

Executive Summary:

MEDEA is an interdisciplinary research project developed under the auspices of the Seventh Framework Programme. The main objective of MEDEA is to produce an empirically informed theoretical approach that will take account of current research and make substantive policy recommendations.

The project offers a historically sensitive and multi-scalar approach to development paths and the effects of these on livelihoods. It does so through tracing the contours and effects of development models and the global flows through which they are transmitted in four empirical cases (Argentina, Brazil, Slovakia and Spain), and the manipulation of research data through qualitative modelling. Combining a range of qualitative and quantitative methodologies, the project explores the dynamic effects of models and their context-bound implementations, as well as local and global responses to these effects. Taking into account local trajectories and complexities, the project engages in an ongoing process of comparison that takes into account the potential tensions between hegemonic models and practices and the highly specific social and historical conditions of their implementation.

The project is based on the premise that the analysis of theoretical development models and global policies must be situated within the complexities of historically unfolding conditions and relationships on the ground. The consortium has been particularly concerned with the concrete outcomes of historical processes, of global flows and the implementation of economic models within specific locations. As different models and policies succeed one another and as different sectors of the economy gain or lose prominence within the overall economic structure (nationally, regionally and globally), other industries, forms and relations of production and distribution emerge, shaped and reshaped in complex networks of mutual dependencies. Thus, the livelihoods and strategies of relevant actors and stakeholders in the steel industry are at the centre of the analysis. By focusing on the steel industry, which has played a significant role in national and regional development in Europe (for example via the European Coal and Steel Community treaty - ECSC) and beyond, the project tracks the relationship between employment, skills and economic models.

The consortium identifies the issue of skills and education as a central theme that provides important insights regarding the interface between policy, entrepreneurial strategies and local contexts and populations. There is an entanglement of skills, knowledge, education, and economic models, which has implications for the ability of individuals and groups to respond to changing circumstances. For individuals and households, this entanglement is reflected in their relative ability to find employment and secure stable livelihoods; for the industry, it is relevant to its capacity to respond to global challenges. In particular, this relates to the extent to which different skills and forms of knowledge are valued and may or may not be transferable across different productive sectors. Therefore, the effects of economic models must be understood in relation to the complexities of both local and global economic processes.

Project Context and Objectives:

The MEDEA project has aimed to make a substantial contribution to theoretical and applied approaches to development through a comparative, ethnographic investigation of the effects of and responses to models of economic development. In particular, it has focused on institutional and personal trajectories, with special reference to the transmission of key resources, such as knowledge and skills.

Key objectives:

1. The identification of key national and transnational trends and development initiatives and their effects. These are explored through the comparison of four case studies, considering the emergence and transformations of institutional patterns, development approaches and policies.

Research in four country cases identified overall trends in the steel industry in relation to changing development models over a period of sixty years. This work was carried out under work packages 4 (Trajectories I: National profiles) and 7 (Interviews: State, Unions and Stakeholders, Civil Society), and summarized in deliverable 7 (Country Report 1). The national profiles provided the basis for in-depth ethnographic research in seven sites associated with the steel industry.

2. A theoretical engagement with models and transnational flows. This informs the development of a framework for the analysis of global processes and the understanding of the relationships between local and global forces.

Because models emerge, circulate and function at global as well as local levels, the empirical research in the four countries is contextualized within the analysis of global flows of development models. Work package 5 produced a theoretical report (Deliverable 5) that stressed the power dimensions that affect the design, circulation and implementation of development models at different scales.

3. The comparative analysis of institutional and social mechanisms for the transmission of resources, particularly skills and knowledge.

4. The compilation of data sets on firms, households and work experiences to enable future research and testing of the project findings. The data sets include film and visual records.

The ethnographic research generated a range of qualitative data on work, households and livelihoods (work package 10: Ethnography of Livelihoods). Particular attention was paid to issues of change, which was approached through the study of generations (work package 9, Trajectories III: Generations). The analysis of data (work packages 11 and 12) generated through this research provides the basis for deliverables 8 and 9 (Databases Work and Households), and a detailed report (Deliverable 10: Country Reports II). This also provided the structure for work package 13, Film and Visual Record.

5. The identification of critical variables and the design of appropriate qualitative and quantitative models expressed through a range of simulations and reports.

The comparative analysis was facilitated through an interdisciplinary dialogue that identified critical variables for the preparation of models (work package 6: Models) to evaluate these variables and explore a range of hypotheses relating to economic models and concrete economic processes. On the basis of the findings of work packages 4, 7, 9 and 10, the modelling exercise focused on simulations of state-led import substitution industrialization models and market led models (Appendix 1, 2) to explore the relative significance of local and global variables (Deliverable 12).

6. A critical engagement with the relevant literature from the perspective of the empirical research and the modelling exercises, in order to contribute empirically and conceptually to current debates regarding national, regional and global economic models, trends and their effects.

The project's Conference (work package 14: International Conference, deliverable 13) brought together international experts from a range of disciplines to discuss central empirical and theoretical issues arising from the research. The conference papers have been compiled in two edited volumes ('Work and Livelihoods - History, Ethnography and Models in Times of Crisis' and 'Envisioning the Future - Models and Ethnography in Times of Change'). This work develops the project's engagement with the scientific community, stakeholders and the wider public. As such, it ties in with the project's dissemination strategy, which has also paid attention to visual data under work package 13. The research teams generated and compiled visual documentation pertaining to each research site. A selection of these visual materials has been organised geographically, according to each country, and made available through the project website (see <http://www.medeasteelproject.org> online, Deliverable 11)

Context of the project

The project was designed to address central concerns:

- In the first place, the consortium wished to address a long-standing concern within the social sciences with the apparent dislocations that arose between the intended effects of economic models and their real effects. Related to this, the aim was to contribute, through an ambitious empirical study, to current debates about neoliberalism in its various interpretations and applications and the hegemonic position of the notion of the market in current popular and scholarly debates. It was important to untangle the conceptual and ideological from the real relations that obtain in concrete situations, such as work, unemployment, livelihoods and household and community relations. The project was designed so as to avoid the 'flattening out' of social reality by the dominance of the market and the economy in current debates, while maintaining a keen interest in the concrete realities and potential futures of industrial work.

- A related concern has to do with the tensions arising between global and local processes, in particular global models that tend to universalize the character of the economy and its relation to society. This project focuses on global models of economic development while paying careful attention to local implementations and local effects. A central aspect of this focus on the local is the recovery of emphasis on the views and understandings of local actors.

- By focusing on the steel industry the consortium wished to explore the apparent decline of industry in favour of newer, 'cognitive' economies. The project, which focused on skills and knowledge, dislodges the simple opposition between manual and intellectual, mechanical and cognitive. Instead, it explores the ways in which different skills are valued and/or implemented, how they evolve to encompass or replace other skills, and how they may be differentially valued by different social agents.

- Finally, the consortium was committed to contribute to developing new impact pathways in the social sciences. This commitment was built into the design and implementation of the project, for example by the inclusion of stakeholders at an early stage of the research and by the project dissemination strategy (please refer to Impact section)

The trajectory of the steel industry offered many opportunities to explore these issues. The industry held a strategic position within import substitution development models, which resulted in important investments in the sector by states across the globe. The nationalization of steel at this stage aimed at rationalizing and promoting the industry's central role in support of infrastructural projects and the wider industrial base. It also had strategic importance as a major employer and, often, as the site of well-organized trade unions. Global and institutional pressures contributed to the privatization of the industry, which in many instances had already undergone restructuring and change. These measures were followed by closures, mergers and the concentration and globalization of the industry.

These momentous events took place in a relatively short period of time and it was feasible and important for the project to capture the experiences of different generations of workers in the industry throughout this process of radical change. Furthermore, although technological innovations have changed the organization and experience of work and permitted the industry to develop new products, the industry still faces many challenges in adapting to fluctuating markets. The consortium wished to understand the research subjects' interpretations and responses to these situations, how the past and the future informed their views of the world. Finally, the industry exemplifies, both historically and ethnographically, the complexity of relationships and actors operating at different scales and with different capacities to exert power and influence. These include workers and their organizations, their families and communities, local and global enterprises and investors, and national and supranational entities. The research posed many challenges, which were addressed through an interdisciplinary, historical and multi-scalar approach, combining theoretical and archival research, modelling and ethnography.

With these challenges in mind, the consortium from the outset included the University of Bologna, which was responsible for exploring the data through modelling, and the University of Brasilia, which focused on a theoretical exploration of the global dimensions of development models and their implementation. The ethnographic research teams were based at the University of Barcelona, Comenius University, Goldsmiths, IDES and Brasilia. The case studies were selected on the basis of their comparative value. All four countries in the study underwent economic reforms under military and/or authoritarian regimes, and all experienced the effects of pro-market policies. Indeed, all four cases have, at different points in their economic history, been examples of the successful application of economic models. Two European countries and two

emerging economies in Latin America were selected in order to take into account the differential impact of supranational entities and the effects of the global market.

It was important that the selected European countries should be members of the European Union. Slovakia was interesting because, while Central Slovakia has a long tradition of metal work, the steel industry in Eastern Slovakia gained prominence under state socialism. The Velvet Revolution ushered in radical social and economic changes towards a market economy that transformed the lives of workers and their families. Slovakia joined the EU in 2004 and the Eurozone in 2009. The EU market and German industry play a crucial role in the Slovakian economy and the steel industry in particular. Spain experienced extensive economic development under Franco's regime and a renewed orientation towards the global economy from the 1980s. EU accession, which took place in 1986, entailed a number of economic reforms that radically reshaped the industry.

In contrast, Brazil and Argentina provide interesting examples of different responses to global crises and opportunities. Under Peronism and Varguism, both Brazil and Argentina experienced large-scale state investments in industry and both countries were subject to military regimes, followed by democratic governments that, to different degrees, furthered pro-market policies.

Project Results:

Country trajectories - history and comparison

Industry and steel in the early 20th century

The historical and comparative analysis of the four countries that constitute the empirical basis for the project's analysis and recommendations proposed a useful periodization. While the study of each case reveals the political and economic contingencies affecting one specific national context, all four reports show similar patterns of development over time. Furthermore, although the periodization was based primarily on statistical data and secondary sources relating to general economic trends in each instance, it also highlights significant stages in the evolution of the steel industry in these countries. For example, the steel industry's early development in all four countries was heavily determined by state-led investment and economic policy, associated with efforts to create a national programme of industrialization.

