently two characteristic groups first (West Germans and others), and determined the most characteristic variables from the examined ones. In the group of the larger electrotechnical firms, the most characteristic indices were productivity levels, turnover per total costs, and labour costs per employees.

We also would have liked to know if there were other characteristic variables, if five groups corresponding to the examined countries were considered. In this case, the most typical indices were the qualification of workers, personnel training, and the intensity of use of e-mail.

Also a regression analysis has been performed to identify the relative effects of the different indices and the factors on productivity levels. When the original variables were considered as regressors, unit labour costs, value of fixed assets, long-term contracts with the suppliers, and accessibility by railway seemed to have a relevant effect on the productivity level. This was reaffirmed also by the factor regression.

Regarding the small electrotechnical companies, the group of the top 10 are similar: there are five German companies that can be found among the best in both list. However, the bottom 10 are different. When companies have been ranked according to the factor score, mainly Polish companies – one third of all Polish companies – got to this group. This might suggest that although these companies reached a relatively good productivity value in the examined year, the other factors of productivity are not favourable, which may have a negative effect on their productivity in the future. The opposite might be true for almost one third of the Czech companies. In the top, the advantage of West German firms is unambiguous. 60 *per cent* of them can be found in the top 10 of both lists. All German (East and West) companies are in the upper third,

when the companies are ranked according to the productivity index. The West German companies are typically better than the East German ones. Only about one third of the Hungarian and Czech companies can be found in the first half of this list. If one considers the rank-list of factor scores, it is found that most of German companies stay in the upper half. The Hungarian ones are ranked relatively better, since 60 *per cent* of them are in the first half.

The result of the cluster analysis was similar in this group to that of the larger firms. The disadvantage of the Central and Eastern European firms was however even more apparent.

When two groups were considered, the discriminant analysis identified productivity levels, labour costs per employees, and fixed assets per employees as the most group-creating indices. In the case of five groups, the most characteristic indices were the level of qualification, long-term contracts, and the intensity of use of e-mail.

The regression analysis in this group showed that unit labour costs, the training of personnel, and again the accessibility of railway transport had the largest effects. The factor regression also underlined the role of railway transportation facilities and in this latter examination, the qualification levels also played an important role.

Cosmetics industry

The most astonishing result in the ranking emerged in the case of large cosmetics companies. As it was mentioned above, the small Polish firms have obvious disadvantages in this industry. According to our results, the opposite is true among large companies. In both lists, about one third of Polish companies can be found in the top 10, and one third of them got into the first half. However, we also found Polish firms in the bottom 10. This means that in Poland, this industry might have a dual character. Some large companies have already reached or even exceeded the productivity level of the Western companies, while several – mostly small ones – cannot catch up. Also the Czech companies show such a division. The Hungarian companies are not so different, and their productivity level is average. In the productivity rank-list 62 *per cent* of Polish companies are in the first half, while only less than one third of the Hungarian ones can be found here. There were only four West German companies in the sample, three of them got into the first half. The productivity of the East German companies proved to be average. In the rank-list of factor scores, their position is worse.

The cluster analysis supported the conclusions drawn from the ranking analysis. Here, the West and East German companies are not unambiguously separated. On the

contrary, Polish companies form a separate group owing to their high productivity. The Hungarian and Czech ones are rather evenly distributed.

In the case of two groups, the discriminant analysis identified the following characteristic indices: turnover per total costs, and unit labour costs. In the case of five groups, the only characteristic index was the intensity of use of e-mail.

Also for the cosmetics industry, both the usual and the factor regression were applied. Unit labour costs, the intensity of use of e-mail, and railway-indicator proved to be the most relevant indices. The factor regression pointed out the effect of the qualification level as well.

In the case of small cosmetics companies, the advantage of German companies is apparent, too, and the top and bottom 10 is very similar in the two lists. 86 *per cent* of East Germans and 67 *per cent* of West Germans are in the top 10 of the productivity index. In the sample were only three West German companies, but all of them can be found here in both lists. Only a couple of Czech companies reached the productivity level of the German ones. In general, all of the German companies are in the upper third of the rank. 60 *per cent* of the Czech companies can be found in the first half of the productivity rank-list, while only 9 *per cent* of the Hungarian ones are ranked here. The disadvantage of the Polish firms are apparent. When the companies are ranked according to factor scores, the bottom 10 consists of only Polish firms. In this second list, the Hungarian companies reached somehow better results.

When clustering firms, the West and East German companies are together separated from the others. In this case, most of the Czech and Hungarian form one group. The majority of Polish companies got into a separate group. This supports the result of the ranking according to factor scores, which showed an unambiguous disadvantage for the Polish small cosmetics companies.

When the discriminant analysis was made for the case of two groups, the group-creating indices were productivity levels and unit labour costs. In the case of five groups, the selected indices were intensity of competition, fixed assets per employees, intensity of long-term contracting, and the e-mail use.

Both, the factor and the usual regression, showed the important effect of the unit labour costs and the qualification level.

Innovation

We examined the relation of innovation and other indices in the selected industries. This has been done by testing a logit model. It was observed that the use of IT had the most important effect. The other important factor is the human capital stock. In this analysis, the firm size did not prove to be very important, but its coefficient was certainly positive.

7. Workpackage 7

PRE-ACCESSION, STRUCTURAL AND COHESION POLICIES IN LIGHT OF THE ACQUIS COMMUNAUTAIRE AND THE DETERMINANTS OF THE PRODUCTIVITY GAP

The research in this workpackage was conducted by Peter Holmes, Xavier Lopez-Gonzalez, Johannes Stephan, and Cordula Stolberg. The objectives of research in **workpackages 7** include firstly an assessment of pre-accession policies and the terms of EU accession with a view on their effects on (productivity) catch-up. Those include in particular:

lxx) pre-accession policies (Europe agreements, PHARE, ISPA, SAPARD)

lxxi) the terms of EU accession (acquis communautaire in a selection of negotiation chapters, accession treaty)

In a second step, analysis is focussed upon:

lxxii) the installation of 'institutional framework conditions' in CEECs

lxxiii) on the design of EU industrial and enterprise policy in light of the particular economic situations pertaining in the new member states, and finally

lxxiv) the compatibility of EU competition policy with the conditions of economic development in CEECs.

Policy-frameworks before and after accession are assessed against the background of the results generated in other workpackages, *i.e.* against their likely effects on the (potentials for) productivity determinants. This analysis hence yields possibilities for sound alterations and extensions to policies on both sides (EU and CEECs) as well as to structural fund and cohesion policy to thereby provide the necessary sound basis for policy making geared towards meeting the conditions of swift economic catch-up development in CEECs in general and the closure of the productivity gap in particular. This workpackage is therefore the focal point of one of the two main objectives of the

whole research project, in particular to assist the formulation of an efficient and effective management of the enlargement and integration process in respect to economic policy. The implicit objective of this workpackage as an economic policy extract of the whole research project is to provide the necessary knowledge base for a more pronounced consideration of factors of technological convergence as necessary supplement to the contemporary bias of enlargement agenda on institutional convergence.

The "Europe Agreements", concluded between the EU and new member states, as well as the white paper of the EU Commission on the "Preparation of the Associated Countries of Central and Eastern Europe for Integration into the Internal Market of the EU" from May 1995 spelled out the institutional conditions that had to be met by new member states prior to their joining the ESM. Those conditions were less than those required of full members in the acquis communautaire to the extent that they are focussed on what the Commission considers to be relevant for the internal market only. Yet, those conditions were at the same time more than was required of full members in as much as new member states were asked for full legislative implementation whereas contemporary full members can still get away in some cases with at least temporary derogations and selective postponement of implementation of legislation.

It is to be expected not least from the East German example that integration into the ESM of transition economies does not *per se* guarantee swift and automatic convergence of per capita income levels, and hence the closure of the productivity gap. Where this automatism does not set in, some well targeted economic policy could accelerate or even prove to be necessary to foster economic catch-up. Supportive political measures could improve the conditions for the weaker new member states to close the productivity gap. The German experience also tells that vast financial transfers targeted at mainly social welfare systems but also used for infrastructural investment cannot induce a process of self-sustained economic growth, let alone catch up development.

The EU has endorsed the objective to assist the whole of the EU economy to improve industrial competitiveness with a particular focus on knowledge, innovation, and entrepreneurship. The instruments targeted at these objectives include mainly competition policy and enterprise policy.

In the framework of EU structural and cohesion policy, the EU has set itself the objective to assist a swift process of real economy catching up in less advanced regions of the Union. With the integration of CEECs, the main focus for EU cohesion policy will rest with its new member states.

Focussing on the conditions for real economy catch-up in the new member states in CEE, the aim is to assess the current design of EU policy intervention. To verify the efficiency and effectiveness of policies for our focus, a clear picture of the reasons for lower levels of real economy competitiveness in CEE is needed. In this respect, we can make use of the results generated in the research project on the determinants of productivity gaps between West Europe and a selection of candidate countries in CEE.

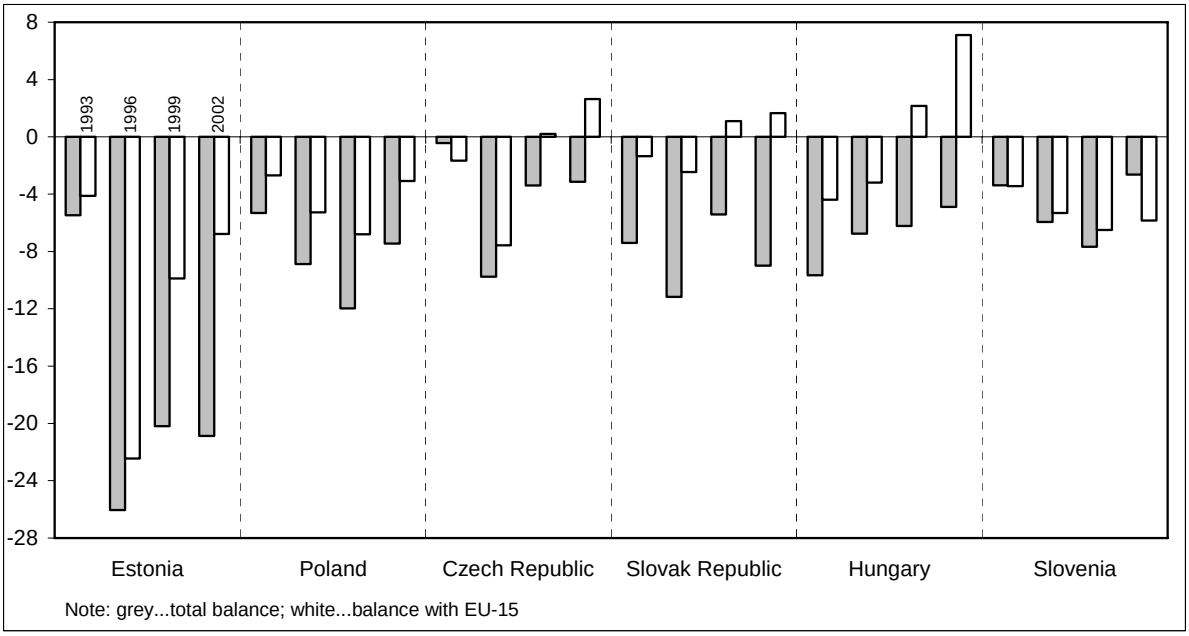
7.1. The Europe-Agreements and trade liberalisation

The Europe-Agreements were concluded between the EU and new member states in the early 1990s. With a view on improving the conditions for a process of swift catch-up development in the new member states, the agreements in particular offered some budgetary means for structural policy, the SAPARD and ISPA funds.

In addition, the Europe Agreements stipulated the terms of respective trade liberalisation between the EU and individual new member states. Amongst the most prominent features, the agreements aimed at an asymmetric speed of reduction of tariffs and quota: the EU would open its borders faster than would the new member states be required to do. The main idea behind this was of course to offer the new member states the possibility to establish themselves on the new markets in the West following the demise of the CMEA-market. In macro-economic terms, export surpluses would provide the needed supply of foreign (and hard) currency (without constant devaluation of national currencies and increasing foreign indebtedness), and help to meet obligations arising from foreign debts (or even help reducing them). Hence, export surpluses could help much needed macroeconomic stabilisation which, at the time, was approached by way of currency overvaluation (by pegging exchange rates in a framework of positive inflation differentials) and high real interest rates.

In reality, however, significant deficits in foreign trade with the EU emerged right from the outset of transition (see chart 8.). This, however, is not what constitutes improving conditions for catching up. But: with the demise of CMEA-trade and with the opening of borders to the West, all transition economies experienced vastly increasing imports from all possible western origins. In particular, trade deficits *vis-à-vis* the EU turned out to be smaller than total deficits, indicating some of the positive effects of asymmetric trade liberalisation with the EU. So, if negative trade balances are a typical particularity for transition economies (large development gaps, demise of CMEA-trade and redirection of trade towards the West), then preferential trade agreements with the EU did result in lower deficits with the EU.

Chart 8. Trade balances of transition countries with the EU-15 and total balances



Source: WIIW, National Statistical Offices, own calculations.

7.2. Theoretical foundations of economic policy interventions

The aim of this part is to briefly assess the theoretical foundations that underlie EU's concept for policy interventions. To provide sound economic policy recommendations it is necessary to determine the political goals and to assess -from the point of view of market mechanisms- what policies are efficient to promote the designated political goal.

The overriding aim of EU policy intervention can be characterised by the so-called 'Lisbon strategy' which entails that the Union become 'the most dynamic and competitive knowledge economy'. More precisely, today's EU policy interventions include two sub-aims: enterprise growth and innovation in all Europe on the one hand and reduction of economic disparities between economic regions on the other. From an economic point of view, we are prompted to question whether those two sub-aims are in fact compatible in terms of policy-instruments or whether achieving one aim is likely to compromise the other aim.

In general, we can distinguish between two schools of thought with respect to the overriding aim of the Lisbon strategy. Differing predictions on the effects of economic integration follow from different theoretical concepts:

lxxv)one group assumes that technology, being exogenous, is freely available across the integrated economic area. Hence, less advanced regions either catch up with higher growth rates by using freely available and more advanced foreign technology (absolute convergence), or are able to catch up conditional on the ability to absorb and implement the foreign technology in their own production (weak convergence). While the supply of technology is exogenous, differences in development levels are endogenous, and depend on the respective endowments of regions with immobile factors. European integration itself (*i.e.* the deepening and enlargement of the European single market as well as the introduction of a common currency) is sufficient to secure both convergence of levels of economic development within the common market via trade and competition and a higher level of economic development for the whole region via a more efficient allocation of scarce resources.

The implications for economic policy in this convergence hypothesis involve the promotion of unrestricted trade and mobility of factors. With a view on less developed regions this concept would suggest reducing the barriers to the exploitation of more advanced and foreign technology but no specific intervention into market mechanisms.

The policy implications to be derived from the other school of though are quite distinct from this:

lxxvi) a second group assumes increasing returns to scale in the aggregate (decreasing long-term cost curves) and beneficial externalities at the micro level, technology is endogenous and localised. With deepening integration, the most productive factors will tend to flow toward the more favourable regions which offer higher returns and hence improve the allocation of scarce resources; agglomerations will benefit from integration whereas disadvantaged peripheries might well fall further behind. In the strong case of this non-convergence story, the existence of a sufficiently large development gap causes divergence, whereas in the weaker version, convergence can only set in if a minimum regional-specific threshold level of economic development has been achieved (below which private investment cannot yield the rate of return required by the market). Hence European integration secures the higher level of economic development via reallocation of scarce resources to their most efficient use, but benefits are not necessarily distributed equally across regions.

In terms of economic policy, regional concentration by liberalisation of trade and movement of factors within the integration area is the optimal policy (efficiency-

argument). However, more regional concentration might violate the second objective of the Lisbon agenda, if deepening integration results in an uneven distribution of agglomerations between European regions. With reduction of economic disparities between economic regions being an explicit European goal, the non-convergence concepts might justify policy intervention.

This, however, raises two questions: first, a political decision has to be taken on the character of the reduction of economic disparities, *i.e.* whether convergence of per capital GDP via relatively higher growth in lagging regions is the aim, or whether the establishment of equal economic welfare is to be achieved. Whereas the former case would justify policy intervention to reduce the gap or to achieve the minimum required level in regions with insufficient agglomerations, the optimal policy for an equalisation of welfare between regions could best be served by allowing the maximum level of efficiency via concentrations and a surrogate redistribution of generated income to lagging regions in the form of transfers. In the case of the EU, we can assume that for regional policy the former character of convergence is preferred.

The second question pertains to the definition of regions for which the aim of convergence is postulated: if the sizes of regions are too divergent, if population densities are very heterogeneous between regions, if endowments with natural resources are too different, and if the territorial size of a region is too small to assume a meaningful relationship between the activities taking place in the region and what is reported by statistics (take *e.g.* larger agglomerations with central functions), then expecting economic convergence is implausible. In the context of EU regional policy, the so-called NUTS2 regions have been defined as the geographical level at which inequalities should be measured, yet some of the regions are too divergent in their underlying potentials to serve as meaningful regions for economic convergence (see *e.g.* Boldrin/Canova, 2001).

From the design of EU cohesion policy and from public statements in support of policy interventions, we may derive that the theoretical foundation is deducted from the concept of possible non-convergence and that regional policy does take the form of compromising overall economic efficiency for inter-regional equality. However, empirical analysis of effects of regional policy alone on economic convergence (in particular income levels) are rather sceptical (*ibid*.). Some of the evidence suggests that interaction between economic integration (foremost trade liberalisation), macro policy, micro policy and institutional reform, and EU policy intervention may be important (Pischke, 2001).[19] Moreover, cohesion policy has lately received a 'Lisbon agenda makeover' (see the

[19] Clearly, EU assistance in establishing infrastructure remains undoubtedly a positive-effect story.

speech of Commissioner Barnier to the enlarged presidency of the Parliament on 18 February 2004): the proposed re-nationalisation of large parts of cohesion policy to some degree dilutes the potential conflict between the two sub-aims. This allows us to assess EU structural and cohesion policy in the broader framework of policy interventions in general.[20]

7.3. The implications of policies aimed at 'institutional framework conditions'

During the phase of membership preparation, the EU placed particular weight on installing the institutional framework in CEE economies. The pre-accession phase was clearly dominated by the installation of community law from the acquis communautaire into the national laws of the new members. However, the German experience shows that institution-building can possibly be considered a necessary condition for catching up but is by far not sufficient for improving the conditions for real economy convergence. Rather, in post-socialist economies, we observe particular conditions which suggest the need for likewise particular policies. The analysis below, especially chapter III. 7.4, suggests that EU policies as planned have the potential to meet those particular needs. Maybe, however, a different weight of policies aimed at increasing skills and know-how, production networks and inter-firm interaction, R&D and innovation, entrepreneurship, infrastructure, *etc.* would promise to be more effective.

This, however, does not mean that setting framework conditions right for fast economic growth and recovery is less important. Rather, next to fulfilling the pre-condition for economic activity under uncertainty, it can play an important role in the particular situation of post-socialist transition economies, and our analysis will focus competition policy as one of such institutional framework. The intuition is that intensifying competition will lead to both, a more efficient allocation of resources, and second to economic activity to be more innovative. In fact, analysis in other workpackages (in particular WP 6) could indicate that one important reason for aggregate productivity gaps lies in the existence of a 'long tail' of less and least efficient firms. Their exiting the market and thereby freeing resources so far still bound in inefficient use, could free the way to a more efficient allocation of these resources. In reality, freed resources can either be soaked up by growing efficient firms, could engage into own entrepreneurial activity (Schumpeter), or might also in the worst of cases remain unemployed and

[20] None-the-less, this trade-off still persists at the level of member states. With a view on this trade-off, a recent competitiveness report suggests that European regional policy should embrace a stronger focus on promoting knowledge and innovations in the weaker regions. Otherwise, the gap between the most and least competitive regions in Europe threatens to grow even wider (European Competitiveness Index 2004).

eventually become obsolete. With respect to economic policy, there are possibilities to prevent such a worst case scenario, and we will frequently return to such policies, if from different points of departure.

7.4. The design of EU industrial policy in light of the particular conditions pertaining in CEE economies

Industrial policy is essentially under the competence of the member states. The role of the EU in EU industrial policy is therefore confined to the 'open method of co-ordination', in which the Commission serves as something like a conductor of discussions, policy developments and improvements. In the framework of the Lisbon agenda, the discussion pertaining to EU industrial policy centres around industrial competitiveness: knowledge, innovation and entrepreneurship are held to be the three key factors (see COM(2002) 714). The overarching 'philosophy' for EU policies can be summarised as:

> "...the Lisbon goal calls for policies that establish an environment conducive to enterprise growth and innovation while ensuring that the market players are subject to uniform rules. Enterprise policy focuses on the first objective, while competition policy emphasises the second. But both policies contribute to high and sustainable productivity growth" (COM(2002) 262, p. 14).

More specific, the assessment of individual instruments of EU industrial policies suggests the predominance of three important characteristic features:

lxxvii) policy intervention can only compensate (where necessary) for market failure (enterprise policy) or protect/safeguard the market (competition policy);

lxxviii) enterprise policy and competition policy are to work complementary (COM(2002) 262). Potential areas of conflict, as *e.g.* cooperation in R&D and innovation are dealt with specifically in the EU competition policy, in our example in the form of technology transfer block exemptions;

lxxix) industrial policy is strictly confined to a horizontal approach. Hence the *leitmotiv* of 'framework conditions'. This concept originates from the definition of the broad principles of EU industrial policy in 1990 (see COM(90) 556) and resurfaces throughout the latest publications outlining future EU policy, including policies for CEE economies (*e.g.* COM(2002) 714). Specific interventions aimed at supporting particular firms or sectors of the economy are either ruled out

explicitly or embraced only if aimed at reducing over-capacity (*e.g.* the steel sector).[21]

This conceptualisation of industrial policy appears to offer all possibilities to devise a coherent and effective policy-mix in the new CEE members to thereby assist swift real economy convergence. Of particular importance for the new member states is that none of the instruments in EU industrial policy serve to restrict flexibility: none appear to change market scarcities, prices, and hence send distorted signals to market agents, in particular investors.[22]

For the post-socialist economies, flexibility in the reallocation of resources is a particularly important condition of real economy catch-up (Stephan 2003): because of the historically rooted distortions both in sectoral structures and within industrial firms of post-socialist economies, profound restructuring is a necessary pre-condition for a dynamic process of catch-up development. The contemporary patterns of comparative advantages of those economies are hence also subject to change and it is impossible to determine which comparative advantages will in fact lead the new members into real economy convergence: today, those economies feature lower unit labour costs in industrial production, yet some CEE industries appear to develop particular strengths in capital-intensive and knowledge-driven manufacturing industries. Any policy in support of *e.g.* more standard labour-intensive production would hence intervene unduly into the market and can be expected to be non-sustainable in the medium to long term, or non-economically in the short terms as costs exceed societal benefits.

7.5. Additional EU industrial policy specifically targeted at new members

Some additional policy instruments of EU industrial policy are targeted to the particular needs of new members. Those mainly focus upon improving infrastructure, know-how and skills, and local institutions.

Clearly, investment in infrastructure is well targeted at the specific deficiencies in the region. In fact, the accessibility and quality of transport infrastructure proved to be amongst the firm-specific sources of lower levels of productivity in a comparison of firms from West and East (workpackage 6). Policies aimed at improving know-how and skills of

[21] One prominent exception to this rule, however, is the EU Common Agricultural Policy. We will later stress that in particular this policy can in fact be potentially harmful for the goal of real economy catch-up in some of the CEE member economies.