In Spain, industrialization underwent a period of marked growth between 1831 and 1861. Until 1939, private firms and foreign capital funded the steelmaking industry, which comprised traditional small-scale, family owned producers or *ferrerías*. The gradual development of modern blast furnaces produced for sectors ranging from armaments, tools and luxury goods, to shipping, railways and manufacture of machinery, as technological development and economic policy focused on the steelmaking industry as an integral axis of economic development. During the interwar period (1919-1935), Spanish industry diversified and both the state and the banks (despite the relative undeveloped status of the banking sector) gave increasing support to basic industrial sectors. The creation of the Instituto Nacional de la Industria (INI) and, in turn, its creation of a public integrated plant, the Empresa Nacional Siderúrgica Sociedad Anónima (ENSIDESA), reshaped the steelmaking industry as the country's economic policy adapted to the nationalist and autarkist ideals of the Franco regime.

From its iron-making past in the Austro-Hungarian Empire, where the industry focused on basic production and the extraction of raw materials, the emergence of Slovakia's steel industry was also associated with the development of a national economy. In fact, analysts highlight that the first process of industrialization was accomplished in 1840, when legislation supported the establishment of industrial enterprises. Industrial development intensified in 1867, when the elites reached an agreement to turn the Habsburg Monarchy into the dual state of Austria-Hungary. Iron production before World War II was aimed at demand generated by the agricultural sector and, to a lesser extent, transport and the domestic market. After the economic crisis of 1900, which prompted the collapse of older enterprises, steel production declined significantly and, although it was expected that the 1918 new Czechoslovak state would encourage industrialization, old divisions between the more industrialized Czech territory and the agrarian Slovak territory endured. This is reflected in the fact that Slovakia was responsible for only 8% of the total Czechoslovak industrial production. The new state aimed to regenerate and promote industry through new economic plans, but the Second World War interrupted their implementation.

From 1879 to 1930, Argentina had an agro-export economy, which encouraged investments in infrastructural development, immigration strategies and the institutionalisation of primary education. The First World War and the Great Depression had an impact on trade and the interruption of importations of key commodities. The combined conditions of the European conflict and the economic crisis prompted a significant shift in economic strategy towards the development of a national industry. In the 1940s, protectionist measures underpinned an industrialisation policy along the lines of Import Substitution Industrialization under what was known in Latin America as *desarrollismo* or developmentalism. In this context the steel industry developed through private and state investments, such as the Fábrica Militar de Aceros (1935) and Altos Hornos Zapla (1943) and through the creation of a National Plan for the Steel Industry (1947) and of integrated steel plants such as the Sociedad Mixta Siderúrgica Argentina (SOMISA).

The evolution of Brazil's steel industry is entangled with the history of the country's industrialisation. In 1925 a branch of the Companhia Siderúrgica Belgo-Mineira became the first integrated plant in South America. Founded by the association formed between the Luxemburg group Arbed and local businessmen from the province of Minas Gerais, the plant expanded production: in 1946 it produced 70% of Brazil's total production of 342.000 tons of steel, up from the 4.500 tons produced in the 1920s. During Getúlio Vargas' government in the 1940's the Companhia Siderúrgica Nacional (CSN) began its activities, and effectively supported the implementation of national policies that aimed to promote the Brazilian industrial complex and support the country's autonomy from foreign economic influence.

National industry and world markets: post WWII

In the post World War II period, the economic boom created many incentives for the steel industry. In this period, the state took a central role in promoting the industry. In this second period there are broad similarities across the four cases, though the differences between our examples are also highly significant. In Spain, the evolution of the steel industry was shaped by the policies pursued by the Franco regime. Franco's economic policies are analysed in terms of three periods (1941-1949, 1950-1959, 1960-64): the first period was characterised by the effects of the wars, with economic policy based on autarky. The aim of promoting industry was addressed by the creation of a national institute for industry (INI - Instituto Nacional de la Industria) in 1941. In the second period, the creation of the ENSIDESA integrated steel plant challenged traditional oligopolies, but also evinced the weaknesses of the INI: an obsolete production apparatus, excessive tariffs, and a management that was not oriented towards profitability. With a focus on the national market, private companies were forced to modernise following foreign models. During the 1960s and until 1974, ENSIDESA was the most important company in the country, despite the merger of private companies in Asturias (UNINSA) and despite its own operating weaknesses and management mistakes. Public funding was awarded to private companies to attract matching foreign investments. At the end of the 1970s, after the death of Franco and following the oil crises of 1973 and 1979, Spain carried out the First Industrial Reconversion in 1982 and joined the European Free Trade Association. Spain joined the European Economic Community in 1986 amidst high rates of inflation, unemployment and high public debt. There were also growing rates of tertiarization of the

production structure and an expansion of the public sector (healthcare, education and pensions) during the socialist government.

In Slovakia, the effects of World War II prompted important reforms to economic policy, where the Czechoslovak state abandoned economic liberalism and paved the way for a two-year plan that included the industrialization programme put forward by the communist government of 1946. In the midst of the Cold War, Slovakia entered the Council for Mutual Economic Assistance (COMECON), which led the way to Slovakia's industrialization from 1950. In spite of the marked political and organization differences between COMECON and Western economies, Slovakia's socialist industrialization was also based on heavy state investments in industry and energy, especially oil, machinery, metallurgy and the chemical industry. Membership of COMECON included the introduction of Soviet planning and management methods. The nationalization of industrial enterprises and the collectivization of agriculture were fundamental elements of the economic model.

In Argentina, the investments of the state in the post-war period resulted in an expansion of the industrial base. In particular, the establishment of SOMISA resulted in an increase of 400% in the production of raw steel between 1960-1965, which meant an increase in the capacity to meet internal demand from 14% to 50%. The pro-industry ISI strategy was dismantled following the military coup of 1976, redirecting the economy towards a greater reliance on imports. The volume of imports increased from an overall value of \$65 million in 1976 to \$1900 million in 1980. This trend had a negative impact on national industry and on employment, which declined in the period. The military regime's policy of deindustrialization was linked to a politics of repression, especially directed towards the labour movement. Although the restitution of democracy in 1983 marked a shift in government policy towards re-instating workers' rights, these failed to reach the levels achieved prior to 1976.

Brazilian industrialization from the 1950's onwards was aided by foreign direct investment, sometimes in the form of joint ventures such as in the case of Nippon Usiminas (Japan/Brazil 1956). Between the early and late 1960s the industry developed an institutional framework for the representation of the steel industry's demands, first through the Instituto Brasileiro de Siderúrgia in 1963 and later through the Plano Nacional Siderúrgico in 1968. During the 1970's there was an increase in productive capacity after the implementation of the second Plano de Desenvolvimento Económico and the creation of Siderbrás as a holding company in charge of state investment in steel, which effectively safeguarded state control over steel production.

The effects of neoliberalism(s) - the 1990s and beyond

Important changes, directed towards moving away from state-induced and state-supported industrialization, began as early as the 1970s. But it was during the 1990s that wholesale shifts in the dominant economic model are evident in the policies and trends affecting the four countries studied in this project. During this decade various processes of privatisation take place that mark important trends and have parallel effects in all four countries, although the historical and political specificities of each establish a unique rhythm and shape in each case.

In Spain the decade was characterised by privatisation, cutbacks in government spending and social reforms aimed at reducing eligibility for government subsidies and support. In the late 1990s high rates of unemployment were coupled with steady increases in foreign investment abroad, as well as the presence of Spanish multinational companies in the world market: Spanish competitiveness in the global arena increased but still remained lower than other emerging economies. In the steelmaking industry, concentration, privatization and internationalization were envisaged as solutions to the difficult economic conditions, and Spanish companies sought 'strategic alliances' with foreign companies, significantly reshaping management strategies and crucially diminishing the number of companies involved in steel production. This process had devastating consequences for the labour-force, diminishing the number of workers and generating conflicts in the restructuring processes.

In Slovakia, changes in economic models are clearly tied to radical political change: the collapse of socialism in 1989 and the 'velvet divorce' of Czechoslovakia in 1993, resulting in the independence of Slovakia. One of the first tasks facing the new nation-state was the transformation of the economic structure through the transfer of enterprises to private ownership. The launch of a federal program of economic reforms in 1991 had a negative impact on the living conditions of the Slovak population, especially because the Slovak economy was based on heavy industry, which was particularly singled out for restructuring and reform. Consequently, by the mid-1990s, only 17,3% of Slovak products was considered competitive. The managerial elites became supporters of the Meciar government's critique of the 'shock therapy' economic neo-liberalism that had been pursued by Czechoslovakia after the collapse of COMECON and the subsequent loss of markets for Slovak production, in favour of a gradualist approach whereby industries and assets were transferred to Slovak capitals, in what might be described as 'clientship privatization'. In this context, steel production and metallurgy, which had remained the pillars of the post-socialist economy, showed a marked decline after 1996. There was significant economic growth in this period but despite this, the rate of unemployment decreased only moderately, which can be explained by higher productivity rates and the diversification of the third sector. Meciar was criticized for the isolationism that was seen to derive from his particular approach to privatization and after his defeat in 1998 a new coalition government implemented economic policies inspired by economic liberalism and neo-institutionalism. Consequently, unemployment reached a record high in 1999. Nevertheless, the liberalization of the economy, the privatization drive and the neoliberal policies adopted by Slovakia strengthened the country's bid for EU membership. The solution proposed to deal with the situation focused on foreign investment as the principal agent of economic development. Indeed, the importance of foreign investment was accentuated with Slovakia's entry into the European Union.

During the 1990s Argentina experienced an intensive programme of structural reforms, including trade liberalization, a wide-ranging drive towards the privatization of state assets, the de-regulation of the financial system and of labour relations. A central feature of Menem's Peronist government strategy was the Plan de Convertibilidad that pegged the Argentine currency to the US Dollar on a one-to-one basis. The state-owned, strategically important SOMISA was privatized in 1992, when 79,97% of shares passed to private owners, with Techint the majority buyer; negotiations between government, trade unions and the firm resulted in a 20% share for the workers via the trade unions. More broadly, the

Convertibility Plan had important consequences for private and public debt and the real value of money. This affected local producers and dramatically increased the rate of unemployment, poverty and instability in the labour market. Crucially, the overvaluation of local currency and the opening of the economy to external markets created unfavourable competitive conditions for local commodities. The measures that were carried out during the period in question led to an unprecedented national crisis in 2001-2002. This crisis had a profound political and economic impact and prompted a shift in the direction of government towards a production-based economic model. This new economic direction had a positive effect on the steel industry, which underwent a period of expansion from 2002 to 2008.