[22] A possible exception are instruments targeted at improving the access to finance by way of "a wider availability of guarantees" (COM(2000) 771, p. 7). Such policy intervention can easily give rise to adverse motivational effects as moral hazard. Apart from this, however, provision of seed and early stage financing as well as micro-loans have the potential to increase flexibility by assisting the emergence of new firms.

entrepreneurs and workers alike also correspond well to the specific needs of the new members' economies (again workpackage 6). Of course, the level of formal education is comparably high in the new member states, but management deficiencies and a weakness in entrepreneurship are amongst the most important competitive disadvantages in CEE. The EU plans to focus policy in this field on "creating an environment conducive to entrepreneurship, skills upgrading and SME development" (COM 2002) 714, p. 28). Further measures include "supporting the development of business services, promoting the culture of inter-firm cooperation and enhancing the development of innovative clusters" (*ibid*. p. 28). In fact, the above cited analysis on firm-specific determinants of productivity gaps/workpackage 6) holds that amongst the most important sources of gaps between comparable firms in East and West pertain to marketing and management deficiencies like low intensities of use of communication technologies (email, internet, e-business) for inter-firm networking, and a general lack of networking between the firms and their customers, suppliers and other stake-holders as such. Here, management training programmes can be very efficient.

Where business services do not yet exist to a sufficient extent (and workpackage 1 identified rather small shares of this sector in all CEECs), local government institutions can help businesses in tasks like *e.g.* the application for assistance from EU structural funds, the channelling of potential investors to profitable locations and potential local partners, the institutionalisation of networking in general and with respect to technology transfer, *etc.* For CEE's local government institutions, these tasks are complete novelties. Hence, EU support in the development of local governmental institutions and the training of their employees can have an indirect albeit very important effect on the competitiveness of CEE industry.

7.6. EU enterprise policy in light of CEE development conditions

In particular, the instruments of EU enterprise policy focus on the three objectives of entrepreneurship, innovation, and access to markets (see SEC(2000) 771). The instruments promoting entrepreneurial activity include predominantly institutional framework reforms (in the field of bankruptcy legislation, a simplifying of administrative and regulatory procedures for start-ups, and by promoting new legal forms of entrepreneurship), but also more direct measures as *e.g.* improved access to finance for seed and early stage financing and micro-loans, knowledge and skills-related activities (education schemes at all levels, vocational training in firms), as well as business support activities (events laying out the possibilities of inter-firm cooperation and networking, supply-chain management, e-commerce, *etc.*).

The instruments targeted at supporting innovation and change focus on a removal of obstacles for the dynamic and market-oriented development of research and technology (including issues such as intellectual property rights and patenting, as well as the removal of obstacles to the introduction of new products), on an encouragement of support mechanisms and exchange of good practices (both at a regional level in the 'Regional Innovation Policy Network' and 'Network of Regions of Excellence', and at the firm level with a view on innovation finance and technology transfer), and on promoting business services in general. The instruments related to ensuring access for goods and services to markets are mainly concerned with improving the efficiency of the single market project: elimination of remaining barriers, liberalisation in the fields of utilities, improvements in public procurement, competition and state-aid rules and other single market legislation. In addition, the policy-mix envisages some strategies to help small and medium enterprises using the whole potential of the Single Market.

Most of those instruments are not only conducive to dynamic economic development in European industries, but in particular in the new member states: here, entrepreneurship and innovative activity are particularly less developed, existing and potential entrepreneurs are at the lower end of the learning curve in terms of management and market know-how and experience.

In this respect, promoting a bankruptcy framework that allows entrepreneurs a fresh start after failure is necessary to account for the risky character of entrepreneurship and helps to disentangle inefficient allocations of scarce resources in the Schumpeterian sense. Due to the high intensity of enterprise restructuring in the formally state-governed economies, such a dynamic approach to restructuring is particularly important. This can be further promoted by facilitating the administrative and regulatory procedures which are all new to the agents in CEE: here, know-how on how best to operate in a highly regulated environment is particularly scarce. The experience with the promotion of new forms of entrepreneurship, however, seems to suggest only limited effects in the case of Germany if not paralleled with the training of potential entrepreneurs: the introduction of the so-called 'Ich-AG' was targeted at simplifying access of individuals to start an own one-person company.[23] It remains hence doubtful whether the introduction of such additional forms of entrepreneurship are actually needed.

Without doubt, access to finance for (in particular small) entrepreneurs (whether for start-up, restructuring, or innovation) is not only a particular European problem (in

[23] Whilst the time period since the reform is too short to warrant a meaningful assessment of this vehicle, the IAB diagnoses an unexpected high rate of failures.

comparison to the US), but especially grave in CEE: here, incumbent banks are often over-burdened with a poor loan-portfolio from larger client enterprises, and hence unable to provide more risky seed and micro-loans. Additionally, knowledge and skills-related activities in the form of education schemes and vocational training in firms, as well as business support activities by use of events laying out the possibilities of inter-firm cooperation and networking, supply-chain management, e-commerce, *etc.* can help entrepreneurs in CEE to bridge the experience gap *vis-à-vis* their Western competitors. In fact, firm-specific investment-intensities proved to be the one most important determinant of productivity gaps at the firm-level, regardless of size, industry, and country (workpackage 6). Hence finance for investment becomes an important focus in an efficient policy-mix for CEECs. Also, even amongst foreign investment subsidiaries, domestic financial institutions play a less important role for finance. Only in the case of Hungary were domestic sources of finance more important than the foreign owner indicating an already more developed capital market in Hungary (workpackage 4).

In particular the policies geared towards R&D and S&T appear to be well formulated to suit the particularities in CEECs. This can be read from the results generated in workpackage 3, where the main deficiencies in National Innovation Systems were identifies in the 'broad' macro-institutional context of innovation. With firms in CEE only gradually integrating into Western markets and East-West firm networks, Western technology in the East is often new, hence innovative activity is generally lower (see Cserháti/Takács, 2002, for an analysis of factors driving innovation in CEE firms). The production of new knowledge or the combination of existing knowledge in new ways can result in marketable new methods of production (process innovations) and/or in newly developed products. Innovations are typically held to be amongst the most important sources of productivity growth and are subsequently an essential factor for the new member economies to become internationally competitive. Hence, policies aimed at dynamic development of research and technology are of particular importance in CEE economies. In particular, the region- and network-related instruments for the exchange of 'good practices' can help CEE firms to leapfrog on the learning curve.

7.7. EU competition policy in view of CEE development conditions

We now look at the EU's principal policy towards industry, namely competition policy and will devote most space at this point to this theme. Here, the candidates have been obliged to adopt rules compatible with the Rome Treaty since the Europe agreements were signed. It might therefore be tempting to conclude that the effects of accession have already occurred. On the contrary however there are likely to be quite subtle changes. In fact the Europe Agreements did not impose any requirements on candidates

with respect to domestic competition laws, but only with respect to matters covered within the EU by Articles 81 (on restrictions of competition) and 82 (on abuses of dominant position) for private actions, which affect cross border trade, and the corresponding state aids rules. Paradoxically the functions of the newly created competition agencies that had to be carried out under the EA's will most likely have disappeared in most of the new member states on accession, which would have left them with only internal tasks had accession not been the occasion for a major re-think of the way the EU deals with competition issues, namely the creation of a network of national competition agencies to complement DG Competition.

Table 44. Shifting Policy responsibilities after accession

	Pre accession		**Post accession**		
	National	**EU**	**National**	**EU**	
				Network	DG Comp
Competition	Must ensure 81/82 & state aids equivalence where effect on trade Can treat local cases as it wishes. Monitor & approves aids	No formal powers	National markets only EA related tasks *end*	Regional markets	EU-25 cases Pre-amble & SME policies of EU apply in full Control of state aids
Trade	National rules apply	FTA rules only NTBs as they affect product norms	Must apply CET incl. AD; National transition measures?	CEECs lose voice at WTO 2003; gain vote in EU 2004	
Industry	Give state aids; must accept *acquis*	Sets technical norms	Norms? Scope for national derogations?	EU technology etc policies apply in full to CEECS	

Note: AD...anti-dumping; CET... common external tariffs; EA...Europe agreements; FTA...free trade area; NTBs...non-tariff barriers.

Trade policy will now become an EU matter for the candidates. Interestingly the pre-accession phase (like the European Economic Area) was not a customs union but a form of free trade area. The new member states have now joined the EU customs union. For most countries the tariff structures have anticipated membership and a smooth transition is expected. The major impact is likely to be on anti-dumping (AD) where it can be expected that all EU measures applied against candidates will be dropped (barring use of

the new transition mechanism). But the new member countries will have to take on the EU's AD measures instead of their own. The loss of the remaining pre-accession trade policy autonomy raises the question of whether the CEECs had been able to use their residual trade instruments as a policy to affect location of investment and more problematically if so whether the loss of this instrument is likely to be bad for catch up. Table 44. highlights the main changes in competition, trade, and industrial policy.

7.7.1. Competition Law Reform

The EU accession of the CEECs coincides with a major reform of competition law enforcement across the EU. The overall objectives of the Competition Law Reform are a more transparent and more directly applicable competition law enforcement with simpler procedures, a decrease in bureaucracy, and closer co-operation between national competition authorities (NCAs) and the Commission as well as amongst NCAs.

The CEEC accession made a reform of competition law highly opportune. The CEEC competition authorities were set up with the Europe agreement rules in mind. These required that the CEECs, then as associates, should put in place some form of competition regime which would replicate the impact on trade between member states of the articles 81 and 82 (ex 85, 86) of the Rome Treaty. These articles are directly effective within the EU (being enforceable by DG Competition and if necessary by action in the courts). But the clauses of the EA's could not be directly effective in the same way unless implemented by legislation in the partner countries. The partners chose to set up competition laws and competition agencies. The new competition policies went beyond the literal requirement of the EAs, which only necessitated controls on restrictive business practices, which might affect cross border trade between the EU and partners.

It is interesting to note that many existing member states (*e.g.* Italy) did not have a competition authority until recently: the Commission was empowered to tackle cross border cases and the Rome Treaty is silent on purely domestic matters. And member states with competition policies were free to use principles different from Treaty rules for purely domestic matters (the UK for example has only just removed a blanket public interest provision from its domestic competition rules). Hence the new CEEC competition agencies were primarily established to carry out a function that would cease to exist once they became member states. The new agencies would have found that their sole tasks would be to concentrate on the purely domestic cases; indeed it would have been possible for new member states to abolish their agencies had they wished to do so on the grounds that they could rely on the pro-competitive effect of regional free trade on a small open economy, an option that could have appealed to Baltic states.

However a decision was taken at the overall EU level that will radically transform the potential role of the fledgling agencies. The new plan gives operational effect to the jurisprudence of the European Court of Justice that EU competition law is directly effective within member states and can therefore be invoked by parties other than the Commission (though the scope for actors other than the Commission to apply article 81(3) (governing the rules for exemptions from Article 81) is more complex). As we noted above of course, the new arrangements only apply to the application of Community law: matters with no possible effect on trade remain in domestic hands.

A further point to note is that Vissi (1998) argues that whereas under the pre-accession regime cross border competition cases in the CEECs had to be judged according to the wording of articles 81 and 82 alone, the application of the full Rome Treaty to these cases implies that the early general articles of the Treaty, regarding cohesion *etc.* will become relevant to the interpretation of the competition provisions. Frazer (1999) argues that this has been problematic even within the EU, but it is a particularly delicate burden to add to new competition authorities.

The modernisation of Regulation 17 (1962), which governs the restriction of competition (Article 81) and abuses of a dominant position (Article 82), forms the core of the Competition Law Reform. A new European Competition Network serves as a key-player within the new enforcement system. At the same time, more responsibility is shifted to companies, as they will have to ensure that their actions either do not restrict competition or qualify under the provisions of Article 81(3) without being able to rely on "comfort letters" from the Commission.

The European Competition Network will operate on the principle of best-placed authority. The provisions of Article 81(3) will become directly applicable in the candidate countries as well as in the EU, and based on this there will be joint enforcement of the rules governing restrictive practices by the Commission, the NCAs, and national courts. This represents a major change to the present enforcement system. Whereas prior to the reform only the Commission was able to apply Article 81(3), NCAs and national courts are now able to and expected to apply the provisions of Article 81(3) when the Competition Law Reform comes into power. National courts thus play an important role in the enforcement of competition law and complement the role of NCAs. Equally important is the change to the handling of block exemptions granted by the Commission. If the Commission has granted such a block exemption, by which Article 81(1) (governing restriction of competition) is declared inapplicable to certain agreements, decisions, or practices, and if these agreements, decisions or practises cause effects that are

incompatible with Article 81(3), the Commission as well as NCAs have the power to withdraw the block exemption from a particular case.

With regard to the relations among the members of the network and their competences, the Commission maintains a leading function. National competition law has to act within the boundaries of EU competition law. NCAs cannot apply national competition law to agreements or practices within the provisions of Article 81(1) that would prohibit such agreements or practices if the same is not also prohibited under EU competition law. Member states are, however, free to apply stricter national competition laws that prohibit unilateral conduct by companies, *e.g.* abusive behaviour toward economically dependent undertakings.

Moreover, NCAs are obliged to inform the Commission before or without delay after commencing a formal investigation under the provisions of Articles 81/82. This information about proceedings has also to be made available to the other member states. The Commission can also directly intervene in the proceedings of NCAs or national courts: if the Commission initiates proceedings under the provisions of Articles 81/82, NCAs and/or national courts are relieved of their competencies for those cases. Furthermore, if the Commission has reached a decision in cases under the provisions of Articles 81/82, NCAs and/or national courts must not reach decisions that counteract the ruling of the Commission.

In proceedings under Articles 81/82 that might affect trade between member states, the application of national competition law must not lead to the prohibition of agreements/practices that affect trade between member states, but are allowed under Article 81(1) or fulfil the conditions of/are covered by Article 81 (3).

According to the principle of best-placed authority, each case should only be dealt with by one (namely the best-suited) authority. Hence, competition authorities are able to suspend or close a case on the ground that another competition authority has dealt or is dealing with the case. In practice, this requires the exchange of –even confidential- information between the different authorities. The Competition Law Reform provides for an exchange of information conditional on the sole use of such information for the application of Articles 81 or 82 or for the application of national competition law if it refers to same case.

The Competition Law Reform and the concept of the European Competition Network in principle provide ground for a more direct approach to the enforcement of competition policy. At the same time, it puts more responsibilities to the NCAs and national courts, in terms of applying and enforcing competition law. This could potentially prove difficult for

some NCAs in CEE, as competition authorities are relatively new in those countries and are not as experienced in the enforcement of competition law as NCAs in other member states.

The European Competition Network aims at a more direct approach to the enforcement of competition policy. The new system leaves, however, some questions open with regard to responsibilities and competencies within the network as well as with regard to the relationships between the members of the network. These issues become particularly interesting in cases with cross-border implications.

The principle of best-placed authority and the handling of each case by a single authority should make competition law enforcement more transparent (both for competition authorities and firms) and offer a more direct application. Nevertheless, it is not always clear which authority should initiate proceedings in cases with cross-border implications or should have the competency to deal with such cases.

It is ambiguous if NCAs can take decisions that affect other member states too in cases with cross-border implications or whether such decisions are legally binding only within national boundaries.[24] If decisions by NCAs are only legally binding within national boundaries, it might well come to multiple and contradictory enforcement (which the competition law reform actually aims to avoid). It is worth noting that the jurisdictional overlap issue arises in the EU in a very different one from that of the US, where both the Federal Trade Commission and the Anti Trust Division of the Department of Justice enforce federal law. In this case they normally act as prosecutors only and coherence is assured by the fact the initial decisions, and not simply appeal decisions are made by the courts. In fact anyone with standing can bring a case to a US court, notably aggrieved competitors, consumer groups and individual states. The direct effect of EC competition law actually opens up the prospect of additional private enforcement of EC competition law as has occurred occasionally in the UK. We note below the issues raised by the private enforcement of the state aid element of competition law.

The issue of market definition is an important one, too. The outline of the Competition Law Reform does not state which authority should define the relevant market in cases with cross-border implications. The market definition is however highly relevant in such cases, as the decision on whether a firm conducts anticompetitive behaviour can change with the definition of the relevant market.

[24] See also Mavroidis, Petros C. and Neven, Damien J. (2000) on this issue. They interpret the White Paper, as that decisions by NCAs are only binding within national boundaries.

In their paper on the European Competition Network, Mavroidis and Neven (2000) point out some further potential problems that the implementation of the Competition Law Reform might bring about: they refer to a potential 'disintegrating effect' of the reform, as the NCAs have different incentives in exercising their power and have probably no incentive to consider effects outside their national boundaries but will in their own interest.

The balancing between positive and negative net benefits might become difficult under multiple enforcement. If one country experiences a negative effect from a decision (although the net effect over all countries affected might be positive) it will bloc the implementation of the decision. Some hypothetical scenarios and their likely outcomes[25] can help to highlight the potential problems and questions the new system of competition law enforcement raises:

- In case two firms from two different countries that have an agreement which would impose vertical restraints, which NCA would have the competency to deal with the case/initiate proceedings? Or is this otherwise a case that the Commission would deal with?

No set rules exist for such a scenario. Two or more NCAs might deal with one case. NCAs might continue to deal with cases that are already dealt with by other authorities or might indeed initiate proceedings although another NCA/the Commission is already dealing with the case. Generally, the member state/NCA that is better placed to deal with the case should take on the case.

- Considering the same case as above, one of the two countries now has granted an exemption for that agreement. Would such an exemption only be binding within national boundaries or would it also be applicable across borders, *i.e.* in the second country? What would happen if the second country disagrees with the granting of the exemption? Would the Commission intervene and, more importantly, would the Commission undertake a cost-benefit analysis for the case in light of its effect on both countries/all member states? Alternatively, would one of the two countries have to undertake such an analysis?

If the Commission has issued a decision concerning an agreement, NCAs and national courts cannot –in cases with cross-border implications- issue a divergent decision (as

[25] The scenarios were presented to Adam Zolnowski from the Polish Competition Office who kindly outlined the operations of the European Competition Network with regard to the cases and highlighted where such operational procedures have yet to be put in place. The results above represent a summary of the answers.

mentioned above, this does not –under the provisions outlined above- apply to purely domestic agreements under block exemptions). If however a NCAs or national court grants such an exemption, another Member State is free to assess the matter without considering previous rulings. The outcome of such a process is nevertheless entirely unforeseeable at the moment, as the issue of the reach of jurisdiction of a state in itself is not clarified. Complicated by the issue of an exemption, there are neither formal nor informal guidelines as how to deal with such a case.

- How is the question of defining the relevant market in any potential case handled? Which authority defines the relevant market and which criteria are used to do so? What happens if there is disagreement about the definition of the relevant market among NCAs or between NCAs and the Commission?

Apart from the general criteria of the homogenous conditions of competition and the substitutability of the concerned products which NCAs will use in a similar fashion when applying EC law, there are no further guidelines as how the relevant market should be determined. Therefore, different and contradicting market definitions might emerge which could considerably hamper the identification of cases. The issue of market definition may be subject to discussion on the forum of the European Competition Network (discussions of this issue between the US and the EC for example have proven to be successful).

- How big is the potential for "forum shopping", *i.e.* NCAs only taking up cases that are of national interest? Will there be a mechanism in place to prevent such behaviour?

It should not be possible to bring complaints before an authority with little interest in the matter. Cases should be dealt with by the best-suited authority which also has an interest in the case and where the outcome of the case (especially if unresolved) has a potential impact on the economy. There exists however the risk that in some circumstances no authority wants to deal or cannot afford to deal with a case.

- How will the principle of best-placed authority operate in practice? Assuming there is a horizontal agreement between two firms in two countries, which authority will deal with the case? What happens if an NCA of a third country has an interest to intervene because some of its industries/its consumers would be affected by the agreement, too?

The future functioning of the European Competition Network is still very much unresolved. Generally, cases should be dealt with by the authority that has the biggest

interest/is most affected by the case and has the best resources to deal with it. How does this affect CEECs?

7.7.2. State aid

The state aid regime in the CEECs changed completely with EU accession, although the economic impact may turn out to be modest. During the transition period, the CEECs have already established national authorities managing the state aid system in accordance with the EU rules. With accession, however, those national authorities still have a monitoring function but final decisions are taken in Brussels. All new state aid and all plans to alter existing aid (including aid under Article 87(2), ex Article 92)) have to be notified to the Commission. The proposed measures cannot be put into effect until the Commission has approved of them. Moreover, under Article 88(3) (ex Article 93(3)), the Commission has the power to prevent the distribution of aid or stop an ongoing payment. The only exception forms new aid that is classified as being too small to affect trade between member states.

Under the EAs, all CEECs were eligible to apply the regional exception rule in the distribution of state aid, provided under Article 87(3). The Article lists three additional conditions under which state aid can be granted:

lxxx) for regions where the standard of living is low;

lxxxi) to promote the execution of an important project of common European interest;

and

lxxxii) to facilitate the development of certain economic areas.

Similar measures are for example applied to East Germany, for which Article 87(2) explicitly provides ground to grant state aid in order to promote regional development. The measures under Article 87(3) are, however, only applicable for a certain time period laid down in the EAs. The regional exception rule can be considered to be of particular relevance to CEECs: here industries are often infant, agglomerations often insufficiently large to provide cluster advantages and scale economies (in the sense described in the chapter on theoretical foundations). Here, additional support to investment and tax incentives not least for FDI can help to improve conditions for catch up development in CEECs. Looking at the Treaty of Accession 2003 for the Candidate Countries, only Cyprus, Hungary, Poland, and Slovakia appear to have further transitional periods for competition policy and, more specifically, state aid. Those transitional rules lay down

particular measures that can be applied as well as the time frame in which these measures can be applied. Poland, for example, will under the special economic zones provision be able to grant aid that does not exceed 75 *per cent* of the eligible investment cost to big companies and aid up to 30 *per cent* of the eligible investment cost to the motor vehicle sector. Furthermore, tax exemptions might grant corporate tax exemptions to SMEs until 2010. For the other CEECs listed under the transitional measures in competition policy, equally specific measures apply.

As mentioned above, the CEECs have already been adapting to the post-accession state aid system prior to accession by establishing the necessary institutional framework. The establishment of state aid monitoring authorities is thus a central task. Table 45. shows which authorities in the CEECs hold the control of state and which authorities are responsible for monitoring state aid.

Table 45. Institutional arrangement for state aid in CEECs

	Control of state aid	**Monitoring of state aid**
Bulgaria	Commission for the Protection of Competition	Ministry of Finance
Cyprus	Office of the Commissioner for Public aid	
Czech Republic	Office for the Protection of Economic Competition	
Estonia	Ministry of Finance	
Hungary	State aid Monitoring Office	
Latvia	State aid Surveillance Commission	
Lithuania	Competition Council	
Poland	Office of Competition and Consumer Protection	
Romania	Competition Council	Competition Office
Slovakia	State aid Office	
Slovenia	Ministry of Finance	

Source: "Anti-trust and State Aid authorities and legislation in the Candidate Countries", http://www.europa.eu.int/comm/competition/enlargement/candidate_countries/

In the following, we take a closer look at the state aid system in practice and we discuss whether and where problems in the state aid systems of the CEECs are likely in light of EU accession. In particular, we consider the following issues:

- the new state aid regime in practice;
- the amount of granted aid and the instruments used;
- state aid to the manufacturing sector *versus* horizontal objectives;
- state aid used by firms as an strategic instrument;
- state aid and productivity.

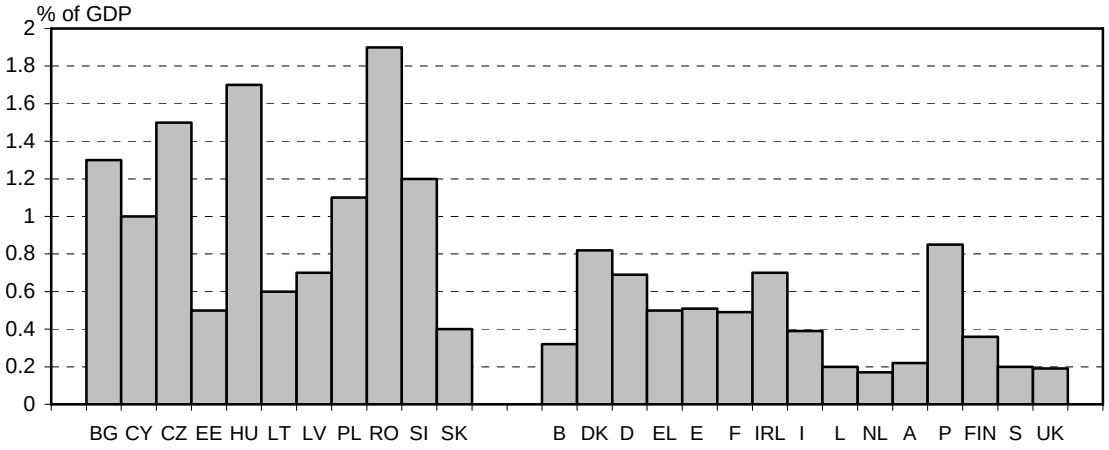
The new state aid regime in practice

As mentioned above, the main impact of EU accession on the state aid regime in the CEECs is that the CEECs have a monitoring function of state aid. Moreover, although general provisions as to the functioning of the state aid system after accession are outlined for the CEECs (see above), further provisions such as potential cooperation between the state aid monitoring authorities (similar to the cooperation within the European Competition Network) are not specified. At this point –considering the short time span the new regime has been put into effect- it is therefore not possible to discuss the new state aid regime in practice after accession further.

The amount of aid granted and the instruments used

An indicator of potential problems facing the CEECs after accession could be the overall amount of state aid granted by the CEECs compared to the overall amount granted by the EU. If there existed a remarkable discrepancy between those two amounts and in particular if the amount of aid granted by the CEECs was considerably higher than that of the old EU, this might indicate that the CEECs would face pressure to reduce the amount of granted aid after accession. A comparison between the amount of state aid granted by the old EU and the CEECs in 2000 reveals that the old EU granted an average of 0.8 *per cent* of their GDP whereas the CEECs granted an average of 1.3 *per cent* of their GDP; measured in Purchasing Power Standards (PPS), the old EU on average granted 185 PPS per person and the CEECs 105 PPS per person.

Chart 9. State aid as percentage of GDP for EU-15 and CEECs, 2000



Note: Total State aid less agriculture, fisheries, and EU funding.

Source: State Aid Scoreboard, autumn 2002 update, Special edition on the candidate countries, Statistical Tables of the Online State Aid Scoreboard.

The diagrams clearly show that on average the percentage of GDP spent on state aid is higher in the CEECs (1.3 *per cent*) than in the old EU (0.8 *per cent*). It should though be noted that this percentage varies considerably across the CEECs, ranging from 0.4 *per cent* in Slovakia to 1.9 *per cent* in Romania (see chart 9.). Hence, while countries at the higher end of the scale such as Romania, Hungary, and the Czech Republic might have to aim at decreasing the amount of state aid granted, the other countries do not lie considerably above the old EU average or the single amounts granted by each of the old EU member states.

More importantly, these aggregate indicators are not well suited to make predictions about potential problems for the state aid regime in the CEECs after accession. An analysis at sector-level would be much better suited to make predictions about potential problems in the state aid system, as it would reveal whether certain sectors seem to be unfoundedly 'favoured' by state aid and how the CEECs perform with regard to the EU objective of tackling horizontal objectives. This analysis will be carried out in the following section.

The instruments for the distribution of state aid can be divided into 4 categories:

lxxxiii) direct grants and tax reductions;

lxxxiv) capital and investment subsidies;

lxxxv) 'soft credits';

lxxxvi) credit guarantees.

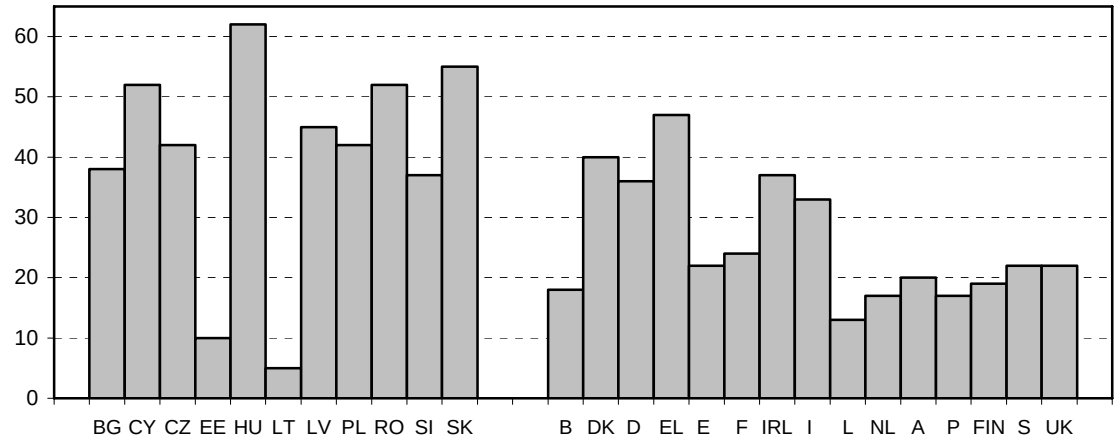
In 2000, the CEECs generally made more use of tax exemptions (51 *per cent* of all state aid was granted by using this instrument compared to 29 *per cent* in the old EU) than the EU. The intense use of this instrument may partly be explained by government budget restrictions (note that, again, the use of instruments varied across the CEECs); however, there does not appear to exist a significant discrepancy in the use of state aid instruments between the CEECs and the old EU, which could become problematic after accession

State aid to the manufacturing sector versus horizontal objectives

The main objective of the distribution of state aid is to increase competitiveness. This is highly relevant for the CEECs as they lack behind most of the old member states in terms of competitiveness. At the same time, as the CEECs are gradually adapting to the EU state aid system, they also have to adopt the state objectives imposed by the EU. The EU has highlighted the need to target horizontal objectives across its member states and subsequently across the CEECs (se above). At this point it is important to stress that the targeting of horizontal objectives does not preclude aid being granted to the manufacturing sector *per se*, as this might actually facilitate the fulfilling of horizontal objectives (*e.g.* aid to increase R&D/training facilities or reducing unemployment).

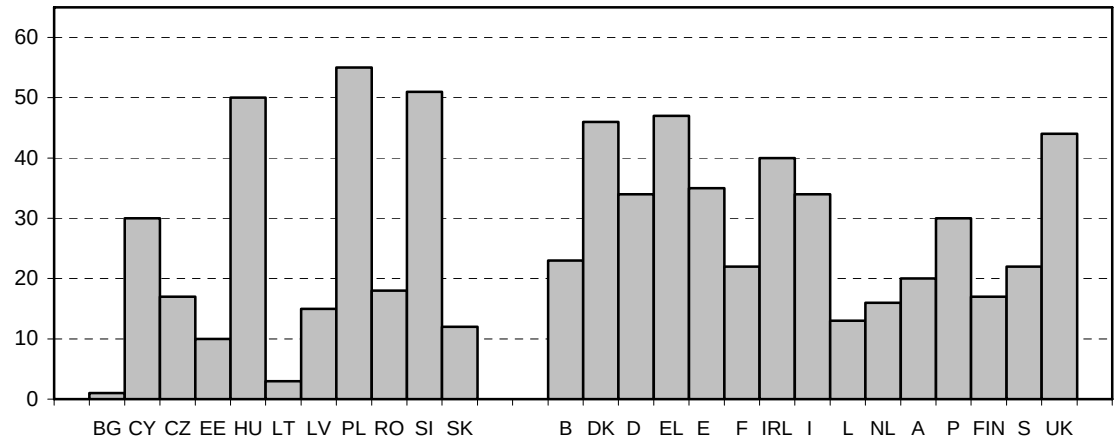
Hence, a look at the general structure of state aid granted by the CEECs should help to analyse how the CEECs perform with regard to pursuing horizontal objectives. Moreover, it could reveal potential problems in terms of the amount of state aid granted in total in relation to the old EU and the amount of aid granted to the manufacturing sector in relation to the old EU. We now turn to the amounts of aid granted to the manufacturing sector and to horizontal objectives.

Chart 10. State aid to the manufacturing sector as percentage of total aid for EU-15 and CEECs, 2000



Source: State Aid Scoreboard, autumn 2002 update, Special edition on the candidate countries, Statistical Tables of the Online State Aid Scoreboard.

Chart 11. State aid for horizontal objectives as percentage of total aid for EU-15 and CEECs, 2000



Source: State Aid Scoreboard, autumn 2002 update, Special edition on the candidate countries, Statistical Tables of the Online State Aid Scoreboard.

The average percentage of state aid to manufacturing in 2000 was 46 *per cent* for the CEECs and 35 *per cent* for the EU. Again, it is important to consider the variations across the CEECs. Moreover, and as mentioned above, aid to the manufacturing sector *per se* is not negative as such; aid might well facilitate the creation of a level playing field (which is another state aid objective of the EU). Alternatively one has to consider that even in

2000 at least some of the CEECs still undertook some restructuring. The aid might have gone into those sectors that underwent restructuring (unfortunately, no industry-specific data is available).

With regard to the manufacturing sector, Hungary, Romania, Slovak Republic, and the Czech Republic granted the highest percentages of aid to the manufacturing sector. A detailed analysis of the receiving industries could reveal whether some sector seem to be 'favoured' by aid. This would certainly have to be changed if it was the case. But even so, those countries might have to reconsider their state aid distribution with regard to the manufacturing sector as they grant considerably more than any old EU member state.

The picture changes slightly when taking the horizontal objectives into account, too. Here, Hungary scores very high with 50 *per cent* of its total aid being granted to the fulfilling of horizontal objectives and lies indeed above every current member state. Thus, Hungary's state aid system seems to be well in line with EU requirements. The Czech Republic, Romania, and the Slovak Republic (and especially Bulgaria, Latvia, and Estonia) on the other hand score much lower in terms of horizontal objectives and might therefore have to reconsider their state aid systems. Bulgaria and Latvia in particular will have to increase their share of state aid going to horizontal objectives. It should be stressed that on average, though, the CEECs in 2000 spent a higher percentage of their total aid on horizontal objectives (39 *per cent*) than the old EU (24 *per cent*). Poland, Hungary, and Slovenia stand out here with considerably higher percentages spent on horizontal objectives than any of the old EU member state. Thus, although some CEECs might have to aim for higher rates of aid directed to horizontal objectives, on average the CEECs seem to perform very well with regard to horizontal objectives and indeed better than the EU.

State aid rules used as a strategic instrument

Another issue, which is also highly relevant for the CEECs, is the one of firms using the state aid system as a strategic tool for pursuing their interests. This would be done in particular to challenge aid granted to competitors or to claim aid themselves. With regard to the situation in the CEECs, foreign investors might also 'bind' the investment decision on the granting of certain forms of state aid (*e.g.* tax exemptions). This would hit the CEECs particularly hard as they still very much seek to attract foreign investment. All of these cases are however very hard to prove and thus only represent suggestions as to the possible use of the state aid system by private firms. The Commission itself has taken up that subject in its "Report on the application of EC state aid law by the Member State courts" (1999) and notes that surprisingly little companies seem to make use of

the opportunity to challenge the granting of aid legally. They suggest that a lack of knowledge about the system might be the reason.

State aid and productivity

The issues discussed above raise the question of the relationship between state aid and productivity. The EU has established the principle of creating a level playing field: this objective does not necessarily increase a region's/industry's productivity as aid might be granted for redistributive or social purposes that does not enhance economic performance. On the other hand, with regard to the provisions of Article 87(3), the CEECs can be assumed to use the state aid system to actively promote an industry's/region's productivity and therefore to raise the country's competitiveness. This is particularly the case, if state aid aims to support R&D and training activities.

7.8. Other Union policies with impact on industrial competitiveness

Not only industrial policy instruments and framework conditions such as competition and state-aid policies are orchestrated to support the aim of competitiveness: in the EU Treaty, all other policies and activities the EU pursues under the provisions of the treaty form part in today's EU industrial policy approach. Those include mainly trade policy, R&D policy, regional policy with EU structural and cohesion fund policies, vocational training policy (see COM(2002) 714, pp. 26-28).

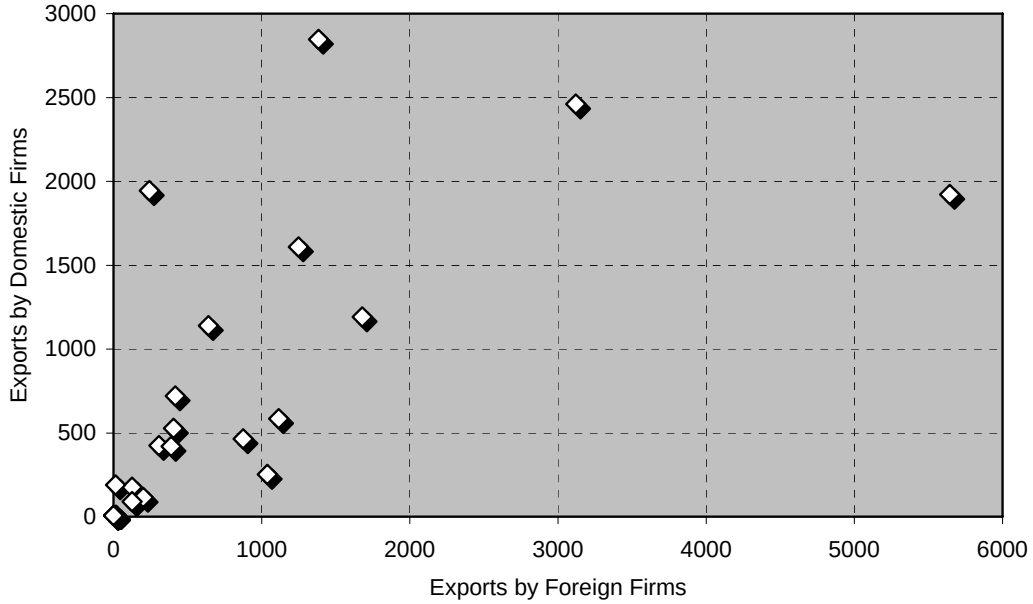
7.8.1. FDI, Trade, and Trade Policy

The relationship between FDI, trade, and trade policy is one that is also highly relevant for the CEECs in light of their integration into the EU. The CEECs are trying to attract FDI, at least partly to increase productivity and the country's competitiveness. Moreover, FDI should contribute to a country's economic growth prospects and should possibly also trigger spillover effects to domestic industries. It is therefore interesting to analyse the impact that trade policy measures seem to have on FDI. The CEECs had to adopt EU trade policies by the time of accession. Thus, it is worthwhile to see whether the current trade policies of the CEECs and their potential effects on FDI do support the EU's emphasis on horizontal trade policy. In an initial investigation of the relationship between trade and FDI we looked at a few simple relationships for the Polish case.

The one relationship that stood out was that the trade pattern of 'foreign' firms by sector seemed to match that of the rest of firms. Where foreign firms have a high share of total exports there would inevitably be a high correlation between total exports of a sector and foreign firm exports, so we plotted the relationship between exports by foreign firms and exports by 'domestic firms' across sectors and find a positive correlation. The same is

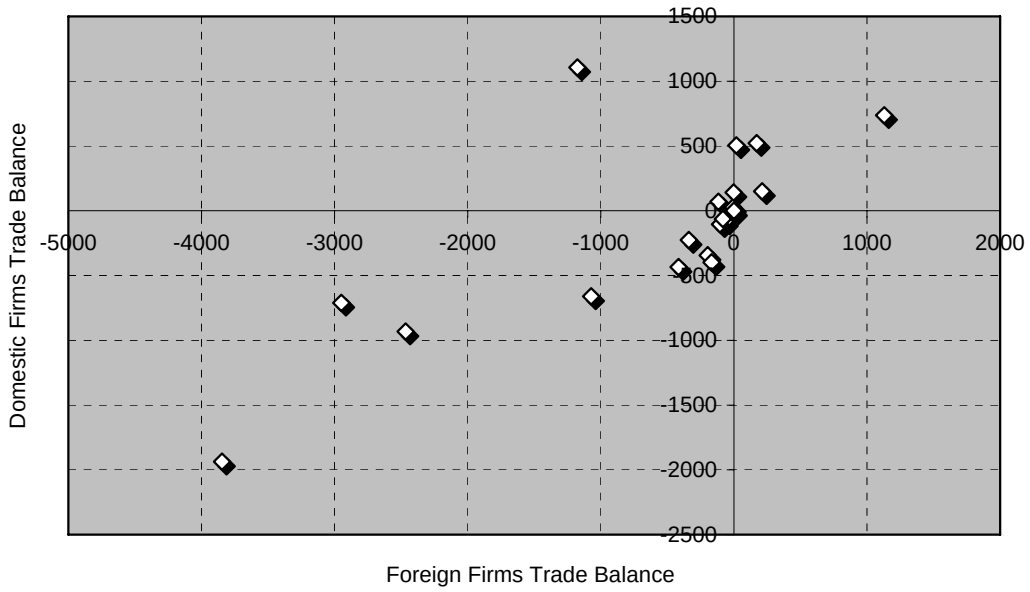
also true of imports. These could be spurious if all that is happening is that we are measuring the size of large and small sectors. However we also observe a strong positive correlation between the trade balance by foreign firms and that of other firms.

Chart 12. Exports by foreign firms against domestic firms for Poland, 2001



Source: "Foreign Investment in Poland", Annual Report by the Foreign Trade Research Institute, 2002; Trade Policy Review for Poland 1999, WTO.

Chart 13. Trade balance of domestic firms against foreign firms for Poland, 2001



Source: "Foreign Investment in Poland", Annual Report by the Foreign Trade Research Institute, 2002; Trade Policy Review for Poland 1999, WTO.

It is not easy to draw policy implications from such a simple analysis but it does seem to offer some reassurance about the nature of the growth and FDI process. It implies (weakly) that foreign investors are in fact investing in firms where Poland has a comparative advantage and whilst we would be hard pressed to use this simple result to argue that foreign net exports have a positive spillover effect on other firms, we can at least suggest that there is in the Polish case no sign of a crowding out effect. On the face of it the similarity of foreign and other firms supports rather than undermines the case for accepting the EU philosophy of horizontal rather than discriminatory industrial policy at least in this case.

7.8.2. Institutional Changes

From April 2004 the new member states cease to have a voice at the WTO; they must let EU speak and negotiate for them. This means they lose a voice and a vote at the WTO but acquire a voice in the EU in 2003 but only get a vote in the EU in 2004.

Candidates must apply EU common external tariffs and also EU Anti-dumping (AD) measures rather than their own. CEECs use AD very little but will be obliged to adopt all the EU measures after entry (though there will also be transitional possibilities of anti-dumping after accession). Most CEECs have few or no AD measures in place but where they had them main targets appear to be the former Soviet Union, China and each other.

Poland however had 8 on 4 products. In fact the EU had measures against more countries for all these products and of course many others. Inside the EU the new member countries will not be able to invoke AD unilaterally but for many products they will find a ready coalition of the willing. This is however unlikely to be a plus for the economies concerned. The ability to introduce anti-dumping measures has in most cases similar effects on productivity to the ability to subsidise declining sectors. A burden is rather imposed on consumers and user industries.

The new member states will of course be relieved of AD and safeguard duties imposed by the EU on them. In fact between 1998 and end 2002, out of 202 new investigations by the EU, 31 were against candidates (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Poland (the top at 6), Rumania, Slovak, Slovenia). In the Swedish case, having been a victim of AD led this country to become a fierce internal opponent of AD. It is not clear if this will apply to the new member states. In the next section, we investigate the trade effects of EU accession of the CEECs with regard to AD policies and in particular the removal of EU anti-dumping measures towards the CEECs.

7.8.3. Anti-Dumping law in the EU

The current definition under which an AD duty can be incurred in the EU follows the agreement on the code of practice of antidumping set out during the Uruguay Round. The antidumping agreement is formally known as the Agreement on Implementation of Article VI of the General Agreement on Tariffs and Trade 1994. It takes dominance over all other agreements under the international trade arena on AD. Article VI allows members of the WTO to apply AD measures on other contracting parties. This can be done when sufficient evidence has been brought forward demonstrating the presence of dumping and the presence of injury to the domestic industries. Dumping, as defined under the agreement, is considered as introducing a good into an export market at a lower worth than its normal comparable value for like[26] products in the exporting country under the ordinary course of trade. An AD investigation can have the following possible outcomes.

- Provisional measures: these can take the form of a price undertaking or a duty once preliminary examination has given sufficient evidence of the existence of some

[26] A like good as defined by WTO/GATT rules is "a product which is identical, *i.e.* alike in all respects to the product under consideration, or in the absence of such a product, another product which, although not alike in all respects, has characteristics closely resembling those of the product under consideration."

form of injury caused. However they are only valid for four months. Under special circumstances they can be extended for a further two-month period.[27]

- Definite measures: these can be used once the investigation has finished and evidence shows that dumping has occurred and that injury has been caused to the domestic industry. Duties are imposed by the Council following recommendations of the Commission after consultation of the Member States[28]. A definite measure can be a price undertaking or a duty, depending on what is judged to be more suitable to undo the harm that dumping has caused.

- Termination: an AD investigation is terminated when there is insufficient evidence to prove the act of dumping or when dumping does not pose a threat to the domestic industry.

Price undertakings are described under the GATT as "a binding commitment by the foreign firm to raise export prices so that either the dumping or the injury suffered by the domestic industry is eliminated" (WTO). The size of the duty tends to be equal to that of the dumping margin, however for the EU this is not the case. The lesser duty rule takes priority indicating that the size of the penalty must be set to remove the injury caused to the domestic firm and not by the full dumping margin. In 1968 the first community wide legislation on anti-dumping was enacted, and similarly to most countries' AD law (notably the US), modified several times. However, the current legislation governing AD practices in the EU is based on the agreements reached in the international trade arena set up by the WTO[29]. It is the Agreement on the Implementation of Article VI of the General Agreement on Tariffs and Trade 1994. However, the AD laws governing practice in the EU show a couple of amendments to the laws agreed upon during the Uruguay Round. These are the Community interest test and the lesser duty rule.

- Community interest test: this measure aims at satisfying all interested parties of the community. It thus incorporates into the implementation of article VI of the GATT that measures against dumped imports will only be undertaken when the appropriate interest of domestic consumers and producers have been considered.

- Lesser duty clause: this clause seeks to reduce the magnitude of the duties imposed so that they do not have to be equal to the dumping margin, but to a

[27] Thirteenth Annual report from the commission to the EU parliament on the community's AD an anti-subsidy activities, 1995. p. 15.
[28] ibid.
[29] Seventeenth Annual report from the commission to the EU parliament on the community's anti-dumping and anti-subsidy activities. Brussels 08/09/99 COM (1999) 411 final.

margin that will remove the injury caused to the domestic industry by the dumped imports.

Upon accession, New Member States (NMS) will have to adapt their trade policy to that of the EU thus incorporating the community interest test and the lesser duty clause into their current AD policy.