The privatization of the Brazilian steel industry began in 1988, with privatization of the smaller units in the sector. Privatization of the larger enterprises followed, with the Companhia Siderurgica Nacional (CSN) privatized in 1993. This followed a longer process of transformation of production and administration to prepare the ground for privatization, in other words, to make the enterprise a desirable acquisition for private investors. It is significant that when the plant was privatized, so were all CSN's assets, including the company hospital, the technical school, outlying buildings and housing. Here, as elsewhere, privatization was accompanied by reductions in the workforce. Privatization also had implications for management, notably the separation that arose between management and ownership and the potential instabilities arising from the differences in scale between Brazilian enterprises and their European and Japanese partners. Another feature that made for potential instabilities was the internationalization of the industry, as it became an attractive destination for Foreign Direct Investments (FDI).

History and comparison: issues arising

Although this report refers to the evolution of the steel industry, the project emphasizes the point that far from implying a smooth and progressive process of change, this evolution encompasses disjuncture and rupture, including the impact of crises, both political and economic.

The historical trends of national economies and their relation to the steel industry can be understood in terms of a broadly drawn periodization, as described above. It is also clear that although there are general trends in the evolution of the industry, there are important specificities to be taken into account in each case. There are, furthermore, local and regional particularities in the models implemented in each case; these differences can be explained, at least in part, through the historical trajectories of the four countries examined in the research, their place in the global economy and the characteristics of government and the articulation of class and politics that obtain in each instance. In terms of changing models, the project notes a shift from models where industry plays an important role, towards models that are articulated in relation to financial markets (for example the Plano Real in Brazil in 1994 and the Plan de Convertibilidad in Argentina in 1991).

Comparison of the four cases indicates that there are significant parallel processes across the cases relating to the implementation of models on a macro-level. Broadly, two models can be identified, following one another over a period of 70 years or so, that share broad similarities across the four cases. The principal characteristic of the

first model is the commitment to industrial growth as a key feature of economic development; furthermore, state actors articulate this commitment through planned economies and/or alliances with local and international enterprises. This model entails heavy investment by the state in infrastructure such as transport and communication and urban development, as well as its involvement in the construction of plants and the advancement of technology. The steel industry played an important role in the model and could in fact be characterized as the linchpin of the strategy of economic development, supplying other national industries and providing jobs. This pro-industry model was replaced from the 1970s onwards by a market-oriented model, where the state's role was greatly restricted, in the expectation that the fluctuating demands of global markets would determine the shape of local economic performance.

What is a model?

The project's point of departure and its central question relate to economic models: how they emerge, how they circulate and how they are implemented. Crucially, the project is concerned with what models do or, in other words, their effects on local communities, lives and livelihoods. To achieve this the researchers needed to distinguish between different kinds of models that operate on very different scales and within different webs of power and influence. Indeed, the research is concerned with the different capacities of models to exercise hegemony. Thus, a range of policies that coalesced around a market-led model and that in 1989 came to be described as the Washington Consensus, became widely influential, notably through the structural adjustment programmes promoted by the International Monetary Fund. At the same time, the case histories show different degrees of adherence to the model and at particular conjunctures - notably in response to crises - governments may adapt or even overturn the basic principles of the model. At yet another level, a wide range of local actors articulate their understanding of the economic, political and social forces that affect their lives and livelihoods. Their interpretative models interact with contextual conditions to inform the strategies that individuals and groups devise to understand the past, confront the present and plan for the future.

These very different kinds of models - 'owned' by diverse actors - demand different methodological and theoretical instruments to provide a sufficiently complex account of them. Furthermore, the analysis of complex processes involving a range of actors and a range of fields of power, from global institutions through to governments, enterprises, trade unions, workers and the unemployed, requires analytical models capable of tracing connections and relationships between these actors and models and/or generating the questions that will lead to a fuller understanding of models and their effects.

In the first instance, models are ideas that are effectively articulated within more or less coherent bodies of knowledge, as well as techniques, technologies and the social relations through which or within which they are devised and actualized. Thus, the study of models involves the study of ideas in practice. Models can be understood as artefacts or devices that engage with concrete circumstances and relationships in specific contexts, in what have been described as performative entanglements. They might also be thought of as instruments of domination of particular interest groups who exert economic, political and/or cultural power.

As mentioned, models are circulated and implemented at different scales and different levels of concreteness and specificity. The project suggests a distinction between broad systems of ideas that circulate widely across different political and economic regions and more specific and tightly articulated models that, through particular practices and forms of implementation, have localized effects. Thus, the idea of industry-led, state-sponsored economic development finds a more focused expression in particular contexts under models such as Import Substitution Industrialization in Brazil and Argentina, Autarchy in Spain and state socialism in Slovakia. From this it follows that models are generated through multiple relationships in different sites, at different scales and with different temporalities. It also follows that models emerge in a relation of dynamic interactions between actors and ideas. Two questions arise in relation to this: how do models emerge and exercise influence? And what role does the distribution of power have in this emergence and circulation of models? The consortium proposes that in order to address these questions it is imperative to take into account the implications of the global context and the ways it intersects with regional and national economic configurations. This is exemplified by the privatization of the steel industry as the outcome of policy interventions that dislodged the state-sponsored model in the drive towards a market-led model. The privatization process that occurred in the steel industry from the second half of the 1980s exhibits some common features across a selected sample of countries studied in the project, albeit with different magnitudes of investment and production in the different examples.

In order to take these questions further, the project implemented a range of modelling techniques, exploring the potential of integrating qualitative data generated through fieldwork and computer modelling and simulation. The interpretation of observed empirical patterns can be impeded by a gap arising between abstract theorising and the variety of diverse empirical histories. The consortium adopted a research design that harmonises the need for rigour in abstract modelling with the need to assign empirical content to theories. For this purpose, the project integrates formal modelling, typically an instrument in the field of economics, with ethnography.

Computer modelling provides the bridge that connects economic modelling and ethnography. Grounded in formalisation, computer simulation supports the process of theorization through rigorous deduction from modelled assumptions. At the same time, computer simulation retains the ability to engage in a dialogue with the type of data extracted from field studies for three reasons. First, programming languages are often more expressive and less abstract than most mathematical techniques. Second, computer simulation, by searching for numerical rather than analytical solutions, is able to maintain a fairly high level of descriptive richness and complexity. In this respect, computer simulation may provide a unique territory to integrate general data originating from statistics with rich accounts generated through interviews and fieldwork. Third, by transforming theoretical hypotheses into simulated patterns of behaviour, computer modelling and simulation generate artificial time series that can be compared with empirically observed behaviour.

A broader methodological point relates to the importance of inter-disciplinarity in researching multi scalar and multi dimensional phenomena such as economic models. In the case of privatization specifically, it became evident that in order to fully capture the

determinants of the privatization process and its impact on societies, it is important to explore sociological, economic and political factors. In this respect, the consortium found it necessary to design the research on the basis of interdisciplinary collaboration between economists, sociologists, anthropologists and political scientists. Taking into account the different scales and variables that impinge on the process through which models emerge, adapt and effect change, the consortium explored these questions through a detailed study of privatization.

The consortium observes that the paths outlined, suggest the process of privatization in these countries followed comparable trends, of increased state intervention in the period from 1945 that peaks in the mid-seventies. In addition, researchers note that in the three countries:

- There are temporary periods of increase in the role of private production in the period 1969-1971 and in the second half of the seventies.
- There follows a period of relative stability in the role of private production in the first half of the eighties.
- There is a clearly marked process of privatisation at the end of the eighties, often anticipated by a transitory increase in the role of the state.

The observed similarities in the patterns of privatization in these three cases suggest the importance of exploring the dynamics of change affecting economic models at a global level. Rather than concentrate on local political pressures, there is a need to take into account global dynamics and the mechanisms that connect global models to country-specific political decision-making. The exploration of the data suggests the following hypotheses:

1. Economic models advocating the privatisation of state-owned firms develop at the global level.
2. Globally developed economic models generate pressures through the activity of global or international political entities (such as the International Monetary Fund, International Finance Corporation, Multinational Investment Guarantees Agency and the European Community for Coal and Steel).
3. Pressures by global and international political entities are mediated by national political elites who articulate nationally legitimised privatisation programmes.
4. Nationally legitimised privatisation programmes may be adjusted further, following political pressures by interest groups that operate at the local level (for example, regional administrations, sectorial organisation and trade unions).

The significance of privatization demonstrated and explored through the modelling exercises is supported by the ethnographic data, in particular the narratives of workers, trade unionists and other social agents related to the steel industry, for whom privatization represents a critical event. While the modelling of the aggregate data demonstrates the existence of a sharp change in the composition of capital in the industry, albeit at somewhat different moments and to different degrees of exclusivity, the narrative data shows how these events impinged on the lives and livelihoods of steel workers, their families and indeed entire communities. The impact of privatization is also evident in the significant changes in local employment patterns in the cases studied in this project. Thus, privatization as a feature of the recent history of

capitalism, understood to be the widespread shift of ownership from the state to private hands, is best understood through the combination of ethnographic narrative data, statistical data and modelling.

A focus on privatization also draws attention to a more encompassing and wide-ranging, yet radical, shift in dominant economic models (from state-sponsored and industry based growth models towards market-led private and global enterprise). The extraordinary capacity of the new model to prosper can be attributed, at least in part, to the growing significance of the global domain as a market for capital, goods and labour, and as an environment in which increasingly powerful global actors oversee the gestation, consolidation and implementation of economic models that inform not only the interventions of states but also the strategies of enterprises. The specific political orientations and ideologies that characterize particular governments during the privatization process are far less significant than the global pressures that obtain during the period from the oil crises up until the end of the 1990s. It is, therefore, crucially important to grapple theoretically and empirically with the global domain.

How do models emerge and how are they disseminated?

The modelling exercise highlights the significance of the global scale in the design and circulation of economic models. This raises the need for a thorough exploration of the global and how global actors and processes become effective. The researchers have proposed that there are models characterised by high levels of abstraction, which could be described as meta-models. These arise and move through webs of fragmented or discontinuous global spaces, such as industrial enterprises, mills and factories. Connections and flows across loci that articulate these webs are structured by what the project researchers describe as the diffuse mode of dissemination of development models. This mode has an ontological capacity, difficult to perceive because of its depth and its naturalizing power. It works in implicit rather than explicit ways. It is the result of a myriad of agencies and agents in the *longue durée*. This mode may be represented by the values of decision-makers and is contrasted with the concentrated mode that refers to individuals such as entrepreneurs, managers and technicians who transfer visions, technologies, models and know-how within specific localities and circumstances. The concentrated mode has an explicit and evident framing capacity. It is thus manifest in social relations and social reality and is amenable to ethnographic scrutiny. In this respect, discourses can be seen as the stuff of the diffuse mode while models are best understood as the stuff of the concentrated one.

On a global scale, models flow through a matrix of metanarratives that are often expressed as civilizational discourses, which provide the ideological environment in which development models are generated and legitimated. This matrix is made up of discourses and models of different levels of abstraction. Discourses explain and naturalize social life, providing the parameters for the acceptance and legitimation of models. These in turn inform and promote concrete processes of decision-making and intervention in a specific reality. Discourses and models are not the only elements that constitute the flows and the webs of connection. The movements of capital, for example, are also expressive and constitutive of the system of relations and flows. The history of corporate mergers and acquisitions shows the intricacy of the connections and the complexity of the resulting webs. Such processes often reflect

macro political junctures, involving different actions and positions of diverse state elites acting in different historical moments and geographic locations. There are cycles of boom and bust with new opportunities arising with modernization or expansion, old ones disappearing with downsizing or closure of productive units; there are new migrants (workers, technicians, managers), sometimes producing new segmentation in the labour market (based on ethnicity or other forms of differentiation), new cultural exchanges, new interconnections with different parts of the world and their avatars, the introduction of new technologies and managerial models, different relations with public policies, politicians and state elites. As already highlighted in relation to privatization, capital flows and composition change according to highly complex processes that indicate in turn that flows are not only multi-scalar, but are also multi-lineal, involve multiple agents, and multiple spaces and time frames.

When considering flows, whether of ideas, capital or technologies, it is important to take into account the shifting distributions of power across the different agents involved in these processes. Indeed, it can be argued that global governance and the contours and weight of nation-states are implicated in, and affected by, the transfers of know-how, technology and capital. Ideologies and systems of international cooperation and aid are amongst the range of devices - that also include international law, treaties, conventions, pacts, as well as research, conferences and reports - that facilitate the diffusion of categories, systems of classification and consensual models across transnational economic and political elites. For example, capacity-building programmes are not neutral instruments directed at shaping the labour market. Rather, they act as vehicles for the dissemination of certain values, models of development and government practices. One of the most important consequences of the work of international cooperation is the strengthening of nation-states' elites and of state administrative apparatuses. Another consequence is the design of national economies by means of the application of various extra-economic devices and governance techniques. International cooperation also has political, economic and identity consequences for the donor and recipient countries. Flows of resources mobilized through cooperation schemes provide the means for donors to build hegemony, while securing jobs and income for the donor country.

The discussion of global circulations of development models indicates that flows do not happen in empty spaces. Rather, they take place in power fields that are structured by many political and economic agencies and agents. These insights clearly show the need for (a) a sociology of the logistics of flows that pays attention to the characteristics of agencies, agents and systems as well as the infrastructures and apparatus associated with time-space compression, and (b) a wide ranging and ambitious discussion about how flows are controlled and who controls them.

The research suggests that the translation of a model into concrete practices and interventions, such as the privatization of state-owned enterprises, illustrates the ways in which scale, agency and power unfold. At the global level, following the 1970s oil crises and taking firmer shape in 1989 with the Washington Consensus, actors and processes colluded to promote privatization as a key element in the model promoted by the IMF and WB. On the other hand, global pressures also impinged on the steel industry, where scale in relation to production, capacity and

markets is crucial. These 'market' pressures also worked towards the erosion of state ownership and control in favour of privatization of steel enterprises. On the ground, these became elements of coercion (via global institutions and the state) acting against those who had benefited from state-led industrialization. But in the ensuing struggles, which took place in the majority - but not all - of the research sites, the hegemony exercised by the Washington Consensus model played an important role in shaping the outcome of these conflicts. The resolution in favour of privatization can be explained by the relative power of the actors (for example trade unions and the state) and the apparent absence of alternatives. According to informants, experts and stakeholders, there appeared to be no alternative to the privatization model as a solution to the very real problems encountered by the industry in its relationship to increasingly complex and constraining global conditions.

What are the implications and effects of model change?

Economic models are also models of society (encompassing social relations, social categories, spatial and temporal forms). The relationship between production and social organization is explicit in industrial models dating as far back as the 19th century when industry was associated with urban planning, the foundation of schools and other services. A similar strategy is illustrated in the Brazilian state's investment in the development of Volta Redonda alongside the construction of the President Vargas plant, as will be shown in the sections below. Another important feature in all the cases studied in the project is the role of the state in relation to training and education, which also changes with privatization. Overall, the case studies suggest that the shift to some version of neoliberalism produces a disarticulation and a reassembling of social relations, of social and political spaces and of time frames.

Since the 1990s and the widespread privatization of the industry, there have been striking changes in the size, composition and quality of the workforce. These are associated with changing definitions of the worker and of the skills demanded by the industry (high levels of education and training, flexible and broad competencies, credentialism) on the one hand, and growing levels of job insecurity on the other. Associated with this is the extension of forms of precarious employment and subcontracting that have the effect of deepening the fragmentation of the workforce.

Subcontracting or outsourcing of tasks from one enterprise to one or several others was first identified as a symptom of the decentralization of production and a cause of precarious employment and informalization in the 1970s, in particular with reference to Italy and later to other Southern European countries such as Spain. The motivation for outsourcing relates to the limitation of costs, particularly regarding labour and sometimes taxes and overheads. Furthermore, subcontracting tasks or entire functions to outside firms enables the mother-firm to address risks relating to unstable markets and fluctuating demand; it may enable them to benefit from the lower costs of informal work contracts without infringing labour regulations and laws. In the cases discussed in this project, subcontracting entails the outsourcing of functions to external firms, but unlike the classical cases studied in the early literature, here the work may be carried out within the mother firm albeit under the umbrella of a separate enterprise. This is clearly the case with the outsourcing of maintenance tasks and cleaning, where

workers employed by the subcontracting company will work alongside workers employed by the subcontractor company, although in some establishments, such as the Navantia shipyards in Spain, subcontracted firms also carry out production tasks. Although the spatial dimension identified with the decentralized production of the 1970s and 1980s is often not relevant in the case of the steel plants discussed in the project, the rationale for subcontracting remains the same: to reduce costs, particularly of labour, enhance the flexible use of these resources. The wage differentials and the different conditions of employment pertaining to the 'guest' workers from the subcontracting firm and the 'host' workers of the mother-firm become clearly visible and relevant to the every day experience of work.

The rifts and divisions produced by the system of subcontracting in turn have significant consequences for the capacity of local interest groups to organize for collective action. For example, workers who are not on the companies' permanent work force and who are therefore particularly exposed to conditions of job insecurity, are likely to be left unprotected and unrepresented as trade unions sometimes struggle to incorporate them, or altogether fail to articulate inclusive strategies that reflect the interests of all workers in the sector. Nevertheless, in spite of the differences across the case studies in relation to the commitment and capacity of trade unions, governments and civil society organizations to address the causes and effects of insecurity, the rise of precarious forms of employment appears to be de-linked from specific governmental forms and models. Rather, they seem to originate from the dynamics of the global economic system as a whole and the steel industry in particular. The industry itself faces uncertainties in the global market, dependent as it is on both the availability of accessible raw materials and the continuing prosperity of industrial economies that ensure a healthy demand for its products.

One of the most significant outcomes of the process of restructuring that preceded and followed privatization is the decline in the number of workers employed in the industry. In Slovakia, in the decade from 1970 to 1980, the Košice plant on average employed 25000 workers. Today, there are around 10000 workers at the plant. In Central Slovakia, the decline of industry since privatization has been significant, leaving the region with a 19.5% unemployment rate, the highest in the country. Nevertheless, employment remains concentrated in the industrial sector. The Železiarne Podbrezová plant, privatized in the mid-1990s, saw a reduction of its workforce from 5000 to a current level of 3000, but remains the largest private employer in the region. Similarly in Spain, in the case of Ensidesa-ArcelorMittal, a workforce of 27000 at the end of the 1970s was reduced to less than 6000. This is a trend across all the case studies and in smaller as well as the large-scale enterprises. Nevertheless, although in many cases privatization was succeeded by an intensification of restructuring and, in the public imaginary, privatization has become an important threshold between a past of stability and a present and future of uncertainty, the decline in employment is a longer-term and enduring feature of the continuous adaptation of the industry to global economic trends.

The examples outlined in the project show that when interpreting unemployment figures and in particular when considering solutions to the problems of unemployment, it is important to consider the relative economic heterogeneity of the locality and the region. There is a difference in the levels and implications of unemployment between regions

where the steel industry is located at the heart of an industrial district that has developed in relation to it and its ancillary enterprises, and regions where declining demand for labour by the steel industry takes place in an economic environment that is diversified and therefore alternative forms of employment may be available. This feature is also important when considering skills and education, in that diversified economic landscapes benefit from training that enhances the flexible adaptation of skills and learning. Conversely, where there is a concentration of investments in a single industry, even effective training schemes may fail to undermine levels of unemployment, as trainees who are surplus to the needs of that industry fail to re-allocate their skills and their knowledge towards other sectors of work. These observations are particularly important given that unemployment is disproportionately affecting the young. The problem of youth unemployment is a global phenomenon, as is the concentration of the young in low-paid and insecure employment. The study of the steel industry provides some important insights into this process of marginalization of the young from the labour market, as discussed below.

The repercussions of unemployment and of insecure or temporary employment are felt beyond the world of work. Households need to adapt to changes in the level or regularity of income, in the distribution of tasks between different generations and across male and female household members. Evidence from research in San Nicolás, Argentina, suggests that the loss of employment that took place during restructuring and privatization in the 1980s and 1990s has had long-term effects on households, including that of limiting the ability of the younger generations to pursue a sound strategy of personal advancement. The loss of income and the fracturing of family units presented obstacles to the completion of studies, now a fundamental requirement for entry into the steel industry. Elsewhere, as in Podbrezová, a long tradition of mixed economy, where individuals or families worked in both industry and agriculture, has been revitalized under the pressures of unemployment. In Podbrezová it is also possible to continue self-provisioning activities and the availability of land and houses can accommodate extended families as they adapt to conditions of crisis and unemployment. Those living in highly urbanized conditions have less flexibility, although multi-generation households are a feature in urban areas too as the lack of income and housing deficits militate against the young setting up independent residences. On the other hand, there is also evidence of a different trend in domestic arrangements: the study of the Spanish family-firm Megasa shows how women's entry into the labour force brings about re-arrangements of domestic work and responsibilities between husband and wife, which in turn have implications for work in the steel factory, making shift work less desirable amongst the younger generation. Shift work is, nevertheless, a feature of the organization of production, and the conflicting demands of household and work can result in tensions within households.