7.8.4. The Trade Diversion Effects of EU Anti-Dumping Policy

The accession agreements undertaken by the EU and CEECs have conceded duty free access to 95 *per cent*[30] of CEEC imports towards the EU 15 (the remaining 5 *per cent* concerning mainly agricultural products). Thus the trade balance between the new member states and the EU-15 is not likely to change enormously upon accession. The main change that will affect trade between the two parties is the removal of all contingent protection from the EU. Antidumping and anti-subsidy activities will cease. We will analyse the possible effects of the removal of anti-dumping actions from the EU targeted at the NMS. The European Union has been a prolific user of anti dumping measures; during the 90s the EU initiated 349 proceedings of which 38 were against future accession countries. 17 (44.7 *per cent*) of these investigations ended in the imposition of definitive duties, 8 (21.05 *per cent*) were resolved by price undertakings and 13 (34.2 *per cent*) investigations were terminated with no imposed penalties. The apparent trend in AD filings from the EU to the then-Accession Countries is significantly biased towards chapter 73, this being *articles of iron or steel* with 36.8 *per cent* of all investigations. Table 46. represents the distribution of AD initiations by sector.

[30] According to the Revue de l'Elargissement, No. 59, English edition 9th February 2004.

Table 46. Incidence of AD Initiations by Sectors for the Period 1991-2000 towards New Member States.

Chapter	Product Specification	Amount of times targeted	NMS Chapter share of exports towards the EU
73	Articles of Iron or Steel	14	3.9464%
31	Fertilizers	7	0.8068%
44	Wood and Articles of Wood; Wood Charcoal	5	4.6556%
72	Iron and Steel	5	3.6990%
56	Wadding, Felt and Nonwovens: Special Yarns; Twine, Cordage, Rope and Cables	3	0.1290%
25	Salt: Sulphur; Earths and Stone; Plastering material, Lime and Cement	3	0.9464%
79	Zinc and articles thereof	1	0.1590%
Total		38	14.3422%

Note: NMS refers to Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia.

Source: Authors calculations taken from the EU annual report on antidumping and anti subsidy activities.

The share of new member states targeted chapter exports in total exports towards the EU shows the possible range of trade distortion that AD will have upon trade between the two parties during the period under investigation. The results obtained show that the above seven chapters represent 14.34 *per cent* of exports from new member states to the EU. The following analysis will try to shed light on the possible distortions to the 14.34 *per cent* of trade that *may* be affected by AD. This figure by no means cast a maximum on the effects of AD on NMS, but is useful in understanding what proportions of trade we are talking about in the following section.

Revealed Comparative Advantage in Targeted Chapters

In order to further understand the nature of AD targeting towards NMS, we look at the Revealed Comparative Advantage of the above mentioned chapters so as to ascertain the competitiveness of the targeted industries.

Box A. Calculation of Revealed Comparative Advantages (RCA)

Commonly RCA bears the name of its inventor and is known as the Balassa index. The RCA is calculated using the Balassa (1965) index. This measures the specialisation of countries in given sectors by comparison to the rest of the economy. We compare NMS trade with the EU as a benchmark and thus calculate the RCA relative to the EU.

This is calculated using the following equation:

$$RCA = \left(\frac{X_{i,j}}{\sum_i X_{i,j}} \right) \div \left(\frac{\sum_j X_{i,j}}{\sum_i \sum_j X_{i,j}} \right)$$

with $X_{i,j}$ = exports of sector *i* from country *j*.

The numerator represents targeted chapter exports to the EU divided by overall chapter (all chapters) exports of NMS to the EU. The denominator is chapter imports of the EU divided by overall chapter imports (all chapters) of the EU. When RCA > 1 then the sector under investigation is said to have a revealed comparative advantage. Conversely when RCA < 1 then the sector does not benefit from a revealed comparative advantage.

The results of the analysis using the method as explained in Box A for the chapters under investigation reveal the following.

Table 47. Revealed Comparative Advantage for Targeted Chapters

Chapter	Product Specification	Average RCA*)
73	Articles of Iron or Steel	3.400
31	Fertilizers	2.986
44	Wood and Articles of Wood; Wood Charcoal	2.785
72	Iron and Steel	2.535
56	Wadding, Felt and Nonwovens: Special Yarns; Twine, Cordage, Rope and Cables	1.263
25	Salt: Sulphur; Earths and Stone; Plastering material, Lime and Cement	2.163
79	Zinc and articles thereof	2.328

Source: COMEXT-database.

Note: *) The value reported is the average RCA for the period 1992-2001.

As can be clearly seen all the targeted chapters show a very important positive RCA. This shows that AD targeting is mainly towards those sectors which show a revealed comparative advantage. The removal of AD measures will allow the targeted sectors to reap the benefits of their comparative advantage. Hence, accession to the EU can be expected to yield an additional benefit to CEECs in the form of discontinuation of AD measures levied against them.

The negative impact of AD can be measured by analysing the diversion of trade from countries that are named by the petition to those that are not, this is know as the *trade diversion* effect.

Trade Diversion

The trade diversion effect analysed by the literature[31] discriminates between named and non-named countries. It reports the apparent trend of non-named countries *taking over* trade from named countries, thus reducing the effectiveness of AD as a tool for keeping imports out. Our concern lies on the direction of this trade diversion within NMS, the EU and the rest of the world.

[31] Studies such as Prusa (1996), Vanderbussche et al (1999), Brenton (2001) and Lasagni (2000)

By separating the non-named category into three sections we can investigate whether trade is diverted to non-named countries within the EU, in NMS or towards other world producers. We shall also discriminate between the outcomes of the investigations[32]. The results are reported below.

Box B. Calculation of effects of anti dumping on trade between NMS and the EU

In order to calculate the trade effects of AD, the framework introduced by Prusa (1996) (and expanded by Lasagni (2000) for the EU) is used[33]. This consists of creating a dataset containing trade values of imports towards the EU of both named and non-named countries. However, Cross-case comparison is not always relevant when large differences in trading volumes exist, this is the case for most of the data. This called for the use of differing techniques so as to allow comparison. Time was normalised using t_0 as the year of initiation and subsequent years with the corresponding suffix depending on how many years had passed since initiation so that t_1, t_2 t_3 and t_4 represent respectively trade values 1,2,3 and 4 years after the investigation has been initiated, these lie between 1992 and 2001. Furthermore to allow for cross-case comparison percentage changes of trading volumes were computed using the year of initiation of the AD investigation (t_0) as the benchmark following this equation:

$$\Delta\, imports_{i,t}^{j} = \frac{\left(imports_{i,t}^{j} - imports_{i,t0}^{j}\right)}{imports_{i,t0}^{j}}$$

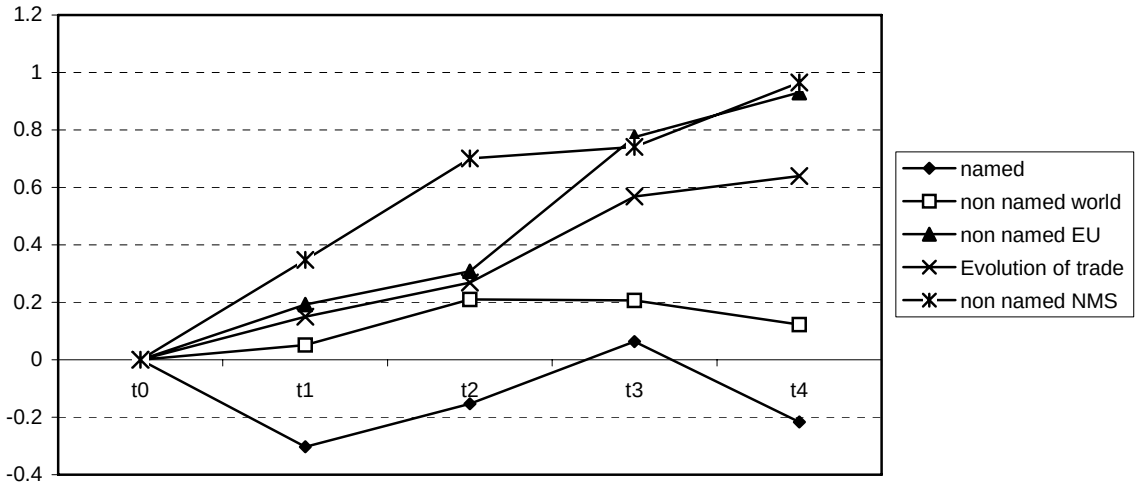
with i = (1,..., 38), t = (t0,..., t4), and j = (named, non-named EU, world and NMS).

So that the change in imports of good i at time t is equal to the imports of the product at time t minus the import of the products at time t_0 (initiation of AD investigation) divided by the value of imports at time of initiation. The j is to differentiate between named countries and non-named countries (in the EU, in NMS and in World).

[32] These can be resolved by termination of the investigation, agreement on a price undertaking or the imposition of definite duties.
[33] Other notable cases, Brenton (2001) and Vanderbussche et al (2001)

When an AD investigation ended in the imposition of definite duties, the results reveal the following reaction in trading patterns.

Chart 14. The Trade Effects of AD duties on named and non named countries



Source: Authors' calculations using EUROSTAT.

As can be seen in chart 14. there is a negative effect of AD duties on named new member states by reducing trade with the EU for the goods under investigation by over 20 *per cent* in the first year. After that, we see a recovery of trading patterns. More interestingly we also note that the share of trade of non-named new member states goes up quite significantly. We use the evolution of trade throughout time as a counterfactual showing how trade should have evolved during the period under investigation and thus note that named country trade is well under the evolution of trade line thus showing that the negative effect of AD on named new member states is of greater magnitude than 20 *per cent*. We can also see that there is a significant diversion of trade when AD is imposed towards non-named new member states. This can have many implications. It allows us to make inference on the similarity of composition of industry across new member states, and show that there appears to be a trade diversion effect. When an AD investigation ends in the imposition of duties, named country exports suffer but non-named new member states exports increase. The imposition of duties also seems to benefit EU producers but very slightly.

When an AD investigation ended in a price undertaking, the deviation of trade from its value before investigation revealed little change in trading patterns. The data showed a fall in named country exports for the goods under investigation in t_1, followed by a quick rise in the following year tending towards the evolution of trade line. Prusa (1997) indicated that there tended to be a negative effect on trade during the period of investigation, largely caused by the uncertainty of the outcome of the investigation. This

he termed the investigation effect. When an investigation is terminated there appears to be no negative effects on named country exports for the goods under investigation. However, non-named NMS exports show a significant increase.

These results must be put into perspective. We must look at the trade values in order to assert the magnitude of the effects of AD on trade. Named country trade with the EU represent but a fraction of total trade both within and outside the EU for the goods under investigation. Total trade for the period under investigation between new member states and the EU amounted to an average of 53 billion EUR. The average amount of trade directly affected by AD was but 795 million EUR. This amounts to a mere 1.5 *per cent* of total trade with the EU. We thus note that although the effects of AD on new member states are quite significant individually, the amount of trade that is directly affected by these is only 1.5 *per cent* of all trade between the two parties. It must be noted that these are the direct effects of AD on the named products. There may exist the presence of other effects of AD not investigated in this study. The existence of a *trade deflection* effect needs to be inspected.

Trade deflection reflects the tendency for countries to adjust their trading patterns as a result of AD. Due to the highly specific nature of AD, countries can switch production at low costs from a highly disaggregated good which has suffered the imposition of AD duties to a *like* good[34] that does not face AD duties. Thus escaping the AD duty, this can be seen as the *trade deflection effect*. The counteracting effect is the so-called *deterrence effect*, which encompasses the probability of new AD filings on the import-deflected goods and thus causes the targeted industry to be deterred from production.

The significance upon trade of the trade diversion and deterrence effects have yet to be calculated, however the magnitude of the effects are kept in the perspective of the estimated distortion of 14.34 *per cent* of trade stipulated above.

We can thus conclude that the effects of AD on new member states produce great distortions in targeted industries whether these be from named or non-named producers. However the overall direct effect is very small and amounts to 1.5 *per cent* of trade being distorted. The trade deflection and deterrence effects may affect a greater share of trade and thus need more investigation. Furthermore we have identified that the trade diversion effect is present between named and non-named new member countries. This stipulates that when a named NMS suffers the imposition of duties, there is a counteracting benefit to non-named NMS industries which 'take over' named country

[34] A like good in this instance can be described as a good of a parallel 8-digit category or higher digit category normally within the same 4-digit category.

exports. We can thus say that the identified trade diversion effect of AD shows that the trade effects upon accession are going to be of small magnitude. However the analysis of the RCA of the targeted industries reveal that the removal of AD measures will allow new member countries' targeted industries to reap the benefits of their comparative advantages and thus grow without suffering distortions to their trading patterns.

7.9. Regulation

The creation of the new network of competition authorities coincides with a new phase in EU regulatory structures, the attempt to introduce a degree of subsidiarity into the rule making system. In a variety of areas such as telecoms, competition and food safety the EU is introducing a system whereby the Community authorities will act as a supervisor of national authorities rather than the final legislator in every case. The area where there is most pressure is food safety. This is of particular interest to CEECs as their food and food-processing industries may be subject to very strict regulations in the rest of the EU. It seems that the new flexibility will not necessarily be to the advantage of CEECS in that it will mostly allow a margin of flexibility *upwards.* In the long run this may be on the interest of CEEC consumers and producers but in the medium term it will mean higher costs for producers and consumers with less risk averse tastes.

IV. CONCLUSIONS AND POLICY IMPLICATIONS

Intensified competition, unhindered access to European markets, technology import, transfer, and spill-over, as well as the participation in the European division of labour (associated with specialisation advantages) are amongst the market forces that can be assumed to be best suited to produce the most efficient market result of integration (allocative efficiency). If, however, the political aim of economic coherence (*i.e.* income convergence) is defined to be an overriding objective, then the result produced by market forces through real economy integration might prove to be an undesired one: in fact, past experience, as well as modern theory, suggest that integration results need not fulfil the political aim of income convergence in all cases. Rather, convergence clubs have typically emerged between groups of economies or regions according to common country-specific criteria (either as initial conditions or as having emerged during integration as a market effect). Integration is assumed to be a necessary condition for real economy catch-up, but could prove to be insufficient to produce the political objective of income convergence, and a case can be made for political intervention. In the case of Central East European economies, such policy-intervention could subscribe to the aim of preventing a 'club' of less developed economies in CEE.

Our analysis in the project was able to identify a large set of determinants of productivity gaps *vis-à-vis* West Europe. Focussing on such determinants would assure efficient policy targeted at the particular conditions prevailing in CEE. Due to the methodological design of the study, we, however, are unable to identify a ranking order of determinants empirically. For this, a macroeconomic modelling approach would be necessary. Such a method, however, would depend on the availability of sufficient data on relevant determinants. Such knowledge, however, was so far unavailable. On of the main achievements of the project was the construction of such knowledge, in particular, such knowledge is comparable in nature (both between CEECs and in comparison with West Europe). A future research effort could attempt to perform such a macroeconomic, or rather macro-determinant analysis in a modelling framework by use of the knowledge generated. Such an project, however, would command significant effort in terms of scale and in particular in terms of econometric expertise.

In the following, we turn to the main policy-conclusions generated from analysis in the individual workpackages.

1. Specialisation patterns in domestic production

- Results of analysis into emerging sectoral specialisation patterns suggest that for some new member states, market forces through integration and liberalisation might turn out to produce conditions which are not conducive to swift economic catching up.[35] Political support or intervention could hence be desirable, however, not in the form of enforcing a 'more desirable' sectoral structure. Policy-measures could rather be geared towards assisting sectoral flexibility and change, and could become important determinants in some of the countries' prospects for catching up.

- Political intervention supporting flexibility of employment and capital allocation with a view on sectoral change (as called for in the EU's second cohesion report) could prove to be a decisive factor in the cases of the Slovak Republic, Slovenia, and possibly Poland. Those countries' patterns of sectoral structures increasingly imply a limit to the prospects for real convergence (if some degree of path dependency of sectoral structures is assumed at least for the short to medium term). In the case of Hungary, sectoral structures explain a large share of the national productivity gap, yet at variance with the afore-mentioned countries, the country's sectoral content did not increase in recent past. Sectoral patterns appear to be indifferent with respect to catching up prospects in the cases of Estonia and the Czech Republic.

- In this respect, CAP, and in particular where this policy takes the form of direct income-support, is most detrimental to the countries' prospects of catching up: we could expect CAP to retard employment shifts from agriculture to other sectors, mainly (relatively smaller) enterprise-related services. In a scenario where the agricultural sectors remain relatively larger on a long-term basis due to comparative advantages, the method of direct income-support would also be ill-advised: in the new member states where the agricultural sector plays an important role in explaining the national productivity gap (as in the Slovak Republic and Estonia, and possibly Poland), this is paralleled by above-average productivity gaps in this sector. A support of technological advancement could be expected to produce more sustainable comparative advantages as compared to income subsidies.

[35] This has been the result of analysis of effects of specialisation patterns on catch-up prospects and is not an argument of infant industry at the micro or mezzo level.

- The industrial sector proved to be the one sector most responsible for national productivity gaps. Hence economic policy could be most efficient if focussed on the qualitative development of industries in new member states. Industrial support need not however target the relative sizes of industrial sectors in terms of employment, as new member states typically still have some degree of over-manning in industry. Qualitative development could either support structural change between industrial branches of different technological intensities, or target directly technological and organisational upgrading within industries.[36]

- Analysis into industrial specialisation patterns evolving in the course of intensifying integration generated a model projecting future potentials for productivity growth. According to the results, the industrial structures of the Slovak Republic, Slovenia and Hungary are predicted to contain the most favourable prospects for swift productivity growth, whereas Estonia and Poland are ranked at the bottom of the list. Prospected for the Czech Republic are rather ambiguous. In general, however, our analysis leads to expect sectoral adjustment within this sector to actually accelerate productivity catch up: if past trends in sectoral adjustment persist, then adjustment itself will have a positive statistical effect on productivity growth. This however, crucially depends on whether sectoral adjustment will actually benefit those sectors that are associated with above-average productivity growth potentials. If sectoral patterns were rather to evolve to resemble patterns in southern EU cohesion countries, then productivity growth and eventually catch up would be prolonged. This, however, does not suggest that economic policy should step in and promote the growth of particular sectors:

    - first, structures develop according to market interaction and additional supply would not necessarily meet additional demand;

    - second, in terms of the theoretical background, the direction of causality runs from technology to sectoral structures: whilst patterns determine prospects, an autonomous change in patterns is unlikely to change technology, that is, only if the emerging structures are sustainable - and this depends on technology advance.

So, even faced with an 'unfavourable' development of sectoral structures, economic policy would only be efficient if targeted at the determinants of sectoral change. In the

[36] Incidentally, such policies can also increase the flexibility of production factors between broad sectors to promote the kind of sectoral change in the countries, for which analysis pointed out the desirability of political intervention for productivity catch-up.

situation of already fully liberalised trade, such an objective could only be met by polices in support of technological development (*e.g.* R&D), technology transfer (*e.g.* FDI), education and training programmes.

2. Specialisation patterns in foreign trade

- Analysis of foreign trade identified the prevalence of a quality-product-cycle between the current EU and the new member states: the quality advantage of the EU in mutual trade is overwhelming and appears to still grow as of lately. The main advantage of new member states was found in costs. Pure reliance on (wage) costs might have been amongst the causal factors or a driving engine behind the emergence of the quality-product-cycle via vertical intra-industrial trade. Such patterns do support technological upgrading. However, catch-up will only occur if technological upgrading in new member states is in fact faster than in the EU which is not a typical feature of product-cycle patterns. In particular, analysis suggests that strengthening the role of technology policy in new member states might be more efficient as compared to attracting FDI to overcome this pattern in trade between the integrating partners.

3. National innovation systems and capacities

The analysis into national innovation systems (NSIs) in CEECs distinguished between 'broad' and 'narrow' NSIs. The results and their interpretation in terms of economic policy also differ between the two distinct systems. The analysis has resulted in several suggestions to change the orientation of economic policy.

- The radical reduction of public funding for entrepreneurial and institutional R&D might have been a necessity of transformational recession. However, the identified lack of a coherent long-term policy in restructuring S&T and in particular R&D systems led to insufficient restructuring of industrial R&D. Only the Europeanization process provided some guidance on the reforming of the individual countries' broad NSIs. In fact, the Europeanization process might have had a greater effect on the building of NSIs in CEECs than public policy itself. This opens the opportunity to couple the reinventing of NSIs with the formulation of EU policies for the new member states.

- Notwithstanding country-specific differences, the analysis of determinants of broad NSI-development suggests an order of priority for economic policy from demand-determinants, to R&D-incentives, and to technology-diffusion-determinants. In this respect, *e.g.* Slovenia has a smaller gap in R&D and absorptive capacities, whereas

Estonia's main strengths lie in demand and diffusion-determinants and weaknesses in R&D. It is important to notice, however, that policy should not follow an exclusive focus on only a sub-sample of these determinants: analysis clearly suggests that innovation is a multidimensional and a multilevel activity. Still, in general, absorptive capacities are currently relatively better than R&D capacities in CEECs. Today, with the demand-determinants having improved markedly in CEECs, the latter can be considered a particular bottleneck to be targeted by economic policy.

- The analysis furthermore established that CEECs have lost some of their advantages in terms of size of R&D which they inherited from the socialist period. In addition, production capabilities (indicated in the analysis by ISO9000 certification) in combination with technological capabilities (size of R&D employment) proved to the most influential determinants of GNP per capita on a macroeconomic level.

- Distinguishing between technology-using and technology-developing perspectives in the narrow NSIs, the analysis hence suggests that production capabilities (*i.e.* determinants of firm-specific productivities, hence non-R&D activities) play a dominant role in today's development of CEE-NSIs. At the firm level, improving absorptive capabilities today can accelerate firms' technology adoptive ability. In other words, firms need to make the transition from 'mastery of production' to improved technological capabilities.

- In terms of policy, this would require a re-orientation of R&D systems from the current exclusive orientation on knowledge-generation to one that is more focussed on knowledge diffusion as well as absorptive capacities.

- Finally, the results suggest that economic recovery in terms of growth did not automatically trigger a likewise recovery of demand for domestic R&D and innovation. Rather, a further condition for improvements in the latter lies with a sound restructuring of both narrow and broad NSIs, functioning financial systems, efficient mediation between supply and demand for R&D and innovation, and with the emergence of public-private and local-global interfaces and interactions.

- In conclusion, our analysis points to a gap between production and technology determinants of productivity in CEECs on the one side and innovation policy to support the closure of this gap on the other. Policies that can assist in closing this gap cannot be confined only on narrow NSIs and oriented only towards the generation of new knowledge but also have to embrace knowledge absorption and

diffusion functions of R&D systems and could better assist integration of narrow and broad NSIs through effective demand-oriented measures. Due to differing 'innovation constituencies' in each CEEC, NICs reforms, however, cannot follow a simple benchmarking methods in the design of policies. Rather, country-specific gaps and weaknesses need to guide economic policy. Those differences include the share of large enterprises (active in business R&D), MNCs being either active as innovators or more confined to low-cost operations. In terms of causality, the analysis would suggest that a positive role and attitude of the state may facilitate the establishment of innovation policies ahead of the current level of demand for innovation policy, *i.e.* despite a weak 'innovation constituency'. Equally, the level of innovation policy may be behind the actual or latent demand from enterprises and other organisations.

4.Technology transfer via foreign direct investment

The Slovak team came to the conclusion that the use of data mining techniques in this type of application is a complementary rather than an alternative method to the statistical approach. A combined approach (*i.e.* data mining plus statistical methods), however, bears several benefits. The potential advantages of the data mining approach result from differences between association rules and correlation coefficients:

- Correlation coefficients define dependency between variables, association rules define dependencies among concrete values of variables, that means association rules provide more detailed information.

- Correlation coefficients are symmetrical, association rules are in general asymmetrical. Association rules can thus provide more insight about how variables influence each other, especially if the relationship is highly asymmetrical, *i.e.* if the confidence for the rule $X \Rightarrow Y$ is significantly different from the confidence for the vice-versa rule $Y \Rightarrow X$.