Privatization did not only affect enterprises. The Washington Consensus model called for a 'roll back' of the state in all areas where it had played an historically significant role, such as in education. In Argentina, the de-investment in education that followed the implementation of neoliberal policies, advocated by the WB and the IMF, had an effect on productivity in that the lack of technical expertise resulted in the deterioration of machinery. The eclipsing of industry as the strategic core of the modern economy (as it had been in earlier models, for example under socialism in Slovakia and under Peronism in

Argentina) led to a decline in the status (and funding) of vocational training. Informants in Argentina refer to a skills vacuum, which posed many challenges as the country re-assessed the importance of industry as fundamental to economic development after the 2001 crisis. Although individuals and families are perhaps the most directly affected, the issue of skills is central to the reproduction of the industry. An historical perspective on generations of workers and education in the four countries suggests that the investments and strategies of governments and firms in education and training have a significant long-term effect on the viability and performance of specific firms.

Ethnographic research: the field sites

In Spain, the research teams based at the University of Barcelona carried out field research in two locations in northern Spain. Aceralia (ArcelorMittal) is located in Asturias, a region with a long history of mining, metalwork and steel production. Aceralia, originally a state-owned plant (ENSIDESA), was founded in 1950 as a central feature of Franco's national development plan. In 1994 ENSIDESA became a shareholding company (as Compañía Siderúrgica Integral) and in 1997 it was bought by Arbed, becoming part of the Arcelor conglomerate formed by Aceralia, Arbed and USINOR in 2001. In 2006, the Arcelor and Mittal merger was the final stage in a process of internationalization of the firm, reflecting dominant trends in the industry. Under ArcelorMittal the plant is a major player in the European steel industry (see <http://www.arcelormittal.com/corp/?page=0&lngId=3&tb0=> online). The second site is in Galicia, where the shipbuilding industry has dominated the regional economy. Like the steel industry in Asturias, shipbuilding in Galicia has had a strong influence on the regional productive landscape, civil society organizations and the development and transmission of skills in the area. Research in Galicia focused on MEGASA, a small family firm founded in 1953. MEGASA developed independently of the shipbuilding industry and therefore avoided the effects of the crisis of the shipyards. MEGASA remains family owned and managed, although it has expanded through the acquisition of enterprises in Portugal during that country's privatization drive in the late 1990s, followed by the purchase of a Portuguese cement factory in 2004. The firm has thus played a role in promoting the internationalization of the industry. Besides, for the distribution of its products it relies on commercialization networks that are largely international. The company has been successful in sustaining its position nationally and internationally, even during times of crisis.

The Slovak team, based at Comenius University, also conducted field research in two very different enterprises in two regions where the production of steel is a key feature of the economy. The first location is U.S. Steel's plant in Košice (see <http://www.ussteel.com/corp/company/profile/sk-about.asp> online), a global producer with headquarters in Pittsburgh, Pennsylvania. It is an integrated steel producer with major production operations in the US, Canada and Central Europe. It has an annual raw steel-making capability of 29.3 million net tons. The company manufactures a wide range of value-added steel sheet and tubular products for the automotive, appliance, container, industrial, construction and oil and gas industries. The Košice plant was built in the 1960s under Socialist economic development plans in which industry – and steel in particular – played a central role. After 1989, the plant, now the East Slovakian Steelworks, was privatized and in 2000 was acquired by the US Steel Group

(at the time a unit of the USS Corporation). The second field site is located in Podbrezová. The firm, Železiarne Podbrezová (see <http://www.zelpo.sk/zelpo/homezp.uk.nsf> online) was established in the 1840s in a mountainous area of Central Slovakia where the treatment of iron and other, non-ferrous, metals dates back to the 16th century. The plant has an historical relationship with state planning dating back to early modernization projects. In 1992, after the fall of the socialist state, it became a shareholder company, with majority ownership going to Slovakian shareholders (99%). The company now has connections with plants in the Slovak Republic, the Czech Republic and Spain and sells to 50 countries across the globe, supplying the automotive industry, the energy sector, engineering and infrastructure projects.

During the first stage of the research, the team working in Argentina, based at IDES, identified two contrasting examples of the range of enterprises operating in the steel industry. The first was a 'recovered factory' in the city of Buenos Aires, which had been taken over and managed by the workers at the time of the collapse of the economy in 2001-2, when many enterprises closed down or were abandoned by owners unable to deal with both market and financial constraints. At the time of the research, the factory was operating at a very reduced scale and the team decided that a longer-term study of this case was unlikely to be productive. Instead, they concentrated on the case of a large steel plant in the north of the province of Buenos Aires. It started out as SOMISA (Sociedad Mixta Siderúrgica Argentina), founded in 1947 during the government of Juan Domingo Perón as part of the Plan Siderúrgico Nacional, a national programme for the development of the steel industry. The plant is located in the country's principal steel producing hub and remained a central element within the national economy while under state ownership since the 1960s. It was privatized in 1992 as part of the Peronist president Carlos Menem's neoliberal reform programme; it is currently part of the Techint group and is Ternium Siderar's largest plant in Argentina (see <http://www.siderar.com/> online).

Research in Brazil was carried out in the Steel Valley (Vale do Aço) in Minas Gerais, which, as its name suggests, concentrates a large number of important steel plants. Research focused on Usiminas (see <http://www.usiminas.com/irj/portal> online), created in 1957 as a joint venture with Japanese and Brazilian capital and investments from the state of Minas Gerais. The bulk of the research was focused on an enterprise that was founded by the state and remained under state control until the 1990s: the Companhia Siderurgica Nacional (CSN) in Volta Redonda in the state of Rio de Janeiro, was created under the guidelines of the developmentalist model implemented by the government of Getúlio Vargas. The plant, named after the president (UPV - Usina Presidente Vargas), opened in 1946, after which it experienced three stages or plans of investment and expansion. It operated under the aegis of Siderbrás, which coordinated the sector nationally, and was privatized in 1993 (see <http://www.csn.com.br> online). In addition to this plant, CSN owns coal mines in the state of Minas Gerais and has a diversified portfolio of interests. The company and the Brazilian steel industry as a whole benefit from the availability of raw materials and in particular from Brazil's position as the world's third largest producer of iron ore.

The changing character of work

Research carried out in the seven sites outlined above shows significant changes have taken place in the conditions of work and employment in the

industry. These changes are associated with a fragmented labour market and hierarchical organizations of the work force. A key factor in this fragmentation is the widespread practice of subcontracting, a management strategy that provides flexibility for the enterprise but which has the effect of generating precarious forms of employment, divisions in the workforce and widespread insecurity.

These conditions are reflected in the narratives of the employed and the unemployed, of trainees and of those aspiring to enter the cycle of training-employment. Concerns about the future, fears of unemployment and an overall sense of uncertainty are amongst the most prominent issues arising from the research with workers, including management personnel. To some extent, there is also a perceived loss of prestige and income compared to the past or to other sectors of the workforce. Nevertheless, these negative appraisals attach more strongly to those employed through subcontracted firms. The workers employed directly by the factory may still feel they represent a prestigious and well-recognized section of industry and of society, even though they may also feel that their best years are behind them.

There are two major areas that appear to account for the pervasive sense of instability and for the precarious quality of work for a significant segment of the work force. In the first instance, the extensive use of subcontracting has the effect of fragmenting the labour force and reproducing a hierarchical structure whereby those working side by side might be governed by very different regimes of employment, pay and job security. In Spain, the inequalities generated by this system were addressed in the 'Acuerdos de Oviedo' signed in the early 1990s in Asturias. These Agreements, made by trade unions and employers of the mother firms and the subcontracted firms, established parity across the work force, equal pay for subcontracted and main firm workers, and equal contractual conditions. This progressive step has had a perhaps unanticipated effect: it has promoted a trend towards employment of greater numbers of staff by the mother-firm, thus depleting the subcontracted firms of trained personnel.

Subcontracting was a feature of all the firms studied in the project, with the exception of Železiarne Podbrezová, where an intensification of the shift work system seems to have addressed the need to use labour flexibly. The case of Asturias illustrates the entangled trajectories of restructuring, privatization, job losses and the rise of service companies. The plant tendered out certain functions, especially in maintenance, to SMEs, who provided services within the plant at a lower cost. As our other examples also show, this situation caused serious rifts and distinctions within the workforce, affecting solidarity and sociality amongst workers. The resulting hierarchy between members of the permanent workforce of the plant and the workers from the subcontracted companies, expressed in lower rates of pay, inferior work conditions, greater exposure to risk and pollution and everyday practices of discrimination, also translated into differentiation and exclusion outside the plant. In Slovakia, such workers would not have access to a mortgage to buy a home, as only those with permanent contracts are eligible. Similarly, in Argentina, workers from the subcontracted companies did not have access to the prestige and material advantages, such as access to loans, hire purchase deals or consumer credit, enjoyed by Siderar's own workers.

In many cases the subcontracted firms play a key role in the process of training and recruitment for the large plants. Indeed, in San Nicolás, the subcontracted companies provided a recognized route into the plant. This was however by no means a guaranteed entry into a permanent post. On the contrary, only a minority of subcontracted workers would enter the permanent workforce, but the possibility of success made entry into the subcontracted companies desirable, in spite of the temporary contract, lower pay and unfavourable working conditions.

Even amongst those workers who consider themselves to be in a secure and relatively well paid position in the industry, there are expressions of anxiety regarding the future: workers in Asturias, especially those in mid-management or upper management posts, were concerned about the risks of relocation. A combination of factors such as the attractiveness of BRIC countries (Brazil, Russia, India, China) for investors, EU industrial policy, relatively high labour costs in the area, and the pressures of global competition made the plant vulnerable. Their anxieties were exacerbated by what they saw as a lack of investment in technological renewal that again made the plant vulnerable in the long run, a concern that was echoed by workers in the US Steel plant in Slovakia. Elsewhere, as in Argentina, there were also concerns about the tenuous ties between the foreign owners of the plant and the country's future, which might facilitate recourse to the rationality of maximizing global opportunities - and therefore possible relocation.

These reflections lead us to the second and crucial feature affecting perceptions of security and insecurity in relation to the internationalization of firms and the globalization of the industry and of the economy. Whereas under the aegis of national industry jobs were rendered secure given the strategic (political and economic) status of the industry within national development projects, privatization of firms that are obliged to compete globally makes these firms and their employees vulnerable to changing conditions in global markets. There are significant differences across the cases studies in the project, as particular firms have a different relationship to specific markets and government structures. For example, EU regulation is claimed to have positive and negative effects on the competitiveness of European enterprises within the global market, but specific conditions within the EU may neutralize or exacerbate the risks arising from the global market. For example, in the case of US Steel Košice, its role as a supplier to the German car industry and other industries, which are so far robust, has made for considerable stability in moments of global crisis. For different but comparable reasons, the Brazilian steel industry is still a key actor within a dynamic national development plan that has been reflected in sustained growth. Added to the country's wealth in key natural resources (such as iron), the strong demand for steel products from its expanding industrial sector, and sustained demand from the export market, this suggests a relatively positive outlook for the industry. This is in fact reflected in the narratives of steel workers who express a positive appreciation of their work and living conditions compared with the past.

Today, there is a marked difference in the credentials demanded by employers in the industry, with much greater emphasis placed on formal educational achievement. Nevertheless, in spite of the central role of education, certification of training and screening (for example via performance as employees of sub-contracted companies), there are continuities in the perception that personal networks remain an important

resource when it comes to access to jobs in the plants. However, there are strong indications of a shift away from the apparent stability of father-son transmission of jobs towards a less stable and less reliable use of personal networks that may include kin but may also involve non-kin who are workers or trade union officials in the plant.

This suggests that while the globalization of markets and the internationalization of investment in specific firms subjects the latter and their employees to a range of tensions and demands, the specific conditions that obtain in each case (spatial and political relationship to strategic resources and/or markets, and the density of the industrial fabric in each instance) mitigate these effects or enhance the vulnerability of firms and workers. According to a report produced by Ernst and Young, steelmakers face an on-going problem regarding the availability and pricing of raw materials that strengthen the hand of suppliers and result in short-term price contracts as well as higher prices. They claim that the industry is caught between raw material suppliers and customers, such that 'Steelmaking has become a form of raw material processing or beneficiation, not the unique creator of value.' This, they suggest, requires the industry to adapt by both passing on higher costs to customers and simultaneously increasing flexibility in production to respond to rapidly changing customer demand. Such pressures on the industry will have different effects on different plants and countries. Brazil, as mentioned, has the advantage of an abundance of iron ore and access to coal. Also, as an emerging market, the industry can benefit from buoyant demand, though the effects of the crisis affecting markets abroad will have a knock-on effect. But in all instances, flexibility regarding product and volume of production is likely to be a determining factor. This would suggest that strategies that maximize the flexibility of labour are likely to be a permanent feature of the industry.

Generations

With the exception of Železiarne Podbrezová, which has its roots in the industrial policy of the Habsburgs, the enterprises in the steel industry studied in this project were founded in the first half of the 20th century. Their relatively short history means that the researchers had access to the direct or social memory of the first generation of workers. In all instances the workers recruited to the steel industry tended to come from the rural areas. They were, therefore, untrained and inexperienced in industrial work. Nevertheless, the early stages of the industry required skills that could easily be transferred from rural labour, for example for the construction of the sites, premises and furnaces. Many of these construction workers became permanent members of the work force once the plants started production.

The large-scale immigration of workers had enduring effects on the environment as planned and/or unplanned housing to accommodate the migrant workers resulted in rapid urban expansion. The example of Volta Redonda is particularly interesting, in that alongside the creation of state-owned CSI there were important investments in housing for the different levels of personnel in distinct neighbourhoods that reproduced the hierarchy of the plant. Generally speaking, for all the cases researched in the project, households tended to be based on nuclear families with a male breadwinner head of household. This generation was able to pass on their jobs to their children on retirement or death. This meant that there was stability in terms of work and household

livelihoods. Although levels of education in this generation are higher than in the previous generation, there is some continuity in the transmission of skills across the generations. This changes with the third generation, who confront a very different set of circumstances in the process of access to jobs in the industry. To begin with, there is a marked difference in the firms' expectations regarding education and training. Indeed, credentialism becomes an important element in recruitment decisions. Nor is the accession to jobs via kinship that had taken place in earlier generations possible for this generation, although contacts remain important.

The situation is particularly difficult for the very young, who confront many obstacles on the way to obtaining a job. This is partly because there are fewer jobs available since restructuring, privatization and technological innovation have contributed to reducing the work force. It is also related to changes in management strategies oriented towards increasing flexibilization. A widespread practice in the industry is the use of subcontracted companies. These companies provide services for the plant that, prior to privatization, were carried out by employees of the firm. New workers enter the industry through these firms, where they acquire experience and training. Wages are lower than for permanent workers and contractual conditions and work conditions are inferior. Indeed, in some cases there are both formal and informal practices of discrimination against workers from the subcontracted firms. Only a small proportion of these contract workers will be taken on as permanent staff by the central firm, but the hope of achieving a stable post in the plant offers a strong incentive to join and remain in employment with the subsidiary firms.

The young therefore face many difficulties in securing a job. They have to ensure they obtain the right educational credentials and are likely to remain in short-term contracts and/or low-pay jobs. Low pay and job insecurity have an impact on the capacity of the young to set off on their own and establish an independent household. This structural difficulty is reflected in the words of the young who explained to the project researchers that, unlike their parents and grandparents, they do not wish to marry young and start a family. They have different opportunities and different priorities to those of the older generation. The latter, for their part, may express negative views about the young: in Argentina, older workers often criticized the young on the grounds that they lacked the values of hard work and commitment to the industry. Despite these views, families and children invest a great deal of resources in the education of children and youths, in the hope that this will provide an inroad to employment.

Generational shifts reflect general trends and changes in the industry, which in turn respond to changing circumstances in the conditions prevailing in local and global contexts. The changes are partly expressed through redefinitions of skills and in particular of the value attributed to different skills and to their bearers. Some of the older workers struggled to adapt to automation and computerization, while also worrying that with them, an entire body of knowledge, skill and experience will disappear. There is a perception of the impossibility of transmission. Indeed, the young may have achieved higher levels of institutional training than their predecessors but they may lack the intimate understanding of steel and the process of its production that was enjoyed by their elders. Also, while the older workers have enjoyed greater professional stability and moments - largely in the past - of

recognition, prestige and even power, the young appear doomed to live in conditions of uncertainty and precarity. These differences are often framed in terms of differences in values or orientations. The issue of commitment and love of work is seen by older workers as belonging to their generation: for the young, it is claimed, work is a means to an end.

Technological change

Today, there is a marked difference in the credentials demanded by employers in the industry, with much greater emphasis placed on formal educational achievement. While in the first generations of steel workers there were limited requirements in place regarding educational achievement, this has changed in response to the changing needs of the industry. During the construction phase of the industry, there was a need for a wide range of skills, many of them, such as building or driving, unrecognized. Technical skills specifically associated with the industry could be learnt on the job.

Automation has changed the relation of workers with their machine, from one of physical interaction and learning by doing, to one that is mediated by computers. Technological change, in particular computerization and automation, reduces the number of workers required in the plant while also demanding different skills sets from those who remain employed. The change in the quality of work is significant and meaningful. As a worker in Železiarne Podbrezová observed, there has been a major technological shift, 'from the shovel to the computer'.

Nevertheless, some of the changes brought about in the management models and in the technologies of production are recognized by many of those interviewed as having brought about positive improvements with regard to the past. In particular, informants referred to health and safety where firms have invested and made improvements. The drive against alcohol abuse at work was mentioned as an important step that promotes safety at work in Brazil, Argentina and Slovakia. But, although health and safety have improved, the internal hierarchies of the workforce generate an unequal distribution of risk: some workers - frequently those employed by subcontracted firms - are still more exposed to high risk areas of the production process than others.

Although the neoliberal model proclaims the merits of erasing state intervention in the economy, this study of the steel industry suggests that although privatization of the industry and of a wide range of services was carried out in the countries of this study, the state continued to play an important role in regulating the labour market directly and indirectly, for example through educational reform and reforms in labour regulations (for instance the Plan Estratégico de Mantenimiento in the 1990s and the Plan Arco in 2004 in Spain) and that a range of agreements was reached by local and national governments, global actors such as the World Bank and private firms, both local and international, in an attempt to regulate the labour market, enhance competitiveness and address social and political concerns. States may also invest in - or support private enterprise in - the development of technologies. Technological innovation and product innovation are crucial for the survival of the steel industry. In relation to specific plants and work processes, local technological development can help address some of the difficulties that have arisen historically from dependence on external providers, as explained by workers in Volta

Redonda, Brazil: forced to follow the specifications of technology producers in the United States, Japan and Germany, workers adapted the 'foreign' technologies and used their 'Brazilian ingenuity' to make them better suited to local conditions and requirements.

State or supra-state investments in research and development and the design of new technologies need to be sensitive to the growing concerns about livelihoods, work and reproduction. Not only must they focus on the importance of creating jobs that afford a proper reward, satisfaction and safety, but there is also a need to develop and maintain a production system that does not put the local and global environment at risk. Some of the research subjects, stakeholders and steering committee members expressed concern about different and contradictory aspects of this issue. On the one hand, there are anxieties about the industry's image raising the need for the steel industry to discard its old image as contaminating and dangerous; on the other, there are worries about environmental and other community protests about risks to public health and about the effects on the competitiveness of European steel of the European Union emission controls. Technological and technical innovation will be obliged to take on board these challenges and devise technologies and industries that are not - nor are seen to be - in conflict with the wellbeing of the populations they support.

Potential Impact:

The project is committed to developing impact pathways in the social sciences through empirically grounded engagement with questions of industry, work and skills. The consortium aimed to achieve this through the inclusion of stakeholders from the early stages of the research and through feedback meetings with stakeholders in the final stage of the project. The relationships established with a range of stakeholders and scholars generated important networks across firms, trade unions, educational institutions, government bodies and international cooperation bodies. The consortium is concerned with ensuring the continuity of these networks beyond the completion of the project itself, through the website and online presence as well as the continued participation of members of the consortium in relevant workshops, academic conferences and debates.