- Association rules in general associate two or more variables (or strictly speaking between their values), correlation coefficients define relationship only between two variables.

But differences among these approaches can also be evaluated on a more general level: traditional approaches are deductive *i.e.* the researcher formulates a hypothesis (*e.g.* "FIEs where foreign owners have a majority in equity share exhibit higher increases in productivity"). It is then tested whether the collected data are in harmony with the formulated hypothesis or not. However, data mining techniques can support also an

inductive approach – one would specify the required minimum confidence and the data mining tool would generate all the association rules with confidence higher than the specify minimum confidence.

In any case, the application of this approach on the CEE subsidiary database would warrant further research, including the testing of other data mining techniques (*i.e.* other than the Apriori algorithm), additional cross-country analysis of the results of data mining, and other statistical methods.

The Estonian team conclude that, from the perspective of technology and knowledge transfer through FDI and the innovation potential, neither excessive dependence and/or control by the headquarter nor excessive independence or autonomy from the headquarter is good, especially in CEE countries today. Excessive dependence impedes the potential for increasing the subsidiary's own absorptive capacity and excessive independence might leave the local unit in a circle of "internationally uncompetitive" knowledge. It is even supposed to be good to lose some autonomy and in return being granted access to the kind of knowledge and technology that was missing and parent company-specific. However, today, subsidiaries have to move from knowledge and technology adaptations towards knowledge and technology development. Having own capabilities, the subsidiary could get more mandates over individual business functions and engage into technology and product development co-operation with the parent companies (reverse technology transfer) and the local or host economy. Therefore, being constrained by a shortage of knowledge and technology, subsidiary-managers should strive be more active in their relationship with their headquarters. The relatively low technology autonomy of subsidiaries in CEECs is expected, at this stage of development, to contribute to the intensity of the transfer of knowledge and technology.

From their analysis, the team concludes for economic policy:

- The government should provide systematic analysis of the development of foreign subsidiaries, inclusive knowledge and technology level, and should target subsidiary-managers to embrace more active international co-operation in specific business fields.

- The government should systematically increase the absorptive and technological capacity of domestic firms and foreign subsidiaries, *e.g.* through human resource, and management capabilities development. This could prove to be decisive especially in specific industrial sectors. Economic policy could additionally target firms' managers to intensify their co-operation (*e.g.* in product and process

development) with related industries (this suggestion is related to existing industries).

- The government could induce the creation of knowledge and production clusters (indirect effects from more value-giving industries/firms are expected).

The Slovenian team is focussed on the determinants of productivity growth at the subsidiary level. Their empirical analysis shows that industrial integration through FDI led to considerable increases in productivity, technology and quality, as well as in sales and exports. The regression models suggest the following conclusions about the productivity growth and control in foreign subsidiaries:

- The level of foreign parent companies' overall control and the level of their control of marketing and strategic functions seem to be the most important determinants of productivity growth in foreign subsidiaries in the Slovenian manufacturing. The higher the foreign parent's control overall, as well as of marketing and especially of strategic functions, the higher the productivity growth in subsidiaries. Foreign parent companies seem to seek control of strategic and marketing business functions and leave operational control to subsidiaries themselves.

- The pattern of control and productivity growth holds regardless of the inclusion of foreign equity share dummy in the model or not. The level of foreign equity share as such is not a determinant of productivity growth, and foreign equity share does not seem to be an alternative for foreign parent companies' control of marketing and strategic business functions. The control of marketing and strategic business functions is obviously important *per se* and is probably based on factors like technology, marketing and supply channels *etc.* Foreign parent companies are eager to exercise control over marketing and strategic functions, regardless of whether they hold majority or minority equity share. In other words, the level and mechanisms of control of individual business functions seem not to be related to the level of foreign equity share.

The model points to some other determinants of subsidiaries' productivity growth. The first is subsidiary size; large subsidiaries have significantly higher average change in productivity compared to small and medium sized subsidiaries. The second is the proportion of sales to foreign parent company; subsidiaries with higher proportion of sales to foreign parent companies or to other foreign buyers experience higher changes in productivity level. The third is that, in two variants of the model, subsidiaries in high technology intensity sectors exhibit significantly lower change in productivity than subsidiaries in other sectors.

All in all, the more subsidiaries are integrated into foreign parent companies' - marketing and strategic management, and export flows wise - the higher productivity growth they experience. To keep marketing and strategic control in the hands of foreign parent companies seems to be the main determinant of subsidiaries productivity growth. Foreign parent companies are eager to keep marketing and strategic control regardless of the equity share they have.

The results of research by the Slovenian team point to the some policy conclusions:

- Industrial integration through FDI led to considerable increases in productivity, technology and quality, as well as in sales and exports. The new EU member states should apply an active policy of FDI inflows promotion, because this will speed up their catching-up process. This policy comprises all the standard FDI promotion tools, as used by the most successful FDI host countries, *e.g.* Ireland, Portugal, Netherlands, Belgium, Czech Republic, Hungary *etc.*

  The higher the foreign parent's control overall, as well as of marketing and especially of strategic functions, the higher the productivity growth in subsidiaries. Foreign parent companies seek control of strategic and marketing business functions and leave operational control to subsidiaries. Any attempt of a host country to legally influence the level of foreign parent's strategic and marketing control and/or of foreign equity in foreign subsidiaries may have an adverse effect on the productivity growth of these subsidiaries. None of the analysed countries, however, have or intend to have any restrictions in this regard.

- Large subsidiaries have significantly higher average growth in productivity levels compared to small and medium sized subsidiaries. There seems to be a rationale for giving some specific incentives to FDI projects above certain size.

- Subsidiaries with a higher proportion of sales to foreign parent companies or to other foreign buyers experience higher productivity growth. Obviously, higher export orientation of subsidiaries and their more intensive integration into foreign parent companies' network bring additional productivity gains. This speaks in favour of stimulating efficiency-seeking (vertical) FDI, *i.e.* FDI projects which are part of foreign parent company's integrated international production strategy.

- Subsidiaries in high technology intensity sectors exhibit significantly lower productivity growth than subsidiaries in other sectors. The fact that it is FDI in high-tech industries, which experience the lowest productivity growth, shows that the new member states still lack the necessary elements and appropriate

environment for a competitive involvement in high tech industries. Even when it comes to FDI in high tech industries, foreign investors are mostly engaged in the lower-end segments and transfer less than up-to-date technologies, which reduces the impact on productivity growth. It seems that the new EU member states could not rely to a major extent on FDI when attempting to catch-up in technologically advanced industries. Here, endogenous efforts are indispensable. The policy of specific stimulation of FDI in high tech sectors could only be partially successful. The real policy advice would be reform and development in the fields of education/human resource creation, R&D, innovation *etc.* This would efficiently create a preferable environment for more high-tech FDI in these countries.

All the above policy suggestions should be combined with a policy of strengthening the so-called spillover effects of FDI, *i.e.* of linkages between foreign subsidiaries and domestic enterprises.

The Hungarian team developed an innovative taxonomy of subsidiaries in respect to the level of autonomy from parents and the extent of abilities to adapt the foreign technology received from parents to function efficiently in the environment of the host economy. The analysis distinguishes between internal (between parent and subsidiary) and external (between subsidiary and the host economy) technology and knowledge transfer. The analysis of potentials for internal and external technology and knowledge transfer focussed on country-specific differences.

- The taxonomy would suggest that the Hungarian FIEs contain quite large potentials for internal technology transfer and display relatively intense adaptation of foreign technology received from their parents. Hence, our Hungarian FIEs are well endowed with conditions for an intense internal dynamic technology transfer between parent and subsidiary (including reverse technology transfer). In our analysis of external technology transfer potentials, however, we established that both material and non-material vertical links to the host economy rather suggest limited potentials for external technology transfer. Only with respect to the sources for finance did our analysis suggest an intense role of the host economy in the operations of foreign investment subsidiaries in Hungary. This could be interpreted to signify what is typically termed a dual economy: well developed and mature subsidiaries, however with little contact to the host economy. Additionally, the share of OPT-kind FIEs appears to be significant in Hungary.

- The Estonian and Polish FIEs of the database play a comparatively important role in their host economy, both in forward linking business and the latter country-FIEs

also in supplying areas of competitiveness and serving as sources of finance. In the taxonomy, however, both country's FIEs rather featured 'premature autonomy' and inability to adapt the foreign technology to their own needs. In the case of Poland, this is mainly due to the strong market-orientation of FIEs. Therefore, the potentials for external technology transfer would be significant in both countries, if only our FIEs would signal to us larger potentials for internal technology transfer - in their current situation, potentials for technology transfer via FDI subsidiaries are rather low for both countries.

- In the case of the Slovenian FIEs, the analysis both suggests rather low potentials for internal technology transfer mainly rooted in the lack in adaptive abilities. At the same time, vertical linkages with the host economy for sales and procurement are comparatively less intense. Only with respect to the non-material linkages supplying areas of competitiveness and FIE-finance could we establish an above-average roles for the country's respective host economies. In total, however, our analysis suggests rather limited potentials for technology and knowledge to diffuse from parent to subsidiary and further on to the host economy.

- In the case of the Slovak FIEs, potentials for technology transfer today appear low according to our taxonomy, yet with FIEs maturing, a brighter future might lie ahead. In particular, the conditions for intense dynamic technology transfer between parent and subsidiary in the future are well in place and await their exploitation. In regard to the conditions for high potentials for external technology transfer were results rather mixed: in our analysis of backward and forward linking activities, we established intense networking activities, but also a high share of FIEs fulfilling our criteria for OPT-kind of subsidiaries. The intensity of non-material linkages are likewise rather average across our country-samples. In sum, we have to conclude rather small potentials at this point of time whereas we expect the potentials to rather increase in the future.

For technology transfer via FDI to be particularly intense, advanced foreign technology first has to be installed in the foreign investors' subsidiaries. Only then can technology flow into the rest of the host economy. Hence, in a first step, economic policy can strive to assist subsidiaries to learn how to adapt foreign technology (*e.g.* in programmes matching up networking partners). A high level of adaptive ability turned out to be the most decisive factor for the subsidiary developing along the FIE learning curve. Once up this curve, the subsidiary is then apt to engage into the dynamic form of technology transfer in a two-way interaction between the investor and its local subsidiary.

In the second step, economic policy can try to increase the intensity of technology flowing from foreign subsidiaries to the local economy. Motivating foreign subsidiaries to increase local content could serve this objective. Restricting foreign direct investment below a threshold level of local content, however, works against the market and is hence not efficient: foreign investors can only be successful if allowed to follow the kind of strategy they derive from their analysis of the market. Policies could be targeted at assisting local firms with the kind of networking, technological, and managerial upgrading necessary in business with foreign investors. Additionally, local content need not consist of procurement of semi-finished products, material, or personnel (in particular in the higher qualification bracket), but just as well of business services supplying those areas of subsidiary-competitiveness, our analysis identified as particularly important across the whole sample of subsidiaries interrogated. Finally, local banks supplying sources of finance could learn from foreign subsidiaries in terms of business plan management and risk assessment strategies. In some cases, this could consist of management education programmes, as potentials are often not sufficiently perceived.

The German team added another taxonomy-related analysis to allow country-independent analysis of potentials for technology transfer. They conclude:

- *MNC strategy matters*: Subsidiary strategy is a significant determinant of technology transfer independent from country effects. The results show that highly integrated and export oriented FIEs (type III and II) are more likely to achieve productivity growth, and production technology upgrades and to a lesser extent quality improvements. Medium integrated and domestic market oriented subsidiaries (type I) show significant probability to benefit from increased levels of quality. Autonomous subsidiary (type IV) strategy has no positive significant impact on technology transfer. Within group estimations showed that coefficients of the other variables have different significance levels and/or signs depending from the strategy.

- *Trade as Technology Transfer Channels:* Given the general trade patterns of subsidiary type II and III it can be argued that intra-MNC trade has a decisively positive impact on technology transfer. Furthermore, a higher export share for receptive subsidiaries increases productivity as well as quality. Whereas, a higher share of imports increases the likelihood of productivity and technology improvements for type II subsidiaries. Given the fact that Type II and III FIEs have also on average the highest foreign equity shares, it can be argued, that FDI and international trade are complementary rather than substitutes for technology transfer.

- *Explicit channels for technology transfer via inward FDI or FIE initiative:* The evidence shows that all areas of business functions and initiative can work as explicit channels of direct technology transfer. However, most frequently and significant is the direct technology transfer via marketing business functions and questions related to product scope. On the other hand FIE initiative with regard to the general organisation of business functions and technical product development pushes forward FIE development in terms of technology. However, there are significant differences depending on respective subsidiary strategy adopted. For type I subsidiaries marketing business functions are explicit channels for positive technology transfer. The more closely integrated type II subsidiaries benefit in addition to from foreign parents initiative in product and market scope. The difference might be explained by the export orientation of type II subsidiaries. Interestingly, for the most integrated subsidiaries (type III) dependency has a negative impact on productivity growth and technology upgrades. Low integrated type IV subsidiaries benefit from technology transfer via operational and strategic business functions as well as from parent initiative with regard to product scope.

- *Dynamics of FIE development:* From the perspective of FIE development and somehow simplified stronger foreign parent initiative and co-ordination is required for the group of autonomous subsidiaries. There is still room for stronger foreign parent engagement in medium integrated/export oriented FIEs. On the other hand higher subsidiary initiative and autonomy pays off for receptive FIEs and medium integrated and domestic market oriented subsidiaries (see Figure 9.). Our evidence shows that a differentiated approach to further FIE development depends on the current adopted subsidiary strategy (degree of integration reached), market orientation (export vs. domestic market) and the particular business function and/or area of initiative in question.

The Polish team conclude that:

- A large degree of dependence is observed in the case of investment finance, product price, process engineering and product development. The overall conclusion is that the prices affect the cash flow between the parent and subsidiary. Investment finance is an area included in a range of strategic areas of managing international concerns and is not transferred to subsidiaries.

- This confirms the proposition that the dependence on the foreign owner decreases after the period of development of subsidiaries utilised for learning. In conclusion, the process of maturation of subsidiaries is accompanied by the growth of their

autonomy and results in the rise of headquarters confidence in the management boards of local subsidiaries. An argument for confirmation of the statement is the fact that subsidiaries of foreign investment enterprises in Poland rarely employ foreign citizens in managerial positions. One fifth of interrogated enterprises declare employment of foreigners as managers or technical specialists.

- The rise of areas of enterprise operation imposes the process of delegation of authority, which is indispensable for the effectiveness of the enterprise and is confirmed by the gathered empirical material. The enterprises with more than 10 business lines indicate a relatively higher level of autonomy in all business functions (with the exception of marketing research). In conclusion, the growth of the number of business lines affects the growth of the autonomy level, which is quite normal.

- The participation of national partner produces the need for taking their objectives into consideration. The smaller influence is indicated by the enterprises with minority share of the foreign investor. In this case a form of holding management is encountered, which results in the rise of the range of decentralization. A relatively large participation of local partners encourages the spread of authority to the local environment as the result of spillover effects. In contrast, in the case of subsidiaries with 100 *per cent* foreign ownership, the prospects of know-how diffusion are distinctly limited. Along with the rise of the share of foreign investor ownership in subsidiaries, a possibility of unrestrained control increases. In the conditions of transformation in Poland's circumstances, the partner for foreign investors takes the form of the State Treasury in a majority of cases. The role of the treasury is however restricted to holding shares in FIEs (even if substantial) and to controlling the fulfilment of obligations agreed between the investor and the FIE. In the prospect of five to ten years to follow, depending on conditions of the contract, the Treasury shares are to be sold to the strategic investor. Nevertheless, the presence of national shareholders restricts the autonomy of foreign investors.

- Greenfield investment is characterized by larger convergence of structures and behaviours in relation to the parent enterprise, which could be associated with the stronger dependence of subsidiaries on foreign investors in terms of decision making. The Polish group includes a large number of enterprises with 100 *per cent* foreign ownership in capital. The development of greenfield investments is slow due to their character. The headquarters cautiously select local partners in terms of the adaptation to the culture of the corporation. This is later reflected in the submission of subsidiaries in relation to the foreign partner.

- Within the group of medium-high technology FIEs, the planning of the majority of business functions is fulfilled by foreign headquarters, in particular in production planning. This results from the protection of investor-specific know-how, the necessity to preserve the investor's technological regime (refer to Ozawa 1979 and Wells 1983), and the centralisation of research activities within the structures of multinational enterprise. The observed phenomenon is associated with a particular disadvantageous feature of capital inflows in the case of the Polish economy, namely the character of FDI for investment. In vestment under the control of foreign investors imposes ready-made solutions with regard to technology and shows strong reluctance to establish more independent research centres in Poland.

5. Productivity and capability in the transition countries: a historical and comparative perspective

The analysis of transcripts of interviews and their triangulation exercise concludes:

- The experience of FDI in Eastern Europe, as documented through our interviews, provides strong evidence that the East-West productivity gap on main production lines is relatively small, and can be closed quite quickly. That means that, as long as wages in the host countries remain well below West European levels there should be ample scope for further, profitable investments. The triangulation process has thrown up nothing to contradict this conclusion.

- The implication is that social capability and technological congruence have not been critical problems on these main production lines.

- It should be stressed that these strong conclusions emerge from a set of interviews involving exclusively West-Central European investor-firms and largely East-Central European host countries. It would be dangerous to extend them to the whole transition region. Our global triangulation exercise reinforces this caveat.

- Investor companies have invested massive resources in training programmes, ranging from full-time secondments to on-the-job training, sometimes on site in the host country, sometimes back at headquarters. These programmes have covered blue-collar as well as white-collar workers. This suggests that one of the reasons why social capability has not been a critical problem is simply that it has been seriously addressed by the companies involved. This conclusion is generally confirmed by intra-project triangulation, though other WPs do raise doubts as to whether training is a factor which significantly differentiates one firm from another.

The positive experience with main-production-line productivity is not matched by performance in relation to ancillary sectors. Investor-firms have generally struggled to build adequate supply networks in the host countries. Where they have persevered, they have done so in the face of a stubborn productivity deficit. Given that lead-company programmes for building social capability have been largely restricted to the in-house dimension this is, perhaps, hardly surprising. There is also a hint that technological congruence problems may be much more stubborn once we move beyond the sphere of Fordist and post-Fordist production lines. Whether that is primarily an effect of fear of technological incongruity on the part of investing firms, or of more objective technological factors, remains unclear. The global literature suggests that the latter factor may be the most important, with the impact of FDI on growth in developing countries strongly and inversely correlated with the size of the 'objective' technology gap between home and host country. Comparison with other work packages within the project confirms our overall conclusion here, but urges caution in relation to its generality. Individual country studies reveal wide differences in precise patterns of linkage, possibly related to differences in underlying resource endowments and related differences in corporate strategy.

- Investor companies have been eager to exploit local training and R&D facilities, but have done so on an essentially casual basis. Teaching of foreign languages and software development are the only two areas where local educational/research expertise is brought in systematically. The implication is that local human capital formation organisations are not playing the role they ought to be playing in the solution of social capability problems in CEE. This is confirmed by intra-project triangulation.

- While investor companies have shown great willingness to help local suppliers to raise their game, they have been short of ideas as to how to actually do it. In practice, help often reduces to simply helping the local supplier to be taken over by another foreign company. This pattern is strongly confirmed by the global literature.

- With strong FDI impacts on productivity trends in FIEs and weak impacts elsewhere, the overall effect of FDI on productivity convergence is likely to be mixed. In FDI target sectors, the tendency to convergence, East-West and inter-country, will be strong. Elsewhere, convergence to West European levels will be slow and difficult, and significant differences between individual East European countries will survive into the long term. This mirrors the global experience.

- The pattern of supply hierarchy in CEE whereby local companies are largely relegated to the status of second- and third-tier suppliers, with first-tier suppliers usually wholly or partly foreign-owned, is not universally reflected in global experience. Indeed, in China the problem is exactly the opposite – domestically owned first-tier suppliers (in this case to the auto industry) are strong, but second- and third-tier suppliers are weak. This in no way invalidates our conclusion on CEE, which is strongly supported by other research on CEE. But it does suggest that patterns of strength and weakness in supply hierarchies may be as much a function of specificities in development paths as of any universal developmental tendency. It is noteworthy that the pattern in Portugal has been more like the East European than the Chinese experience.

- The global experience strongly confirms the case-study results on the importance of two-way technology transfer, or rather on the reverse technology transfer element within that. It does, however, raise serious questions as to whether reverse technology transfer is a positive factor of host country development.

These conclusions are, in a sense, not surprising. It is not surprising that Czech and Hungarian production-line workers can quite easily be brought up to the standards of German workers, and it is not surprising that companies with shareholders to keep happy are not prepared to take on the job of retraining whole nations. There are, nevertheless, critical problems and gaps in the FDI-driven process of catch-up in Eastern Europe. These problems are as much a function of weaknesses in local infrastructure (especially R&D) as of any shortcomings in the management of major foreign investments. The fact remains that, in the outcome, the countries of Eastern Europe may experience uneven, dualistic development, rather than the smooth convergence to West European levels of development which catch-up theory (in principle) predicts. It is now common in Eastern Europe for levels of productivity and real wages in related sectors to vary by a factor of 2:1 and above, depending on whether the companies in question are foreign- or domestically-owned. This is clearly sub-optimal for the host countries themselves. To the extent that it generates social tensions and ultimately impacts on political stability, it could also significantly change the outlook for further foreign direct investment in this critically important area of the 'new' Europe in ways wholly beyond the control of the firms concerned.

Finally, let us return to the main 'unexpected' result of our interviews. The strategies of the companies we talked to are predominantly global strategies. This does not prove that global strategies are generally dominant among firms investing in CEE, but it does

suggest that the global outlook is significantly represented among them. Intra-project triangulation strongly confirms that conclusion.

How is this likely to affect the impact of EU accession on the CEECs? To the extent that multinational investments in the region are cost-driven, and to the extent that enlargement tends to increase real wages in CEE, it will tend to mean a higher degree of onward mobility of investment, which means less FDI in the region. To the extent that the investments are network-building (if, in principle, on a global scale), the removal of frontier barriers and the (putative) improvement of infrastructure, particularly transport, in the new member-states may swing the balance of effectiveness towards pan-European strategies. To the extent that eastwards enlargement unleashes rapid growth in GDP and a boom in consumption in CEE, and to the extent that the new member-states retain significant peculiarities of taste, specifically CEE strategies may emerge – for the first time – in the case of some consumer-oriented companies. In a word, the net impact on levels of FDI could go either way. In that context, we should be that much more cautious about our assessments of the likely overall impact of FDI on productivity in the new member states.

6. Firm-specific determinants of productivity gap

- The analysis of the **Czech team**, consisting of Petr Fiala and Josef Jablonský, used a Data Envelopment analysis (DEA) several multiple criteria decision making framework. The DEA models compare several usually desired outputs with several inputs that influence the productivity in the negative way. In the first wave of analysis of returned questionnaires (machinery manufacturing and furniture industries) there were taking into account four inputs: total costs, the number of workers, labour costs and floor space available for production processes, and two outputs: turnover of the firm and market share of the most important product of the firm. In the second wave of the survey, cosmetics and electrotechnical industries were analysed. We took into account one output (turnover) and several sets of inputs. In the first set four inputs were considered: total costs, labour costs, the number of workers and the number of management. In the second set we added to the first four inputs another four ones: market share, the value share of the most important product, intensity of networking with customers and suppliers and the intensity of use of modern communication technologies. The correlation coefficients between all the used characteristics and the efficiency scores given by two different DEA models with four and eight inputs are presented in the table below. These coefficients show very weak correlation between the input factors and given efficiency scores. The turnover is explained mostly by total and labour costs

and by the number of people of different categories. The results does not show definitely the impact of used factors on the DEA efficiency score.