Throughout the project, the consortium engaged in a dialogue with specialist publics, businesses and members of the general public through the project website, <http://www.medeasteelproject.org>. The aim of the website is to promote dissemination and communication of the project's findings beyond the lifespan of the project itself. Consortium members also participate in debates online through our social media accounts in flickr and twitter. These platforms provide a useful way to generate and respond to interest in the project.

Stakeholders

The consortium held several meetings with Stakeholders who have an interest in the steel industry. In September 2010, Ramón Laso (Spain) and MP Ivan Stefanec (Slovakia) joined a project meeting in Pezinok organized by Comenius University, Bratislava as part of Work Package 8, to discuss the scope of the research and their experience in relation to the industry. All the research teams were represented at the meeting, with Argentina participating through video conference. During extensive discussions, both stakeholders shared their views with the meeting about the present and future of the industry, highlighting important general and country-specific issues that were subsequently considered in the elaboration of research protocols for the ethnographic work packages. Among the issues highlighted, for Laso, were the challenges posed to social agents by the global nature of the steel industry, especially in terms of competition, training and employment. His experience as a member of ArcelorMittal's European Committee provided the basis for a discussion about the need for a more effective dialogue between employers and workers' organizations internationally, as well as the need for supranational initiatives to protect the levels and the quality of employment in the steel industry. Mr. Ivan Stefanec offered a very different view, from the perspective of his experience as chairman of the European Affairs Committee of the National Council of the Slovak Republic. After extensive managerial experience as CEO of Coca-Cola Slovakia, he was elected to Parliament as a member of the Christian Democratic Union, which was in power between 2010 and 2012. Referring to the context of the steel industry's privatization in Slovakia, he explained the rationale of pro-market policies, including privatization.

In July 2011, halfway through the project, Ing. Enrico Gibellieri participated in a meeting with representatives of the project research teams in Bertinoro at a meeting organized by the University of Bologna. The meeting focused on the presentation of the research findings, in particular the modelling of data that had been carried out by the Bologna

team. This provided an opportunity for Ing. Gibellieri to comment on the research findings and for the team members to benefit from his extensive experience and involvement in the industry and as a result of his role in the European Commission, where he acted as Deputy Vice-President of the Steering Committee of the European Steel Technology Platform (ESTEP). As the project approached its completion, the key outcomes of the project were tabled for discussion at a meeting held in Bologna in May 2012, attended by members of the Bologna team (Mollona), of the project coordinator team (Goddard and González-Polledo) and Ing. Gibellieri, who commented extensively on the findings of the project. On this occasion Ing. Enrico Gibellieri was interviewed by members of the consortium; a video of the interview is available through the re-designed website that also hosts the visual output of the project (WP 13 D11). Ing. Gibellieri also participated in the project's international conference in Barcelona in February 2012; his interventions provided an invaluable insight into the key issues identified by the industry, the trade unions and ESTEP. These observations contributed in important ways to the project's final analysis and conclusions.

In San Nicolás, Argentina, a series of meetings were held in April 2012 with students, teachers and trade union personnel involved in education and training centres associated with the steel industry. The meetings were organized on the basis of an overview of the project and its key findings by the project coordinator (Goddard/GOLD), followed by a more focused presentation of some of the salient issues arising from research carried out in San Nicolás (Vargas and Perelman/IDES). The discussions that followed the presentations raised a number of issues relating to work, in particular shared concerns about precarious conditions of work, the importance of training and education, the attempt by the young to get ahead in a difficult labour market and the misunderstandings that can arise between older and younger workers in relation to choices about work and private life. The audience was particularly interested in the project's findings about youth unemployment and the prevalence of subcontracting and temporary contracts. The teachers and students involved in the debates, many of whom worked - or aspired to work - in the steel industry, welcomed the presentation of the data and the analysis proposed by the researchers, identifying many aspects of their own experience in the exposition of the findings. The presentations prompted a great deal of debate amongst the audience across generations and professional status. In subsequent conversations with participants, it became clear that the extensive debate had provided important feedback about education and training for the industry to teaching personnel, trade unionists and, indeed, to the consortium.

In July 2012 Buzalka (Comenius) met with Ivan Mikloš, a well-known reformer in European post-communist countries. He was a key figure in the design of the neoliberal reforms, first as a key state figure in charge of privatization in Czechoslovakia and later in Slovakia as Vice Prime Minister for Economic Issues (1998-2002) and Minister of Finance (2002-2006 and 2010-2012) in the Centre-Right government. He was also a key state figure in the privatization of the steel plant in Košice in 1999-2000, when the company became part of US Steel. He remains a very influential figure in European business circles. At the meeting Buzalka outlined some of the findings arising from the research conducted in Slovakia, specifically the perspectives of workers and trade unionists regarding privatization and the conditions of work that have prevailed since then, as well as the possible connections between privatization and the effects of the current economic crisis. Mikloš put forward a

different perspective to that which prevailed amongst trade unionists and workers more generally: he argued that privatization was inevitable and that there was a lack of alternatives able to address a profoundly disrupted economy. On the other hand, he agreed with the project's findings regarding the importance of skills and of ensuring sound provision of education and training. He tends to agree with the argument that, while his party was in government (and he was in post), they had underestimated the high levels of vocational and professional training that had been built under socialism. Indeed, Mikloš stressed the importance of investment in education, and in particular in university education. However, plans proposed by his party to build up these areas were never fully implemented as other priorities for the coalition pushed these initiatives to one side.

In Brazil, Firmo (Brasilia) presented a document outlining the main findings of the project, in particular those that pertain to the Brazilian case, to Gildásio, a steel worker and trade unionist with the Sindicato dos Metalúrgicos de Timóteo (Metasita), in the Steel Valley, Minas Gerais (Vale do Aço). Gildásio's comments focused on the issue of the increasing levels of precarity of work since restructuring took place in the industry, specifically in Acesita in Minas Gerais. He also reflected on the role of trade unions and how they reacted to the restructuring process. Gildásio reflected – and invited reflection – on the relevance of research for the workers and how best to communicate research findings more widely. He also made a case for the importance of future research on youth and trade unionism. Specifically, he stated that he would welcome the opportunity to engage with the younger generations of workers and participate in research aiming to address the question of why young workers show a lack of interest in, or indeed shun, the trade unions.

Steering Committee

In April 2010, IDES coordinated a meeting (First Meeting on Social Studies of Steel Production in Argentina) that brought together experts from a range of disciplines including economics, history, anthropology and sociology. The meeting was inaugurated through a presentation of the project and the research carried out in Argentina (Perelman/Vargas). This was followed by a number of presentations, papers and interventions regarding a broad range of issues pertaining to the industry. On a broader level, there were presentation on the characteristics of economic models and their implications for employment in recent Argentine history. This important meeting provided a useful opportunity for the IDES team and the project coordinator to identify potential steering committee members.

A meeting with Argentinian steering committee members was organized in September 2011, featuring Dr. Victoria Basualdo, Dr. Laura Colabella and Patricia Davolos. Following a presentation of the aims, objectives and preliminary findings of the MEDEA project, the meeting went on to discuss Dr Basualdo's latest book on the Argentinian working class, which was especially relevant to the research on industrial work carried out by MEDEA's Argentinian team. Dr. Colabella also presented her research on forms of recruitment in the Argentinian bureaucracy, while Patricia Davolos' contribution focused on processes of segmentation, outsourcing and trade union strategies in the telecommunications industry. All three contributions broadened the scope of questions about employment, skills

and new economic strategies raised by the Argentinian team with regard to the steel industry.

In addition to encouraging the participation of research staff in national and international conferences (such as the conferences of the European Association of Social Anthropologists, the American Anthropological Association), the consortium hosted a project conference in February 2012 in Barcelona (WP 14, D 13). The Conference, organized by the University of Barcelona, provided an ideal context to advance the discussion of data and the consortium's analysis and to think about the project's implications in light of other comparative approaches to work, employment, learning and skills in industry. The conference was well attended and included specialists from a wide range of countries and disciplines. Also in attendance were five members of the Steering Committee (Professor Lydia Morris from the University of Essex, Professor Luis Reygadas from the Universidad Autónoma Metropolitana - Iztapalapa, Ing. Enrico Gibellieri, from the European Steel Technology Platform, Professor David Ost, from Hobart and William Smith Colleges, USA and Professor Paz Benito del Pozo, from the University of León). They brought to bear their experience and expertise in the lively discussion of the conference papers and main themes. Building on the success of the conference, the consortium prepared proposals for two edited volumes (WP 15 D 16), submitted to Routledge for review. In addition five chapters produced on the basis of the research conducted under Medea were accepted for a Special Section of Focaal - Journal of Global and Historical Anthropology and a number of articles are in press, including 'Global flows of development models' by Professor Lins Ribeiro, in Anthropological Forum (June 2013 Vol.23, 2).

In May 2012, Professor Paz Benito del Pozo spent a month at the Department of Anthropology at Goldsmiths on a research visit. During her stay, the Goldsmiths team benefited from detailed discussions with her regarding the Spanish case and took the opportunity to interview and film Dr Benito on the subject of the steel industry; an edited version of the film is available for viewing on the project website.

Policy recommendations

1) Agencies and agents involved in the production and dissemination of models need to be aware of the impact of their models, and the changes they may induce in people's livelihoods and in processes of social reproduction, as these models are implemented in different global scenarios.

2) Development agencies and agents need to be sensitive to local realities, so that differentiated local agencies/agents are able to participate actively in the design and circulation of models on a global scale. This includes the need to be receptive to local knowledge systems and locally developed innovations, practices and models, taking into account both 'folk' and 'expert' models.

3) The project findings suggest that it is important for researchers, government bodies (local, national and supranational), trade unions and community/civil society actors to reflect on the implications of model shifts for local environments and to devise and promote alternatives that enhance education, employment and well-being.

4) Greater and more effective regulation is needed in order to protect the rights of workers and address the effects of the fragmentation of the labour force. This includes the need to address flexible labour practices that have gained ground as firms confront the pressures of global markets. The continuing pressures of global competition mean that these forms of employment are likely to remain a feature of industrial work. It is therefore crucial that casual workers are afforded representation and protection.

5) Subcontracting has been a notoriously difficult problem to tackle, both by governments and by trade unions, given the propensity for the subcontracting chain to 'disappear' into informal and often intractable forms of economic activity. However, recent de-regulation and restructuring processes have increasingly led to the incorporation of subcontracting within the formal structures and official strategies of firms. This is evident in the steel industry, where employees of subcontracting firms may find themselves working side by side and sharing the work environment with those employed directly by the mother-firm. This points to the urgency - and the feasibility - of ensuring parity across different categories of workers (company and subcontracted) in terms of pay, security, safety and respect. The case of the Acuerdos de Oviedo negotiated in Asturias, Spain in the early 1990s, provides a useful starting point to consider appropriate policy interventions and frameworks for corporate good practice. However, there are limits to the effectiveness of localized agreements and corporate practices; instead, it is important to work towards national and transnational mechanisms that promote and safeguard work conditions that are fairly remunerated, safe and adequately supported through training and education.