Table 47. Correlation coefficients between inputs, output and efficiency scores

	DEA4	DEA8	Turn.	TC	LC	Mng.	Work	Share	1st p.	Net	www
DEA 4	xx	0.430	0.140	0.080	0.025	-0.083	-0.103	0.111	-0.031	0.043	0.003
DEA 8		xx	0.348	0.307	0.256	0.139	0.164	0.036	-0.071	0.270	0.194
Turnover			xx	0.900	0.769	0.674	0.647	0.007	-0.019	0.165	0.125
Tot.costs				xx	0.828	0.666	0.624	-0.013	-0.051	0.145	0.095
Labour					xx	0.591	0.656	-0.058	-0.023	0.220	0.187
Manag.						xx	0.565	-0.087	-0.092	0.114	0.128
Work							xx	-0.135	-0.070	0.086	0.097
Share								xx	0.049	-0.022	-0.073
1st p.									xx	0.049	0.103
Net										xx	0.565
www											xx

- Our analyses got a broad spectrum of results according to applied models, analyzed countries, branches and sizes of firms. Specific results generate specific policy implications, but it is not so easy to derive from the results general policy implications. In this report we will interpret only some evident general results. The results from different models evidently demonstrate the productivity gap between the West Germany and the Central and Eastern European countries. In the new EU countries there is also the problem of underinvestment. The new EU countries in comparison with the West Germany have very low relative fixed capital intensity. From applied models result dependencies between the number of workers, qualification of workers and unit labour costs. The policy implications for productivity improvement are expressed by the tendency to replace the quantity by qualification of workers and modernisation of fixed assets. The applied models also confirm the positive impact of modern instruments (networking, Internet, e-business) on productivity in firms.

- The analysis by **Johannes Stephan** identified that investment was amongst the most important firm-specific determinant of productivity gaps. Hence, economic policy which would focus on assisting firms by stimulating the propping up and modernisation of their fixed assets would certainly be effective. This becomes particularly important when considering that only in a few cases, we were able to establish a significant role of labour-capital substitution.

- Amongst the other firm-specific determinants, we established that weaknesses in the management of firms, so-called 'soft factors', *i.e.* differences in the organisation of production processes and differences in the management of firms (marketing, inadequate market position, networking, *etc.*) account for a large fraction of the productivity gap (see *e.g.* Bellmann/Brussig, 1998; Ragnitz *et al.*, 2000). Whilst economic policy cannot directly influence the management of firms, policy-support for management training can help managers to learn the kind of know-how that is decisive for competitiveness and success at the firm level and to appreciate the benefits associated with a market-oriented management.

- In particular, we established that managers in the East on average spend less time on strategic planning. Our experience with previous in-depths case studies in East Germany suggests that the management of manufacturing firms in East Germany is often devoted more to the technical solutions leading up to a project rather than the additionally decisive determination of the medium to long-term goals of the firm. Hence, strategic planning involving market analysis, process organisation, marketing in general, *etc.* perhaps receive not sufficient consideration.

- Other important fields within the 'soft factors' pertain to the intensity of networking and the use of modern technology for communication to assist networking with existing partners and to find and attach new partners to the firm. Whilst these functions can be expected to improve in quantity and quality over time along the typical learning curve of managers in less mature market economies, clearly focussed management training programmes could help to overcome those deficiencies. Networking between firms certainly was an important part of economic life under the planned system, however with a different focus. Today, networking involves more long-term contractual ties that allow managers and investors to overcome some of the uncertainty they are confronted with in an economic system governed by competition on markets with their price mechanisms serving as indicators for demand and supply. Amongst the different networking partners, it is in particular the regular contact with stake-holders other than long-term customers or suppliers that contains large explanatory power. In terms of economic policy this

is not only a field for management trainee programmes but rather also points to deficiencies in the supply of enterprise-related services. The low level of development and small size of this sector of the economies in the East could be targeted by economic policy. Next to networking with stake-holders, the intensity of regular and long-term contracting with customers and suppliers is a reflection of management quality and can only be targeted by economic policy in the form of management training programmes.

- The use of modern communication technologies might be rather new for managers, yet those technologies are in place and their benefits await to be exploited. Here again, training programmes can be focussed on the use of those technologies to work the market and to bind customers, suppliers and in particular stake-holders to the own firm. Large-scale accessibility of the internet, however, is additionally the responsibility of the national telecommunication firms which as public-goods utility suppliers often remain in some state-control even if only in terms of a state-regulator. Infrastructure-building is additionally an important field for EU structural fund policy which could make an important difference in terms of productivity catch-up at the firm level. Both Email and e-business are internet-based.

- When asked about the preferred strategies to weather intensifying competition, firms reacted quite differently across countries: firms in both parts of Germany clearly favoured the cost-reducing strategy related to labour costs. In CEECs, more weight was attached to introducing new products, and firms have in fact been quite successful in this.

- In terms of different strategies to increase productivity levels, firms unambiguously favoured internal, more long-term oriented means like R&D, process and product innovations and externally related means like marketing and networking activities. Surprisingly, finding a foreign investor turned out to be at the bottom of the list.

The analysis of the **Polish team**, consisting of Malgorzata Jakubiak and Anna Wziątek-Kubiak, centres around the matched-pair method. It divides the size, and industry panels into the 'better' performing and the 'worse' performing firms (with the criterion being firms' apparent productivity levels), irrespective of their country of origin. From their analysis, they conclude in terms of economic policy on four distinct fields.

- *Investment policy:* The role of investment in productivity improvement, especially of low productive firms, is crucial. The very low relative fixed capital intensity of the new member states, which is accompanied by low unit labour costs, high intensity of work and exhaustion of the potential to reduce employment are the main

arguments supporting the urgent need to stimulate investment in the new member states. This is a prerequisite for moving up the quality ladder and maintaining comparative advantages of lower costs of labour in these countries. Given the hypothesis that the lower the productivity the higher the role of fixed capital intensity in productivity improvement, there is an urgent need to create the environment which will support the increase in the investment rates in these countries.

- *SME policy:* Very low productivity of SMEs of the new member states compared to Germany, as well as very low fixed capital intensity and investment rates, low share of employees improving qualifications, as well as unstable business environments are the main arguments for improvements in SME policy in the new member states. Since most production in the analysed branches is of a labour-intensive character and low labour costs are still a key advantage of the new member states, the low mark-up on wages (especially social security contributions) is of special importance. Another argument for the improvement in SME policy is extremely high differentiation in productivity levels among the SMEs in the samples, suggesting a broad process of squeezing them out of the market in the nearest future.[37]

- *Education and training policy:* Differences between 'better' and 'worse' firms' sub-samples in the share of employees improving qualifications, reinforce the selection process on the market and have important macroeconomic implications. The lower the level of productivity the smaller the share of personnel upgrading skills. Thus, trainings as a determinant of productivity level influences and will continue to influence the process of selection of firms. If 'better' firms push out 'worse' firms from the market, the problem of unemployed, which does not act to raise qualifications, will grow. Without further training people will, furthermore, stay unemployed, adding to already large structural unemployment in some of the new member states (especially in Poland). The issue of government policy in education and training, especially of workers who are, as our research results reveals, much less involved in education and training than managers, is therefore being pushed high up the agenda. The problem is also related to the Lisbon Strategy.

[37] This hypothesis is based on the assumption that the small firms in the samples produce the same products. However, it is very possible that small firms serve completely different market segments.

- *Regional policy:* The differences in productivity levels of rural and urban firms create the need for a policy supporting investment in infrastructure and the development of rural areas.

The **Hungarian team**, consisting of Ilona Cserháti and Tibor Takács, examined the collected data on the selected industries by a variety of different multivariate statistical methods. The objective of this analysis is to identify the areas in which firms in the new member countries still have some way to go in terms of catching up. Their results led them to conclude in terms of economic policy:

- The productivity highly depends on the innovation, but the qualification of the employees is an important factor from this point of view. A little bit astonishingly it is even more important among the examined countries than the networking or the application if the ICT, although their importance have also been underlined by the results. It is a remarkable result that in all cases the qualification of the physical workers has a higher importance than that of the management. This means that support for the improvement of qualification is needed in the phase of catch-up. In our opinion both the state and the corporate sector has to provide support and sources for it.

- Our examination supported the fact that there is still a definite gap between companies of the earlier East and West Germany, and the productivity gap between the West Germany and the Central and Eastern European countries are even apparent. There is however an exception, namely the cosmetics industry, where the large Polish companies reached, furthermore exceeded the Western productivity level. It is also typical that there are huge differences within the new EU countries. This is explained by the ownership structure. Large multinational companies have already reached high productivity level, while national companies lagged behind, and this may not change in the future. This has been supported by many other research in the past years. This suggests that the governments of the new EU countries should encourage and stimulate the better co-operation of multinational companies with national ones. This would lead to the raising of the technological level and of the productivity, and this will diminish the dual character of the national economies.

- The main factors of the productivity in the presently examined industries are the ULC, the qualification, the accessibility and quality of the railway transport and the IT use. This was also supported by our previous research concerning the furniture industry and the investment goods production. The result suggest that there should

be more emphasis on the railway system in the development of the infrastructure, although in Hungary for example the governments consider normally the development of the highway system as a priority.

- It is also important that the ICT should be accessible also for smaller companies, and they should be encourage to use it in their business. Although there are several governmental programs for it, the ICT in general not so widespread than in the developed market economies. One of the causes is the relatively high costs and the lack of accessibility of good quality communication lines.

7. Economic policy in the EU and its compatibility with the particular conditions in CEECs

The analysis of EU policies toward the new member states in the light of the results generated by other researchers in the project concludes:

- At the most general level, the assessment of EU policies and the results generated in the project suggests that swift productivity catch-up is most efficiently assisted:

  - by a rather classical policy-mix of increasing competition (with a view on the long tail of weak firms in CEECs);

  - by increasing flexibility for intra and inter-sectoral migration;

  - by some form of support for investment, in particular into infrastructure;

  - by support, possibly organisation, of (management) training programmes with a focus on marketing and strategic management in a modern competitive market economy.

- The general picture emerging from the discussion of horizontal vs sector-specific state aid in CEECs seems to be that in general terms the CEECs have adapted well to the state aid system required by the EU and should not face any major challenges in light of EU accession. Some CEECs however, seem yet to be under-performing in some areas and will have to initiate the necessary changes.

- The somewhat technological bias of horizontal EU industrial policy means that lock-in of CEE economies into low-wage comparative advantage is not an issue. Rather on the contrary, technology-oriented bias might -in the worst case- not correspond to existing or (short-term emerging) abilities/capabilities in CEE economies and hence remain less effective than elsewhere or than another kind of policy-bias more in tune with specific CEE-comparative advantages.

This positive evaluation of instruments of EU industrial policy for CEE economies could be complemented with an analysis into the efficiency of deployed resources: what we were able to assess here was whether the instruments as such meet the specific needs in CEE economies, not however, whether alternative uses of resources for those policies could potentially yield larger impacts. Such a policy-evaluation exercise, however, would be beyond the means of this research.

With respect to the individual fields of economic policy, we conclude:

- *Competition:* The new network opens possibilities for using full flexibility of existing EU policies within CEECs (*e.g.* priority for SMEs referred to in treaty but not in Arts 81/82 directly.) What is less clear is whether the decentralisation of enforcement will actually allow this discretion to be used effectively in practice, and the implications are of national courts as well as national agencies being more involved.

The general picture emerging from the discussion of horizontal vs sector-specific state aid in CEECs seems to be that in general terms the CEECs have adapted well to the state aid system required by the EU and should not face any major challenges in light of EU accession. Some CEECs however, seem yet to be under-performing in some areas and will have to initiate the necessary changes.

- *Industrial Policy:* The CEECs are currently mostly subject to the EU rules, and it seems likely that it is the rule based system that has the most to contribute to convergence.

There is little evidence, from CEECs and existing EU, that policy tools that are current available and will lost were major factors for example, in Irish catch up - nor that EU funds were prime cause there: most analysis (including work done at Sussex) suggests that Irish catch up was due to national horizontal policies.

Certainly in the EU-15 a high level of state aids does not seems to be correlated with ability to pick winners, but rather with the political strength or social problems in certain sectors. It leads us to still feel state aids control should still be an aim. But an interesting we must be wary of private actions in this area for the attempting to tilt playing field towards those with ability to pay lawyers

One area where accession and a new policy framework could possibly have an impact relates to technical norms. Accession occurs at a time when the EU is trying to adopt a slightly more devolved approach to for example food safety standards. There is a real risk for CEEC firms and consumers having to pay extra to reduce risk levels below those deemed acceptable. Accession will mean that for the first time the new member

states get a vote on the relevant regulations, and will be able to defend national measures before the ECJ. But in practice it seems likely that most tolerated derogations will be upwards

- *Trade Policy:* The candidates will now be inside the EU net. Steel safeguard measures could not longer be applied against them for example. But it is not entirely certain that this is in the long run interest of productivity catch up. EU rules risk leading to (slightly) more protectionism but on the other hand, because measures can only be introduced at EU level, pay off to investing in rent seeking likely to be limited.

The result will be that firms cannot relax on productivity improvement merely by hoping for protection.

Does any of this suggest that enlargement should bring about major changes in EU policy towards industry, whether in terms of what can be done nationally or what should be done at a community level? In terms of the constraints on national policies we would still argue that the virtue of the EU system is that it provides a rule-based framework for economic actors: predictability for investors may well be worth more than discretionary policy powers when political actors are weak, financially constrained or inexperienced. Seabright and Holmes 2000 following Krugman 1987 argue that the tying of hands may be a powerful benefit of EU rules.

At the EU level the introduction of new policies towards industry was subject to unanimity by the Maastricht Treaty. The Community's record in micro economic intervention is not really such as to suggest that its programmes really are the best instruments for promoting catch up.

In total, we conclude that that the biggest contribution to catching up of CEECs is likely to be accession itself, in as much as it will make the consolidation of policy credibility due to the direct effect of EU law and the binding nature of EU law on its members.

V. DISSEMINATION AND EXPLOITATION OF RESULTS

The project's two main vehicles to increase recognition of the project as a whole remained the flyer and the project's internet-site. In fact, an analysis of how often and how many visitors access the project's web-site suggested that our site is amongst the most often frequented site within the IWH-server. The flyer is being distributed regularly at conferences, research visits, and other opportunities when meeting colleagues. In particular, this flyer also serves as an introduction into the project when contacting possible candidates for the EVALUATION EXPERT and USER groups (see Annex 4. for list of EVALUATION EXPERTS and their respective efforts in evaluating our research results).

In order to increase knowledge about the project amongst the potential "users" of the project (national governments, their organisations, employers' and industry associations, influential MNCs engaged in CEECs *etc.*, both in the EU and new member states), we established the system of a USER group. All our preliminary results and reports were distributed amongst an ever increasing group of potential users. The USER group today consists of a substantial number of individuals, some of which however indicated to us their preference not to be listed in any publicly accessible source. Reasons given relate to their being public figures who have to be careful with an association with policy-relevant suggestions over which they naturally have no control. The most influential contacts with Users was established with the Estonian and French governments:

- the Estonian Research and Development Council of the State Chancellery produced a comprehensive R&D and Innovation Policy Review, in which project research results from Slavo Radoševic in workpackage 3 and Johannes Stephan in workpackage 1 are frequently used, referenced and discussed;

- the DREE (Direction des Relations économiques extérieures) of the French government designated one page in its "Revue d'Elargissement" (No. 59, 9 February 2004) to reviewing the results generated by Johannes Stephan in workpackage 1.

A comparably important impact in terms of recognition of the project and the scope of dissemination of results was achieved by:

- project participants presenting their results at national and international conferences and workshops, most of which had a formal pa*per s*election (reviewing) process;

- three larger conferences organised by the consortium itself with the involvement of invited guests;

- by participants publishing their results in the form of research reports which appear on the project internet-site, working papers, discussion papers, books, book-chapters, and journal articles.

Rather than accumulating project results and reporting them exclusively or mainly to the EU and a selected readership (as *e.g.* colleagues and USERS), our strategy of dissemination and exploitation featured a bias on publishing results as widely as possible in the forms of publication listed above. This way a larger group in the scientific community and in the politically and socially relevant community of Europe could be targeted (for a list of conference presentations and publications, see Annexes 2. and 3.). With regard to consortium-participation at international conferences, we would like to highlight first a panel-session organised by the Estonian and Slovene teams and Johannes Stephan for the annual meeting of the European Associations of Comparative Economic Studies (EACES) in Belgrade, Serbia and Montenegro on 23-25 September 2004. Second, the Estonian team and Johannes Stephan presented and discussed their respective research results in a 'concerted action' at the CEES Copenhagen Business School International Workshop on Transition and Enterprise Restructuring in Eastern Europe, Copenhagen Business School, 26-28 August, 2004.

Most research results in the project have already been discussed in the larger research community and most have also been published already. Some results, however, are still in the form of reports but are now in the process of being published in a more widely recognised form of publication (mainly books, book-chapters and journals).

For particular additional future dissemination and exploitation plans, participants have listed the items in table 48.. Those items are already sufficiently substantiated to warrant listing here: for books, (pre-)agreement with publishers have been reached; for journals, articles have already been submitted; for conference-participations, contributions have been positively evaluated by the selection committees of the conference.

Research collaboration with colleagues in the project led to several newly emerging institutionalisations and intensifications of research networks:

- the research team at the University of Sussex, headed by Peter Holmes (Sussex), and Johannes Stephan (IWH) have discussed the role of competition policy for the convergence process in CEECs with in this project in workpackage 7. During this time, Peter Holmes invited Johannes Stephan (IWH) and CASE (Poland) to

participate in an EU 6th Framework Programme STREP-project on competition policy (Competition Policy Foundations for Trade Reform, Regulatory Reform, and Sustainable Development). This project formally started on 1st September 2004 and involves additionally researchers associated with CEPR (UK). Hence, research collaboration between the IWH, CASE, and the University of Sussex not only continues but is also enriched with a larger network of first-class researchers.

During the life-time of the project, colleagues within the consortium have intensified cooperation which led to numerous profound research results and publications:

- Slavo Radoševic has collaborated intensively with the Slovenian partners (Boris Majcen and Matija Rojec) in workpackage 4 of the project; this led to two academic papers, one published by the IWH and one already submitted to a leading journal.

- Boris Majcen and Matija Rojec have visited the IWH in a one-week intensive discussion of analysis and research results in workpackage 4. The discussions were focussed on the analysis of the common paper by Boris Majcen and Matija Rojec, and on the adaptation of the original conceptual approach for workpackage 4 which seemed to be refuted by analysis of the data generated in field work.

- Subsequently, Judit Hamar (Kopint-Datorg) spent a one-week visit at the IWH during which the new conceptual framework was finalised and tested against the data generated. This led to a common paper to be published in a refereed journal and in a longer version in the co-edited book with Macmillan/Palgrave.

- In a further attempt to deepen our analysis of data generated in workpackage 4, Slavo Radoševic suggested an internship at the IWH of one of his most talented students. Björn Jindra spent three months at the IWH which led to a substantial MA-thesis on technology transfer in general and another article on the workpackage 4-data specifically. His MA thesis will be published in the co-edited book with Macmillan/Palgrave and his article forms part of our submission to the special journal volume.

- Katrin Männik was granted a Marie-Curie Stipend at SPRU (University of Sussex), the home institution of David Dyker, Cordula Stolberg, and Peter Holmes, and to which Slavo Radoševic has a close affiliation.

- Helena Hannula spent 10 months from September 2003 as Teacher Fellow in Estonian Studies at SSEES, the home institution of Slavo Radoševic (University College London).

- Urmas Varblane from the Estonian team invited one of his most talented students Priit Vahter to the final project conference in Budapest to present his econometric analysis of technology transfer via FDI in Estonia and Slovenia. Subsequently, the IWH invited Priit Vahter for a one-week research stay in Halle. This led to an article which will be published in the co-edited book with Macmillan/Palgrave.

- Finally, the cooperation between the IWH and Priit Vahter and Björn Jindra led to the establishment of a research network on 'Intensity of Technology and Knowledge transfer in Transition Economies via Foreign Direct Investment', coordinated by the IWH. In Halle, this network includes two additional researchers assessing technology transfer in East Germany: Jutta Günther, and Harald Lehmann. As a first activity, a workshop in Halle, including papers by Björn Jindra, Jutta Günther, Harald Lehmann, and Johannes Stephan was held on 29th October 2004. Additionally, this network published a call for papers for a workshop in the framework of EACES to be held in Halle in June 2005.

Table 48. Future dissemination plans, sufficiently substantiated to warrant listing

Researcher	Research result	Planned dissemination and exploitation
Books		
Sub-group of WP4 teams plus two externals: Björn Jindra and Priit Vahter	Results of WP4-data analysis plus econometric analysis of technology transfer	Book-publication with Palgrave/Macmillan. Format of the book agreed with the publisher, no further refereeing
Polish team in WP4	Results of WP4-analysis	Several book-projects to be published in 2005. Formats agreed with Polish publishers, no further refereeing
Estonian group in WP4 plus Slavo Radoševic and Nick von Tunzelmann	Results of WP4-analysis	Book-project to be published in 2005: 'Estonia, the New EU Economy: Building a Baltic Miracle?'
Dyker, Holmes, Radoševic	Results of WP3+4+7	Book-project to be published in 2005.
Teams in WP6	Results of WP6-data analysis	Book-publication with Nomos-Verlag. Format of the book agreed with the publisher, no further refereeing
Czech team in WP6	Results of WP6-data analysis	Two books in print with the publisher 'Professional Publishing', ISBN 80-86419-42-8 and ISBN 80-86419-62-2
Book chapters		
Katrin Männik, Nick von Tunzelmann	Results of WP4-analysis	Joint chapter in Aurora Amélia Castro Teixeira and Ana Teresa Tavares (eds), Multinationals, Clusters and Innovation: Does Public Policy Matter?
Journal special issue		
Teams in WP4 plus Björn Jindra	Results of WP4-data analysis	Special issue of the East-West Journal of Economics and Business with six contributions (selection pending on referee process; pre-agreement with the editors)
Journal submissions		
Tomas Sabol and A. Hosková	Results of WP4-analysis	Paper submitted to the Journal 'Ekonomický casopis'. No referee reports yet
Johannes Stephan	Results of WP1-analysis	Paper submitted to the Journal 'Comparative Economic Studies'. Positive referee-report with, however, substantial revisions
Johannes Stephan	Results of WP6-	Paper submitted to 'East-West Journal of

	data analysis	Economics and Business'. No referee reports yet
Radoševic	Results of WP3	Paper submitted to an international journal. No referee reports yet
Boris Majcen, Matija Rojec, Slavo Radoševic	Results of WP4-analysis	Paper to be submitted to 'Journal of International Business Studies'. No referee reports yet
Boris Majcen, Matija Rojec, Slavo Radoševic	Results of WP4-analysis	paper to be submitted to 'Journal of International Business Studies'. No referee reports yet
Slavo Radoševic plus external team	Further analysis of national patent data at industry level and their integration with R&D data	Journal paper in cooperation with Djuro Kutlaca. Not submitted yet, but sufficiently advanced to warrant listing here
Working papers		
Maria Kania	Results of WP4-analysis	Paper at the University of Economics Prague, Centre of International Studies
Björn Jindra	Results of WP4-analysis	IWH Discussion Paper
Boris Majcen, Matija Rojec, Slavo Radoševic	Results of WP4-analysis	Institute for Economic Research Working paper
Organised workshops		
Hubert Gabrisch and Johannes Stephan	Results pertaining to technology transfer and upgrading NIS	Workshop at the IWH in the framework of EACES workshops in June/July 2005 to be held in Halle/Germany. The call for papers will appear in the next EACES newsletter and INOMICS
Conference-participations		
Boris Majcen, Matija Rojec, Slavo Radoševic	Results of WP4-analysis	2nd Symposium Central and Eastern Europe - Connecting Coporate and Academic Europe, 18-19 November 2004, University of Vienna
Judit Hamar and Johannes Stephan	Results of WP4-analysis	1st Mécanismes Economiques et Dynamiques des Espaces Européens (MÉDEE) and Kopint-Datorg International Conference on "Enlargement of the European Union: What are the stakes and potential effects?" in Lille (France) on 9-10 December, 2004
Judit Hamar and Johannes Stephan	Results of WP4-analysis	8th EUNIP International Conference, BIRMINGHAM, 13-15 December, 2004

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VII. ANNEXES

1. List of deliverables

The researchers involved in the project are able to account for all deliverables planned for the duration of the project (see table below). In those cases where deliverables referring to the publication of scientific results have been fulfilled by more than one means of publication, only the publication with the highest level and quality of dissemination are reported here: the ranking is lead by articles in refereed journals, followed by book-chapters and monographs, working and discussion papers and reports at the bottom of the list. The dissemination strategy of the project has featured the upgrading of publications according to this list (*i.e.* deliverables listed as reports are still awaiting their publication in a higher ranked means of publication). This strategy has served the consortium well, and we plan to continue this until results are exhausted.