6) Subcontracting may provide a lifeline to small and medium enterprises (SMEs) that rely on the contracts of large enterprises in the industry to survive and prosper. The proliferation of SMEs adds to the complexity and diversity of the economic environment and is thus an important asset within regional economies. However, policy, state and trade union intervention need to provide the means to foster and support the success of these smaller units while also promoting fair and safe conditions of work for their employees.

7) While the diversification of skills and opportunities has emerged as an important issue from the perspective of current and future workers, it is also the case that the capacity for diversification would add to the competitive advantage and long-term success of SMEs within and beyond the subcontracting chain. Policy should address this potential through inclusive education and training platforms that promote innovation and dissemination of appropriate technologies and broadly based areas of knowledge and broad skill sets. Such platforms should be mixed (including a range of organizations and actors), transparent and inclusive of SMEs across the entire process of producing and disseminating knowledge, technological innovation and good practice.

8) The industry needs a skilled workforce to prosper in a very dynamic market. It is imperative that enduring and appropriate investments in education and training are in place. Effective intervention requires close collaboration between industry, educators and other stakeholders to ensure productive linkups across education and training, skills and work.

9) While apprenticeships are considered to be highly desirable both by prospective workers and by employers, it is crucial that these be

properly regulated to prevent their use as vehicles for the employment of cheap labour; instead, apprenticeships should be regulated mechanisms to ensure the acquisition of skills and experience and accession to full employment.

10) Given the growing importance of flexible task allocation, problem solving and multiskilling, it is important that practical and vocational training take place in relation to broadly defined educational goals, embedding specialized technical training within broad curricula, and promoting new forms of entrepreneurship linked to local communities and regional economies and the

11) The importance of ensuring that a broadly based education underpins professional training at all levels is evident in the need identified in many research sites to counter damaging and prejudicial notions of 'the other' at work and in the community. These notions may attach to differences of ethnicity, origin, gender, sexuality or age and foment discord and fragmentation in the workplace and the community. Education understood in its broadest sense, encompassing formal educational environments and informal educational opportunities in the community (such as local cultural events, provides the most effective means to engage in a critical re-evaluation of stereotypes and prejudice.

12) It is crucial that legislation regarding work and labour conditions takes on board the complex relationships between the spaces and characteristics of work and the organization of livelihoods at the level of households and communities. This is relevant also to the issue of generational change and the problems faced by young people in many of the research sites to establish an independent household. The holistic approach of the early 20th century whereby the state and/or the enterprise invested in housing and services alongside their investment in production is a useful starting point when evaluating the spatial, social and material connections between industry, society and locality.

13) In some research sites, the consortium identified tendencies towards change in the gendered division of labour in the household, though these did not necessarily imply a more egalitarian distribution of tasks and responsibilities. In anticipation that this trend may increase with more women entering the labour force, there is a growing need for services to promote gender parity with regard to education, training and work. This inevitably also entails investments in support of household reproduction, especially in relation to high quality and affordable childcare.

14) The steel industry has been identified historically with male workers and with attributes largely associated with masculinity. This situation is slowly shifting as a result of changes in society and in the industry, notably the transformation of work through the introduction of new technologies. Legal frameworks, local policies and the practices of firms and trade unions must ensure gender parity at work and facilitate parity in the home. This requires a multilayered approach such as gender parity at the point of education, training and recruitment, equal pay and promotion opportunities, equality in relation to parental leave, and the regulation of shift-work.

Future research

The work carried out during the course of the project in relation to devising methodological and analytic tools highlights the enormous

potential and importance of inter-disciplinary work. The project outcomes confirm the relevance of the consortium's investment in comparative analysis. The conclusions of the research also indicate that this perspective can be usefully developed by extending the comparison to include other case studies or to compare different industries and different fields of production. The modelling process engaged in throughout the duration of the project offered many opportunities to probe the generative possibilities of social research. This suggests that the development of these conversations across disciplines is fruitful and deserves wide support and, furthermore, that training in modelling techniques would enable qualitative social scientists to engage in different kinds of discussion about their findings, and make their research findings available to wider publics and policy makers.

Recent upheavals in global economic systems reveal the weaknesses of analyses that overlook the interplay of political, social and economic processes. The shortcomings of current economic models and economic policy can be attributed to their failure to take into account the significant connections that obtain across geographically distant economic systems and across the economic, social and political processes that interact locally to produce globally relevant phenomena. MEDEA's pioneering use of computer simulation contributes to the development of interdisciplinary research and policy by enabling the creation of virtual environments in which alternative policies can be tested in vitro. A virtual simulation platform facilitates the interaction among stakeholders from different cultural, disciplinary and economic backgrounds and enables a process of testing different attitudes and perspectives by simulating the long-term consequences of decisions. In this respect, economic, social and political processes interact locally but also coalesce into global (for example the IMF, World Bank, WTO) and intermediate (such as the EU, national states) political structures. Can social scientists offer a useful perspective capable of identifying and explaining the unfolding trends and mechanisms that underpin changes in the economy and society? The project proposes a future research agenda that promotes interdisciplinary dialogue, rigorous empirical research and ambitious theoretical exploration that blends in-depth field research, modeling and computer simulation

The conditions of crisis that have affected European and other economies since 2008 highlight the need for research on matters of subsistence, livelihoods and work, the uneven distribution of opportunities and rewards across social systems, and the varying capacities of households and communities to confront difficult economic circumstances. Given the complexity of the circumstances and their variable effects on different sectors of the population, it is imperative that research on the crisis and its effects includes a substantial qualitative and ethnographic component. An approach that privileges long-term interaction with different subjects and institutions is needed to provide the detailed, nuanced data that reflects the different effects of economic change and furthermore, this approach is best placed to identify the range of responses and strategies devised by different actors to deal with the difficulties they encounter.

Similarly, there is an urgent need to engage critically with hegemonic and alternative or emerging economic models. While this engagement can be carried out at a discursive level, it is only by relating the discursive forms to the tangible, locally expressed effects of these models made

visible through ethnographic research, that the full implications and potentialities of these models can be usefully evaluated and addressed.

The broader, globally expressed trend towards the diminution of jobs, the global problem of youth unemployment and underemployment and the concentration of the young in low pay and precarious work, raises concerns about the future of these workers and, by extension, the future of our societies. There is a pressing need for locally detailed but globally pitched research on the issue of the young and work, as outlined by the project stakeholders, including innovative, participatory research involving young workers and unemployed youth and the grass-roots, government and NGO initiatives devised to address their plight. Given the rifts that the Medea project has identified within the workforce in the steel industry, it is important to highlight the need for such research to pay particular attention to those points of fracture and delimitation that might arise in relation to gender, race, ethnicity and nationality, as well as those pertaining to age and generation.

These reflections are echoed in the observations of stakeholders, who have suggested that the findings of the project open up important avenues for future research. In Brazil, Firmo's meeting with union leader Gildásio, proposed the need for research on the younger generation and their relationship to work and the trade unions. In Argentina, the stakeholders who are involved in teaching and training took up the issue of alternative employment beyond the local steel plant. They proposed research on the local networks of industrial and service firms, in order to highlight heretofore-unidentified local needs that can inform the design and delivery of relevant, innovative and flexible training programmes. Similarly, in Slovakia, Mikloš highlighted the need to promote greater investment in education, as well as the importance of conducting further research aimed at enabling the implementation of appropriate education programs for schools.

On the issue of skills, education and training, research in the different sites included in the project illustrates the range of educational practices carried out by states, local governments, enterprises and trade unions. An interdisciplinary and comparative study focusing on these practices and incorporating an ethnography of pedagogies and practices would provide a useful basis for policy-makers in their task of addressing the work-skills gap that is seen by many in industry and government as a significant obstacle to economic success.

Ethical research/researching ethically

From its inception, the project aimed to devise ethically sound research practice. At the first meeting of the consortium held in Bologna in October 2009, the project coordinator (Goldsmiths) and the scientific coordinator (Barcelona) tabled for discussion examples of ethical guidelines for research produced by professional anthropological associations. Members of the consortium were invited to bring to the discussion ethical guidelines produced by their disciplines and/or country and regional associations. These resources contributed to the design of the research protocols produced in advance of each research work package and distributed to all consortium members for discussion and comment. Consequently, ethical issues were incorporated into the planning and the implementation of the research. The ethical framework first discussed in the Bologna kick-off meeting was revisited in depth in a methodology workshop held in Barcelona in January 2011. The workshop

provided an important opportunity for the members of the consortium to exchange their views about the implications of protocols relating to the generation of data and their dissemination, for example regarding the anonymity of informants, seeking informed consent, etc. The discussion also entailed a review of the practice of the consortium in line with the Consortium Agreement and enabled the meeting to refine the protocols to be followed in relation to the effective use of data across the consortium.

A gender-sensitive approach informed the project from its conception. A concern for gender-related issues underpinned the design of the project, for example in relation to the formulation of research questions such that questions of work and industry should take into account, wherever possible, the implications of these for domestic arrangements, livelihood practices outside the factory and household strategies where gender and age could be expected to play a significant role. Wherever possible, male and female subjects were contacted and interviewed. However, given the strongly gendered quality of the steel industry, the majority of interviewees were men. The inclusion of women and of extra-factory relations was an important element of the research design but in many cases the marked differentiation between public and private spheres, the sphere of work and trade union activism and the sphere of home and family, posed many obstacles for researchers attempting to cross over from the public/work domain to the private domain. Consequently, in many instances, with the notable exception of the Megasa study in Spain, the women encountered in the research were administrators, trade unionists, technicians and teachers, rather than the wives and daughters of steel workers.

The characteristics of the industry also affected the composition of the stakeholder groups, where male figures prevail. The exception was the case of San Nicolás, where the focus on educational institutions resulted in the participation of a higher proportion of women. These were students and trainees, teachers and administrators of the institutions whose perspective was interesting, although it did not appear to diverge significantly from that of the male participants. The steering committee selected by the consortium was composed of an equal number of men and women.

List of Websites:

<http://www.medeasteelproject.org>