In cases where one deliverable is listed on more than one account (denoted by a, b, c,..) constitutes the publication of results in sub-units: the originally envisaged deliverable proved to be more comprehensive in scope, so that more than one publication was necessary to cover the deliverable.

Table 49. List of deliverables

D1a	Project's World-Wide-Web site	October 2001
D1b	Flyer	February 2002
D2	Meeting in Trento WP2	November 2001
D3	Meeting in Halle WP4	September 2001
D4	Meeting in Halle WP6	September 2001
D5	Meeting in Trento (WPs 1 and 2)	December 2002
D6a	WP1: Book Publication (*IWH Sonderheft*)	August 2003
D6b	WP2: Book Publication (*IWH Sonderheft*)	April 2003
D6c	WP4: IWH Discussion Paper No. 177	July 2003
D7	First project workshop in Warsaw	September 2002
D8a	WP1: Journal article (*Wirtschaft im Wandel*)	November 2001
D8b	WP1: Journal article (*Acta Oeconomica*)	October 2002
D8c	WP1: IWH Discussion Paper No. 166	September 2002
D8d	WP1: Journal article (*Wirtschaft im Wandel*)	February 2003

D9a	WP2: IWH Discussion Paper No. 155	February 2002
D9b	WP2: Journal article (*Wirtschaft im Wandel*)	December 2002
D10	WPs 1 and 2: IWH Discussion Paper No. 184	October 2003
D11a	WP3: SSEES Working Paper No 31 on innovation capacities	May 2003
D11b	WP3: Chapter in book (Filho *et al.*)	forthcoming in 2004
D12	WP4: Country report of field work results for Estonia	October 2002
D13	WP4: Country report of field work results for Poland	October 2002
D14a	WP4: Country report of field work results for the Slovak Republic	October 2002
D14b	WP4: Journal article (*Biatec*)	January 2003
D14c	WP4: Journal article (AGH University of Science and Technology)	January 2003
D14d	WP4: Journal article (E+M Special issue 2003)	January 2003
D15	WP4: Country report of field work results for Hungary	October 2002
D16a	WP4: Country report of field work results for Slovenia	October 2002
D16b	WP4: Journal article (*Slovenian Economic Mirror*)	July 2003
D16c	WP4: Journal article (*Slovenian Economic Mirror*)	August 2003
D17	WP5: Research report on project internet-site	June 2003
D18a	WP6: Two reports on data envelopment analysis for all country panels (VSE)	October 2002 and May 2003
D18b	WP6: Report on Innovation for all country panels (ECOSTAT)	October 2002
D18c	WP6: Journal article (*Development and Finance*) (ECOSTAT)	December 2004
D18d	WP6: Report on a comparison between Polish and West German firms (CASE)	October 2002
D18e	WP6: CASE Studies Analyses Working Pa*per se*ries No. 284 (CASE)	August 2004

D18f	WP6: Report on a comparison between East and West German firms (IWH)	October 2002
D18g	WP6: IWH Discussion Paper No. 183	October 2003
D19	Reader on research results presented in second project conference in Prague	July 2003
D20	Second project conference in Prague	June 2003
D21	WP7: Journal article (*Journal of Common Market Studies*)	April 2004
D22a	WP3: Report on (mis-)match between supply and demand for technology in CEECs	April 2003
D23	WP4: University of Tartu, Faculty of Economics and Business Administration Working Pa*per s*eries, No. 27	April 2004
D24	WP4: Book chapter on sources of investment finance in FIEs	2004
D25	WP4: see 14b-d	January 2003
D26	WP4: Several journal articles (*Külgazdaság*)	2003+2004
D27a	WP4: University of Ljubljana Working Paper No. 1	2004
D27b	WP4: Three journal articles (*Slovenian Economic Mirror*)	October 2003
D28	WP5: Journal article (*Science and Public Policy*)	August 2004
D29	WP3: Chapter in book (Meske *et al.*)	2004
D30a	WP3: Report on Innovation capacities in CEECs	August 2004
D30b	WP3: Co-edited book Radoševic and Piech (Palgrave)	forthcoming in 2005
D30c	WP3: Co-edited book Radoševic and Kobal (NATO Science Series)	forthcoming in 2005
D30d	WP3: Book-chapter in Jasinski (ed.)	2004
D31a	WP4: Research stay Boris Majcen and Matija Rojec in Halle	May 2004
D31b	WP4: Research stay Judit Hamar in Halle	June 2004
D31c	Final meeting for WP4+5 in Berlin	21 August 2004
D32	Final project conference in Budapest	May 2004
D33	WP3: Journal article (*Journal of Common Market Studies*)	September 2004
D34a	WP5: Report on productivity and capability	September 2004

D34b	WP5: Book publication (Dyker, Holmes, Radoševic)	forthcoming in 2005
D35	WP7: Report on Competition policy, EU industrial policy, EU trade and anti-dumping policy	September 2004
D36a	Book on WP4 with Macmillan/Palgrave	forthcoming in 2005
D36b	Book on WP6 with Nomos-Verlag	forthcoming in 2005

As explained in the previous report, the members of the consortium decided not to compile a reader containing the results of research presented at the Warsaw meeting (deliverable D6). Most of the research effort until then was directed towards the generation of data in field work, and this does not lend itself for publication. Instead, in the previous report, it was suggested to replace this deliverable by a set of two deliverables (D6a and D6b), which are more interesting both in terms of academia and in terms of a wide dissemination of research results: the breath of analysis conducted for workpackages 1 and 2 resulted in much richer empirical results than anticipated; in addition to the publication of academic articles, the researchers involved hence compiled comprehensive research reports for both workpackages which were both published in the research pa*per se*ries of the IWH (D6a). Additionally, a paper on the most important comparative results from the data generated in workpackage 4 was edited by the two members of the Slovenia team, Boris Majcen and Matija Rojec with the help of the workpackage consultant Slavo Radoševic (D6b).

All deliverables are listed on the project internet-site and can be reviewed by the larger academic community there.

2. List of conference presentations

A comparably important impact in terms of recognition of the project, but also in terms of dissemination of results, was achieved by project participants presenting their results at international conferences and in the form of lectures at universities.

Lecture to the faculty and PhD-students of the Fogelmann College at the University of Memphis, USA, on 15 October **2004**: Johannes Stephan, *'Sectoral structures, industrial specialisation and the productivity gap between East and West Europe'*.

58th International Atlantic Conference in Chicago, USA, 7-10 October **2004**: Johannes Stephan and Judit Hamar, *'The potentials for technology transfer and spill-over effects to host economies in Central East Europe - results of a field study'*.

Annual meeting of the European Associations of Comparative Economic Studies (EACES) in Belgrade, Serbia and Montenegro, 23-25 September **2004**, organised as a panel on 'Technology transfer, foreign direct investment enterprise-development, and productivity growth in CEECs': Boris Majcen, Matija Rojec, and Andreja Jaklič, *'Functional upgrading and productivity growth in foreign subsidiaries in the Slovenian manufacturing sector'*; Katrin Männik, Helena Hannula, and Urmas Varblane, *'Country, industry, and firm size effects on foreign subsidiary strategy - an example of five CEE countries'*; Johannes Stephan and Judit Hamar, *'The potentials for technology transfer via foreign direct investment in Central East Europe - results of a field study'*.

Third international conference "International business in transition economies" at the Stockholm School of Economics in Riga, Latvia, 9-11 September **2004**: Slavo Radoševic, *'International Entrepreneurship, Innovation and Competitiveness in the Transforming and Enlarging Europe*' (Keynote lecture).

CEES Copenhagen Business School International Workshop on Transition and Enterprise Restructuring in Eastern Europe, Copenhagen Business School, 26-28 August, **2004**: Johannes Stephan and Judit Hamar, *'The potentials for technology transfer via foreign direct investment in Central East Europe - results of a field study'*, Katrin Männik, Helena Hannula, and Urmas Varblane, *''Country, industry, and firm size effects on foreign subsidiary strategy - an example of five CEE countries'*.

"Prime Madrid Summer School", Madrid, 5-9 July **2004**: Slavo Radoševic, *'Towards an enlarged European Research Area: Challenges for the Internationalisation of Innovation Systems of Southern, Central and Eastern European countries'*.

Lecture at the University of Tartu, Doctoral Summer School, on 17-21 June **2004**: Katrin Männik, *'The Role of Country, Industry and Firm Specific Effects On The Foreign Subsidiary Autonomy And Performance In Five Central And Eastern European Economies'*.

International conference at the Warsaw School of Management, 20-22 May **2004**: Slavo Radoševic, *'Innovation and Challenge of Enlargement'* (Keynote lecture).

Third Annual Conference of the European Economics and Finance Society "World Economy and European Integration" hosted at the University of Gdansk at Sopot, on 13-16 May **2004**, Malgorzata Jakubiak, *'Firms Specific Productivity Determinants: A Comparison of CEE and German firms from Electronics Industry'*.

Lecture at the Brighton Business School Economic, Social Transition Research Group (Summer Research Seminar Series) on 5 May **2004**; and

Workshop on Estonia at the UCL, SSEES, CSESCE: "Estonia. Growth and Restructuring of a New EU Member", London, 13-14 May **2004**; and

The Augustin Cournot Doctoral Days (A.C.D.D.), Economics, Management and Science & Technology Studies at the Universite Louis Pasteour, Strasbourg, 15-17 April **2004**: Katrin Männik, Helena Hannula, Urmas Varblane, *'Country, Industry and Firm Size Effects of Foreign Subsidiary Strategy. An Example of Five CEE Countries'*.

Lecture at the Budapest University of Economic Sciences and Public Administration on 14 April **2003**: Judit Hamar, *'FDI in Hungary: macro and micro economic effects and the EU-accession'*.

XI International Conference on European Studies in Havana, Cuba, 30 September - 3 October **2003**: Boris Majcen, Slavo Radoševic, and Matija Rojec, *'Strategic Control and Productivity Growth of Foreign Subsidiaries in Central European Countries'*.

EU Enlargement Network Conference "Eastern Enlargement of the EU – Strategies of the Modernisation: From Transition to Integration", organised by the consortium of European institutes in Prague on 9-12 October **2003**: Slavo Radoševic, *'Assessing innovation capacities of the Central and East European countries in the enlarged European innovation system'*.

"NATO Advanced Research Workshop", held in Yerevan, 2 April **2003**; and

The Annual Anglo-Polish SSEES Colloquium: "The Knowledge-Based Economy in Central and East European Countries: Exploring the New Policy and Research Agenda", 28-29 April **2003**, London; and

Workshop on "Innovation policy", held at Siberian Department of Russian Academy of Sciences, Novosibirsk on 2 September **2003**; and

International Workshop "Understanding FDI-Assisted Economic Development", TIK centre, University of Oslo, Norway 29 – 31 May **2003**; and

First "SCI-TECH Forum" organised by the European Institute – Warsaw, Natolin, 7 September **2003**; and

International Conference: "Knowledge-based society as a new challenge for science and technology: Perspectives of EU newcomers and accession countries", in Zagreb, 24-26th October, **2003**: Slavo Radoševic, *'(Mis)match between demand and supply for technology: Innovation, R&D and Growth Issues in Countries of Central and Eastern Europe'*.

Annual Congress of the European Regional Science Association (ERSA) in Jyväskylä, Finland, 27-30 August **2003**; and

Annual meeting of the European Associations of Comparative Economic Studies (EACES) in Forli, Italy, 5-9 June **2002**; and

International conference of the Southern Economic Society in New Orleans, USA, 24-26 November **2002**: Johannes Stephan, *'Industrial Specialisation and Productivity Catch-Up in CEECs - Patterns and Prospects'*.

EARIE conference Madrid, 2002, Judit Hamar, 'Mechanism of productivity growth through FDI'.

International Atlantic Economic Conference in Philadelphia, USA, 11-14 September **2001**: Johannes Stephan, *'Sectoral Structures and Technology in Transition: Central East and European Economies'*.

3. List of publications

3.1. Monographs

Dyker, D., P. Holmes, S. Radoševic, National Systems of Innovation and Technology transfer in Central East Europe, **2005** (forthcoming).

Grabińska T., Niedzielski R. Zabierowski M., Rodzaje i stopień autonomii firm córek a rozpoznanie skuteczności inwestycji zagranicznych. Społeczne i ekologiczne uwarunkowania transformacji i integracji gospodarczej-problemy oporu wobec zmian. Bytom, **2005** (forthcoming).

Stephan et. al, Technology Transfer via Foreign Direct Investment in Central East Europe, Macmillan/Palgrave, **2005** (forthcoming).

Stephan et. al, Firm-specific Determinants of Productivity Gaps in Central East European Industries, Nomos-Verlag, **2005** (forthcoming).

Bruska A., Kania M., Niedzielski R, Logistyka przedsiębiorstw z udziałem kapitału zagranicznego – Próba identyfikacji problemów w świetle wyników badań [Logistics of FDI] Logistyka przedsiębiorstw polskich w warunkach transformacji. Akademia Ekonomiczna w Katowicach. Katowice, **2004** (forthcoming).

Fiala, P., Modelling of supply chains. Praha: Professional Publishing, ISBN 80-86419-62-2, **2004** (forthcoming).

Grabińska T., Zabierowski M., Niedzielski R. Metodologiczne problemy interpretacji danych. Akademia Pomorska Słupsk, **2004** (forthcoming).

Hawrysz L., Kania M., Niedzielski R. Porównanie efektywności przedsiębiorstw z udziałem kapitału zagranicznego z przedsiębiorstwami krajowymi na przykładzie województwa opolskiego. Zarządzanie organizacjami w świetle wyzwań XXI wieku-od teorii do praktyki. Wyższa Szkoła Kupiecka. Łódź, **2004** (forthcoming).

Jablonsky, J., M. Dlouhy: Models for evaluation of efficiency of production units. Praha: Professional Publishing, ISBN 80-86419-42-8, **2004** (forthcoming).

Niedzielski, R., Przedsiębiorstwo kapitału zagranicznego.Wybrane aspekty zarządzania [Foreign Investment Company. Selected aspects of management], Zarządzanie Przedsiębiorstwem. Teoria i praktyka. Akademia Górniczo-Hutnicza w Krakowie. Kraków, **2004** (forthcoming).

Gabrisch, H., M.L. Segnana, 'Vertical and horizontal patterns of intra-industry trade between EU and candidate countries', IWH-Sonderheft, Halle Institute for Economic Research (Halle/Saale: IWH) June **2003**.

Stephan, J., 'Evolving Structural Patterns in the Enlarging European Division of Labour: Sectoral and Branch Specialisation and the Potentials for Closing the Productivity Gap.' IWH-Sonderheft, Halle Institute for Economic Research (Halle/Saale: IWH) June **2003**.

Varblane, U. (ed.): Foreign Direct Investments in the Estonian Economy. Tartu University Press ISBN 9985-4-0216-2, **2001**.

3.2. Articles, chapters in books

Hannula, H., K. Männik, U. Varblane, 'Country, industry, and firm size effects on foreign subsidiary strategy - an example of five CEE countries'. In Hannula, H., S. Radoševic, N. von Tunzelmann (eds) **2005** (forthcoming).

Männik, K., N. von Tunzelmann, 'A joint chapter'. In Aurora Amélia Castro Teixeira and Ana Teresa Tavares (eds), *Multinationals, Clusters and Innovation: Does Public Policy Matter?* **2005** (forthcoming).

Radoševic, S., 'Innovation policies in central and eastern European countries: are they meeting the challenges of knowledge-based growth in enlarged EU?', In Andrzej H Jasinski (ed) (**2004**), *Transition economies in the European Research and Innovation Area: New challenges for their science and technology*, Wydawnictwo Naukowe Wydzialu Zarzadzania Uniwersytetu Warszawskiego, Warsaw.

Radoševic, S., 'Transformation of research and innovation policy in new EU member and candidate countries: what can we learn from it?' In Edvard Kobal and Slavo Radoševic (eds), *Modernization of science policy and management approaches in central and south east Europe*, NATO Science Series, IOS Press, **2005** (forthcoming).

Radoševic, S., A. Reid, 'Innovation Policy for a Knowledge Based Economy in Central and Eastern Europe: driver of growth or new layer of bureaucracy?', In Piech K. and S. Radoševic, *Knowledge based economy in CEE*, Palgrave, **2005** (forthcoming).

Hamar, J., 'Business service sector development'. In Palócz, Hamar (eds) (**2004**), *Industrial services in international comparison*: Chapters II, III, and VI (the summary was additionally published by KOPINT-DATORG, Working Paper No. 40).

Hamar, J., 'Industrial development and FDI'. In GKM-KOPINT-DATORG (**2004**), *A 2010-ig szóló iparpolitika tudományos megalapozása*, [Scientific analyses for helping decision-making process of Industrial policy to 2010] chapters I and II, pp.2-60.

Hamar, J., 'FDI and Industrial Network in Hungary'. In F. McGowan, S. Radoševic, and N. von Tunzelmann (**2004**), *Emerging Industrial Architecture in Europe*, London and New York: Routledge.

Krawczyk, A., R. Niedzielski, Żródła finansowania przedsiębiorstw z udziałem kapitału zagranicznego w wybranych krajach Europy Śrtodkowo-Wschodniej. Prezentacja wyników badań [Sources of investment finance of FIE in CEECs. Presentation of Results]. In Gospodarcza (ed.) (**2004**), *Strategie wzrostu wartości przedsiębiorstwa. Teoria i praktyka, Urbańczyk E. Wydawnictwo Kreos*, Szczecin, p. 267.

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3.3. Refereed journal articles

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Dyker, D., 'Closing the productivity gap between Eastern and Western Europe? The role of foreign direct investment.' Science and Public Policy, Vol. 31, No. 4 August **2004** (accepted, forthcoming).

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3.4. Other publications (Working papers, Discussion papers, *etc.*)

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4. List of Evaluation Experts and their efforts

Evaluation Expert	Research Output refereed	Date
Agnés Benassy	Comment of a research paper at the 58th International Atlantic Conference in Chicago, USA: Hamar, Stephan, The potentials for technology transfer and spill-over effects to host economies in Central East Europe - results of a field study	Oct 2004
Björn Jindra	Comment of a research paper: Hamar, Stephan, The potentials for technology transfer and spill-over effects to host economies in Central East Europe - results of a field study	Aug 2004
Attila Havas	Comment of a research paper at a workshop at Center for East European Studies, Copenhagen Business School: Hamar, Stephan, The potentials for technology transfer and spill-over effects to host economies in Central East Europe - results of a field study	Aug 2004
Walter Heering	Comment of a research paper at the Budapest conference: Holmes, Lopez, and Stolberg, Swift catching up in new EU members from CEE: what role and scope for policy assistance?	May 2004
Attila Havas	Comment of a research paper at the Budapest conference: Radoševic, R&D, innovation and productivity growth in Central East Europe	May 2004
Monika Šestáková	Comment of a research paper at the Budapest conference: Dyker, Stolberg, and Iacovone, Productivity and capability in the transition countries - a historical perspective and comparative analysis of field study results	May 2004
Jaroslav Husár	Comment of a research paper at the Budapest conference via Email: Fiala and Jablonský, Quantitative analyses of productivity gap between Central European firms	May 2004
Attila Varga	Comment of a research paper at the Budapest conference: Cserháti and Takács, International comparison of productivity and analysis of the role of innovation	May 2004
Richard Woodward	Comment of a research paper at the Budapest conference: Jakubiak and Wziatek-Kubiak, A matched-pair analysis of firm-specific determinants: a comparative analysis of Poland, the Czech Republic, Hungary, and Germany as benchmark	May 2004
Miklos Losoncz	Comment of a research paper at the Budapest conference: Majcen, Rojec, and Jaklic, Functional upgrading and productivity growth in foreign subsidiaries in Slovenian manufacturing sector	May 2004
Martin Srholec	Comment of a research report via Email: Stephan, Evolving structural patterns in the enlarging European division of labour - sectoral and branch specialisation and the potentials for closing the productivity gap	Aug 2003
Jutta Günther	Comment of a research paper at the Prague conference: Dyker/Stolberg, Productivity and capability in the transition countries - a historical and comparative perspective	Jun 2003

Adam Zolnowski	Comment of a research paper at the Prague conference: Holmes/Stolberg, Trade Competition and Industrial Policy: Some thoughts on the role of policy in productivity catch up	Jun 2003
Adam Zolnowski	Comment of a research paper at the Prague conference: Hölscher/Stephan, Merger Control and Competition Policy in Central East Europe in view of EU Accession	Jun 2003
Miklos Szanyi	Comment of a research paper at the Prague conference: Radoševic, Assessing innovation capacities of the Central and East European countries in the enlarged European innovation system	Jun 2003
Monika Šestáková	Comment of a research paper at the Prague conference: Radoševic, Assessing innovation capacities of the Central and East European countries in the enlarged European innovation system	Jun 2003
Tibor Takács	Comment of a research paper via Email: Gabrisch/Segnana, Vertical and horizontal patterns of intra-industry trade between EU and candidate countries	Apr 2003
David Kemme	Comment of a research paper at the Warsaw conference: Stephan, Industrial specialisation and productivity gap	Sep 2002
Monika Šestáková	Comment of a research paper at the Warsaw conference: Dyker and Stolberg, Productivity and capability in the transition countries	Sep 2002
David Kemme	Discussion of methods of analysis of data generated in field work on firm-specific determinants (WP 6)	Sep 2002
Horst Tomann	Discussion of coherency of research and linkages between individual workpackages in the project at the Warsaw conference	Sep 2002
Tomasz Mickiewicz	Comment of a research paper via Email: Stephan, Industrial specialisation and productivity gap	Jun 2002
Jens Hölscher	Comment of research outline in workpackage 1 on domestic specialisation and productivity growth	Apr 2002
Tomasz Mickiewicz	Comment of a research paper via Email: Stephan, Sectoral structures and productivity gap	Nov 2001
Joachim Ragnitz	Discussion of a research paper at Halle: Stephan, Sectoral structures and productivity gap	Nov 2001
Michael Kaser	Discussion of aims and objectives, methodology of the research project via letter	Sep 2001

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6. workshops-conferences

The first project workshop, in Warsaw, 27 - 28 September 2002

EU Integration and the Prospects for Catch-Up Development in CEECs

The Determinants of the Productivity Gap

Friday, 27 September 2002

9:00 Start of workshop

9:00 Keynote Address: Professor Michael Kaser

Professor Horst Tomann for the evaluation expert group

Johannes Stephan with an introduction into the project

- *Part I*

Evolving patterns of specialisation and European division of labour

10:15 Patterns of specialisation in domestic production

by J. Stephan

Discussant: D. Kemme

11:00 Vertical and horizontal patterns of intra-industrial trade

by H. Gabrisch and M.L. Segnana

General discussion

11:45 Coffee break

- *Part II*

Technological catch-up via transfer and indigenous R&D

12:15 R&D inputs and outputs as determinant of productivity growth in selected accession candidates

by S. Radoševic

General discussion

13:00 Lunch break

15:00 Mapping the technology structure of multinational company's branch plants - the technology integration of accession candidates: the results of field studies

by 5 country teams à 30 min.

General discussion

17:30 Coffee break

18:00 End of first day

19:30 Workshop dinner

Saturday, 28 September 2002

- *Part II continued:*

Technological catch-up via transfer and indigenous R&D

9:00Determinants of technology transfer: absorptive capacities

by D. A. Dyker, C. Stolberg

Discussant: M. Šestáková

- *Part III*

Firm-specific determinants of the productivity gaps

9:45 Coffee break

10:00 Firm-specific productivity determinants: the results of field studies

by 4 country teams à 30 min.

General discussion

12:00 End of workshop

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The second project workshop, in Prague, 20 - 21 June 2003

EU Integration and the Prospects for Catch-Up

Development in CEECs

The Determinants of the Productivity Gap

Friday, 20 June 2003

8:30 Reception

9:00 Start of workshop

9:00 Brief introduction into the project

by Johannes Stephan

Keynote Address: General survey of growth analysis for

transition economies

by Michael Kaser

- *Part I: Foreign trade and structure as productivity-determinants*

10:15 Trade and Productivity: What do we really know?

by M.L. Segnana

11:00-11:15 Coffee break

- *Part II: Technology transfer: capabilities and technological strategies*

11:15 Productivity and Capability in the Transition Countries: Initial Results from Case-Study Interviews

by Cordula Stolberg and David Dyker

Discussant: Jutta Günther

12:15 Mapping the technology mandate of multinational company's branch plants - the technology integration of accession candidates: introduction and comparative results

by Slavo Radoševic, Boris Majcen and Matija Rojec

12:55-15:00 Lunch break

15:00 Mapping the technology structure: the most prominent, country-specific results of field studies (not included above)

by 5 country teams (30 min each)

16:30-17:00 Coffee break after first three country teams

18:00 End of first day

20:00 Workshop dinner

Saturday, 21 June 2003

- *Part III: National innovation capacities and technological development*

9:00 Assessing innovation capacities of the Central and East European countries in the enlarged European innovation system

by Slavo Radoševic

Discussant: Miklos Szanyi

- *Part IV: Competition policy and industrial policy*

10:00 Merger Control and Competition Policy in Central East Europe in view of EU Accession

by Cordula Stolberg/Peter Holmes and Jens Hölscher/Johannes Stephan

Discussant: Adam Zolnowski

11:00-11:15 Coffee break

- *Part V: Firm-specific determinants of the productivity gap*

11:15 Firm-specific productivity determinants: Introduction into main ideas and methodology of workpackage 6

by Johannes Stephan

11:55 Data envelopment analysis by use of generated data-set

by Petr Fiala and Josef Jablonský

12:25-14:30 Lunch break

14:30 Probit/logit/count models by use of generated data-set

by Ilona Cserháti and Tibor Takács

15:00 Matched pair analysis for Poland and Hungary vs West Germany

by Malgorzata Jakubiak and Anna Wziątek-Kubiak

15:30 Matched pair analysis for the Czech Republic and East Germany vs West Germany

by Johannes Stephan and Karin Szalai

16:00-16:30 Coffee break

- *Part VI: WP4+6 participants only: the way ahead - the final year*

16:30 Discussion of research plans in the final year in two parallel sessions by workpackage (WP4 and 6)

18:00 End of workshop

List of participants

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Anna Wziątek-Kubiak

CASE Warsaw, Poand
Adam Zolnowski

Office for Competition and Consumer Protection, Poland

The third project conference in Budapest

Date:

29 - 30 May 2004

Venue:

Mercure Budapest Nemzeti ****

H-1088 Budapest, József krt. 4.

Tel.: 36-1-477 2000, Fax: 36-1-477 2001

EU Integration and the Prospects for Catch-Up Development in CEECs

The Determinants of the Productivity Gap

Programme

This workshop forms the third meeting of researchers involved in the "productivity gap" - research project. Its main aim is to present to a critical audience the summaries of main research results generated during the past 2 ½ years. This however is not supposed to be the final meeting: the consortium-network will remain intact and keep on organising annual conferences on the topic.

The project was financially supported by the Commission of the European Union in its 5th Framework Programme (HPSE-CT-2001-00065). The project started in September 2001 and runs until August 2004. All research results and a project description can be found on our project internet-site:

http://www.iwh-halle.de/projects/productivity-gap/

Saturday, 29 May 2004

9:00 Start of the conference

9:00Welcome address and introduction to the conference

Scope, aims and objectives of the project *Productivity gap*

Short introduction by Johannes Stephan

9:20 Keynote Address

Zoltán Cséfalvay, Andrassy University Budapest

- *Part I: Sectoral and structural productivity-determinants*

Chair: Hubert Gabrisch

10:00 What can we infer from sectoral structures in terms of future prospects of productivity catch-up in Central East European Countries?

Presentation: Johannes Stephan

10:30 Openness, domestic production and catch up of EU accession countries - Sectoral *versus* intra-sectoral results

Presentation: Maria Luigia Segnana with Antonio Dal Bianco

11:00-11:30 Coffee break

11:30 Skill-intensities in Central East European Countries: a comparison to EU and prospects for catch-up

Presentation: Anna Kaderabkova

12:00 General discussion on first three presentations

12:30-14:30 Lunch break

- *Part II: Technology transfer: FDI and technological strategies*

Chair: Michael Kaser

14:30 The effect of foreign direct investment on productivity in Estonian and Slovenian manufacturing

Presentation: Priit Vahter

15:00 Comment: NN

15:15 The conceptual framework for field work design and analysis of generated data on technological strategies of foreign direct investment networks

Presentation: Slavo Radoševic

15:45 General discussion of the conceptual framework of fieldwork

16:00-16:30 Coffee break

16:30 Strategic control and productivity growth of foreign subsidiaries in Central European Countries -.5

A comparative analysis of data generated in workpackage 4 on foreign direct investment

Presentation: Boris Majcen, Matija Rojec and Slavo Radoševic

17:00 Comment: Petr Fiala and Josef Jablonský

17:15 Country, industry, and firm size effects on foreign subsidiary strategy: an example of five CEE countries

Presentation: Helena Hannula, Katrin Männik, and Urmas Varblane

17:45 Comment: David Kemme

18:00 Poster session with graduate Budapest students

21:00 Conference dinner

Sunday, 30 May 2004

• *Part II: continued...*

Chair: Herman W. Hoen

9:00Functional upgrading and productivity growth in foreign subsidiaries in Slovenian manufacturing sector

Presentation: Boris Majcen, Matija Rojec, and Andreja Jaklič

9:30 Comment: Miklos Losoncz

9:45 Foreign investment enterprises in the EU and Poland - when subsidiaries take the initiative

Presentation: Romuald Niedzielski,

Maria Kania, and Teresa Grabinska

10:15 Comment: Tomas Sabol

10:30 Mapping the Technology Structure of Branch Plants and Technology Integration of CEECs

Presentation: Judit Hamar

11:00 Comment: NN

11:15-11:45 Coffee break

11:45 Foreign Direct Investments and their Impact on Economic Growth in Slovak Manufacturing Sector

Presentation: Tomas Sabol, Vincent Soltes

12:15 Comment: Romuald Niedzielski

12:30-14:30 Lunch break

• *Part III: Firm-specific determinants*

Chair: Gabor Hunya

9:00 Firm-specific determinants and strategic management in comparative analysis of East and West Germany, Poland, the Czech Republic, and Hungary

Presentation: Johannes Stephan

9:30 Comment: Anita Wölfl

9:45A matched-pair analysis of firm-specific determinants: a comparative analysis of Poland, the Czech Republic, Hungary, and Germany as benchmark

Presentation: Malgorzata Jakubiak, Anna Wziatek-Kubiak

10:15 Comment: Richard Woodward

10:30 International comparison of productivity and analysis of the role of innovation

Presentation: Ilona Cserháti, Tibor Takács

11:00 Comment: Attila Varga

11:15-11:45 Coffee break

11:45 Quantitative analyses of productivity gap between Central European firms

Presentation: Petr Fiala, Josef Jablonský

12:15 Comment: Jaroslav Husár

12:30-14:30 Lunch break

• *Part IV: R&D, innovation capacities, and technology transfer capabilities in CEECs*

Chair: Richard Woodward

14:30 Productivity and capability in the transition countries - a historical perspective and comparative analysis of field study results

Presentation: David Dyker and Cordula Stolberg

15:00 Comment: Monika Šestáková

15:15-15:45 Coffee break

15:45 R&D, innovation and productivity growth in Central East Europe

Presentation: Slavo Radoševic

16:15 Comment: Attila Havas

• *Part V: EU policy intervention and effects on CEECs*

16:30 Swift catching up in new EU members from CEE: what role and scope for policy assistance?

Presentation: Peter Holmes, Javier Lopez, Cordula Stolberg, Johannes Stephan

17:00 Comment: Walter Heering

17:15 Concluding remarks and final discussions closing the conference

18:00 End of conference

EU Integration and the Prospects for Catch-Up

Development in CEECs

The Determinants of the Productivity Gap

List of participants

1) Attila Béres, Budapest University of Economic Sciences and Public Administration, Hungary
2) Lázló Csaba, Central European University Budapest, Hungary
3) Ilona Cserháti, ECOSTAT, Hungary
4) Szabolcs Deák, University of Szeged, Hungary
5) David Dyker,Sussex University, United Kingdom
6) Petr Fiala, University of Economics Prague, VSE, Czech Republic
7) Hubert Gabrisch, Halle Institute for Economic Research, Germany
8) Pál Gáspár, International Center for Economic Growth (ICEG) Budapest, Hungary
9) Péter Gedeon, Budapest University of Economic Sciences and Public Administration
10) Anita Halász, International Center for Economic Growth (ICEG) Budapest, Hungary
11) Judit Hamar, Kopint-Datorg Foundation, Hungary
12) Helena Hannula, University of Tartu, Estonia
13) Attila Havas, Institute of Economics, Hungarian Academy of Sciences, Hungary
14) Walter Heering, Brighton Business School, United Kingdom
15) Frigyes Heinz, European Central Bank, EU Countries Division, Germany
16) Katie Higginbottom, University of Sussex, United Kingdom
17) Herman W. Hoen, University of Groningen, The Netherlands
18) Peter Holmes, University of Sussex, United Kingdom
19) Gábor Hunya, Vienna Institute for International Economic Studies (WIIW), Austria
20) Leonardo Iacovone. University of Sussex, United Kingdom
21) Josef Jablonský, University of Economics Prague, VSE, Czech Republic
22) Malgorzata Jakubiak, CASE Warsaw, Poland
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24) Michael Kaser, Oxford University and IGS, Birmingham, United Kingdom
25) György Komáromi, University Budapest, Hungary
26) Nils Kotoed, University of Sussex, United Kingdom
27) Javier Lopez, University of Sussex, United Kingdom
28) Miklós Losoncz, GKI Economic Research Budapest, Hungary
29) Boris Majcen, Institute for Economic Research Ljubljana, Slovenia
30) Katrin Männik, University of Tartu, Estonia
31) Matyas Marczisovszky, Kopint-Datorg Budapest, Hungary
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33) Junko Mizuno, University of Sussex, United Kingdom
34) Judit Mosoni-Fried, Hungarian Academy of Sciences, Budapest
35) Romuald Niedzielsk, University of Opole, Poland

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37) Éva Katalin Polgár, Budapest University for Economic Sciences and Public Administration, Hungary

38) Franciszek Przesór, University of Opole, Poland

39) Slavo Radoševic, University College London, SSEES, United Kingdom

40) Matija Rojec, Institute for Economic Research Ljubljana, Slovenia

41) Tomas Sabol, Technical University of Kosice, Slovak Republic

42) Maria-Luigia Segnana, University of Trento, Italy

43) Monika Šestáková, Slovak University of Technology, Bratislava, Slovak Republic

44) Vincent Šoltés, Technical University of Kosice, Slovak Republic

45) Péter Szomorta, Budapest University of Economic Sciences and Public Administration, Hungary

46) Johannes Stephan, Halle Institute for Economic Research, Germany

47) Cordula Stolberg, University of Sussex, School of European Studies, United Kingdom

48) Tibor Takács, Central Statistical Office, ECOSTAT, Hungary

49) Máté Tóth, International Center for Economic Growth (ICEG) Budapest, Hungary

50) Priit Vahter, University of Tartu, Estonia

51) Urmas Varblane, University of Tartu, Estonia

52) Attila Varga, Pécs University, Hungary

53) Richard Woodward, CASE Warsaw, Poland

54) Anna Wziątek-Kubia, CASE Warsaw, Poland

55) Peter Zajc, European Investment Bank, Luxembourg

56) Gyula Zilahy, Budapest University of Economic Sciences and Public Administration, Hungary

7. Questionnaires

Number: _____

QUESTIONNAIRE FOR FOREIGN INVESTMENT ENTERPRISES

1) What is **your firm's activity** at 3-digit NACE code (See attached classification. If your registration is very broad, please indicate the three most important activities only):

- _____ - _____ - _____

2) What is the total **number of employees** employed in your company: _____

3) What is the **year of establishment** of your company: _____

4) What is the year of registration of your company **as a foreign investment enterprise** (if different from question 3): _____

5) What is the current equity share of the foreign owner?

☐ less than 10% ☐ 10-50% ☐ 51-99% ☐ 100%

6) Do you produce **intermediary** goods, **final** products, or both?[i]

☐ ☐ ☐

7) Please, tick which **functions are being undertaken** (a) on your own only, (b) mainly on your own, (c) mainly by your foreign owner, or (d) by your foreign owner only.

Functions	only your company	mainly your company	mainly foreign owner	only foreign owner
Technical product development [ii]				
Process engineering [iii]				
Determining the product price				
Supply and logistics				
Accounting and finance of operations				
Investment finance				
Market research [iv]				
Distribution, sales				

After sale services				
Advertisement [v]				
Marketing [vi]				
Operational planning [vii]				
Strategic planning				

8) How many lines of businesses [viii], or clearly different product lines, did you produce at the time of establishing your foreign investment enterprise (as in question 4)? _____

How many lines of businesses do you currently have? _____

9) Please evaluate the magnitude of the following changes since the registration of your company as a foreign investment company (as in question 4). Please tick appropriately:

1 = NOT SIGNIFICANT,..., 5 = VERY SIGNIFICANT					
Value of domestic sales	1	2	3	4	5
Value of exports	1	2	3	4	5
Level of productivity in production	1	2	3	4	5
Technology of production equipment	1	2	3	4	5
Quality of produce	1	2	3	4	5

10) Please indicate the **structure of the volume of your sales** (in %) according to the origin of buyers:

Sales to your foreign partner	
Sales to other foreign buyers	
Sales to other domestic subsidiaries of your foreign partner	
Sales to other domestic buyers	
TOTAL	100%

11) Please indicate the **structure of the volume of your supplies** (in %) according to the items below:

Imports from your foreign partner	
Imports from other foreign suppliers	
Supplies from other domestic subsidiaries of your foreign partner	
Supplies from other domestic suppliers	
TOTAL	100%

12) How **important are each of the following areas and sources** for your competitiveness? Please indicate the appropriate number in each cell of the table (*i.e.* for all areas and all sources). [ix]

Levels between 1 = NOT IMPORTANT, 2, 3, 4, and 5 = VERY IMPORTANT.

AREAS **SOURCES**	**Quality control assistance**	**Patents and licenses, R&D**	**People and training**	**Management**
Your own organisation				
Your foreign owner company				
Other buyers abroad				
Other sellers abroad				
Other domestic subsidiaries of your foreign owner company				
Other buyers at home				
Other sellers at home				
Other sources (R&D institutes, universities, consultancies, *etc.*)				

13) Please indicate how important is each of the following **sources of finance** for your company?

1 = NOT IMPORTANT,..., 5 = VERY IMPORTANT					
Your retained earnings	1	2	3	4	5
Your foreign owner company	1	2	3	4	5
Other foreign sources (banks, other firms, *etc.*)	1	2	3	4	5
Other domestic subsidiaries of your foreign owner	1	2	3	4	5
Other domestic sources (banks, other firms, *etc.*)	1	2	3	4	5

14) Who has undertaken the **initiative for changes** in the following areas:

	only your company	**mainly your company**	**mainly foreign owner**	**only foreign owner**
In business functions				
In number of lines of businesses				
In sales and exports				

15) Please, tick directions in which you expect that **your mandate will evolve**?

	Increase	**Decrease**	**Unchanged**
the number of business functions undertaken independently			
the number of lines of businesses (line of products)			
sales and exports			

Background information, definitions:

- A "Foreign investment enterprise" is a company with any percentage of shares in foreign ownership.
- A "Foreign investor" or "Foreign owner company" is the owner of the foreign equity share.

Some additional explanations for the questions:

[i] Final products are those produced directly for the final consumer market; intermediary goods constitute goods or materials which are used as input for further production and are typically sold to other producing firms.

[ii] Technical product development entails the development of the product in terms of what functions the product provides as well as the technical solutions to be solved to allow the product to offer those functions.

[iii] Process engineering includes activities geared towards finding an efficient way to organise the process of production.

[iv] Market research for the product is an assessment of the expectable quantitative extent of demand for the product and an assessment of customer preferences for the design of the product. The design incorporates both the range of possibilities for which the product can be used and the way the product looks like (colour, shape, *etc.*).

[v] The main focus of "organisation of advertisement" is on the development of means of advertisement (in media, on the street, in public transport, advertisement campaigns, *etc.* and not on the financing of such activities.

[vi] Marketing entails not only advertisement activities (as above) but also all activities within the company which aim at increasing the demand for the product (*e.g.* search for markets, changes to the product according to the preferences of the customers, *etc.*).

[vii] Operational planning includes activities geared towards the day-to-day operations of the company.

[viii] The number of lines of businesses is the number of clearly different products you produce. Products belong to a different business line, if they offer significantly different services to the customer.

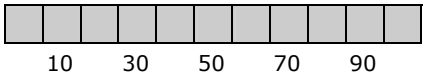
[ix] The table is designed in a matrix-form. That means that you should take into account both rows and columns when determining your answer in each cell. We want to know *e.g.* in the first cell of the table how important for the competitiveness of your company is the input of "your foreign partner" into "quality control assistance". Please enter one value between 1= NOT IMPORTANT and 5=VERY IMPORTANT into that cell. Also do the same in all other cells.

Questionnaire for firm-specific determinants of labour productivity

1) What was the **turnover** of your firm in 2002?
Please enter in million [€]: € _____ mn

2) What were the **total costs (pre-tax)** of your firm in 2002?
Please enter in million [€]: **€** _____ **mn**

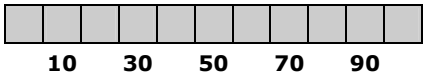
3) What is your estimation of the share of intermediate consumption [i)]
in total production value? Please mark on the scale from 0 to 100%:



4) What are the **two most important specific products** of your firm? Please enter their **descriptions** and the individual **shares** of the two products in total sales of 2002:

1: _____ share: _____ % **2:** _____ share: _____ %

5) How **intense** is **competition** for your firm's main product (No.1 above)?
Please mark on the scale from 0 to 100%:



6) How do you **cope with intense competition**? Please mark for either of the three options:

Reducing employment: ☐ Reducing other costs: ☐ Introducing new products: ☐

7)How many **new products** have been successfully **introduced** to the market by your firm in the last 3 years (*i.e.* product innovations)? _____ **products**

8) Please indicate the **number of people** working today in the following two groups of personnel in your firm:

Management and administration	_____	**persons**
Rest (workers)	_____	**persons**

9) How many in those two groups have a **formal qualification** (or extraordinary work experience)?

Management and administration	_____	**persons**
Rest (workers)	_____	**persons**

10) How many engaged in formal means of **improving their qualification** [ii)] during the last 3 years?

Management and administration	_____	**persons**
Rest (workers)	_____	**persons**

11) What were the **labour costs** (wages and social contributions) in your firm in 2002? Please enter in million [€]: **€** _____ **mn**

12) What is the **value of fixed assets** of your firm in 2002? Please enter in million [€]: **€** _____ **mn**

13) How much did your firm **invest into fixed assets** in categories in 2002?

•Please enter in million [€] for gross and net fixed capital formation, and % for your estimation forreplacing old stocks and enlarging the firm's stock of capital:

Gross fixed capital formation and incl. buildings	**€**		**mn**
net fixed capital formation and excl. buildings	**€**		**mn**
replacing old capital stock	**est.**		**%**
enlarging the stock of fixed assets	**est.**		**%**

14) What is the share of time, the **firm's management devoted** in 2002 to: [iii)]

daily, operational activities		**%**
long-term strategic planning?		**%**
total	**100**	**%**

15) What is the value share [iv)] of your **long-term** (*i.e.* at least 2 years), **regular networking activity** with the following groups? Please mark on the scale from 0 to 100%:

suppliers	
customers	
other stake-	

10 30 50 70 90

16)How **important** is the use of **modern communication technologies** in the daily operation of the firm?
Please mark on the scale from 0 to 100%:

e.mail

www

e-business

10 30 50 70 90

17) What is the quality of the following means of infrastructure at the location of your firm?
Please mark on the scale from 0% for low quality and bad accessibility and 100% for good quality and accessibility:

urban transport [v)]

roads for transport [vi)]

railway transport [vi)]

water transport [vi)]

telephone/fax/internet

10 30 50 70 90

18) Do you have any strategy to **improve the productivity** of the firm in the future? Please select from the options we thought to be most important, or briefly describe your own strategy:

- ☐ lowering employment
- ☐ finding foreign investor
- ☐ engaging in/extending own R&D
- ☐ engaging in/extending marketing efforts
- ☐ engaging in/extending networking activities
- ☐ upgrading of product quality of technology
- ☐ rationalisation of explicitly the process of production, as *e.g.* re-organisation, innovations or outsourcing
- ☐ other:

Thank you very much for your kind assistance

Some Further Explanations:

[i] **Share of intermediate consumption**: The price of one of your main products is 100 units. How large is the share of the value of raw material and semi-finished products, your firm bought to produce the product?

[ii] We are interested in **any means of improving qualification of personnel**, whether bought as an external service or financed and organised from within the firm.

[iii] **Operational planning** concerns activities targeted at improving efficiency in regularly recurring activities, whereas **strategic planning** is a non-continuous task targeted at mainly increasing market (shares) and exploring new markets, increasing sales prices via product or service quality and targeted at reducing production costs.

[iv] By value share, we mean the **share of value of contracts** with partners you do business on a regular basis over a period of at least 2 years (as a percentage of the total value of contracts with each partner-category).

[v] By the quality of **urban transport**, we mean the accessibility (proximity of stations/bus stops; frequency service on the timetable) of the location of the firm for employees and guests using busses, metro, trams, trains, *etc.*

[vi] By the quality of **roads/motorways, railway and water transport** for deliveries to your firm and the shipping of your own products, we mean *e.g.* the quality and size of roads for cars and lorries, the proximity of railway stations and harbours, and the frequency of service, *etc.*

[vii] By the quality of **telephone, fax and internet**, we mean the availability of such communication services and the speed of possible internet-connections, *etc.*

European Commission

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