



Monetary, Fiscal and Structural Policies with Heterogeneous Agents SSH-CT-2008-225408- POLHIA

PROJECT FINAL REPORT

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² The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm ; logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

4.1 Final publishable summary report

4.1.1 Executive summary

POLHIA's general goal, as stated in Annex 1 of the Grant Agreement, consists in "exploring the role of macroeconomic policies and the nexus of macroeconomic and microeconomic/structural policies in an heterogeneous agents setting."

POLHIA aims at providing new insights and useful suggestions for the implementation of both macroeconomic policies and structural policies.

The scientific basis on which policy recommendations rest has been laid down in the first reporting period (months 1-18).

In the second reporting period (months 19-36) research work has been finalized and completed. The research work of most of the POLHIA units, in fact, in this period has aimed at exploiting the theoretical frameworks, analytical models, empirical and experimental databases and simulation software mainly developed in the first period to derive useful research-based policy recommendations.

The articles, essays and papers elaborated for the POLHIA project have been presented in workshops and conferences at academic institutions and policy circles. This dissemination activity aims at stimulating debate and circulating new ideas in order to influence policy decision making.

4.1.2 Summary description of project context and objectives

It is almost a commonplace that macroeconomic policies, if well conducted, are a stability-enhancing device. By providing a non-inflationary environment, they “keep in order” the backstage of a movie in which the actors -- firms and households – determine long run growth by means of saving/investment decisions. In this view aggregate outcomes can be improved upon by means of microeconomic or structural policies such as labour and product market deregulation, investment in human capital etc.

The scope of macroeconomic policies, however, is much wider. For instance, monetary policy affects business fluctuations and growth through financial factors which are certainly no less important than inflation, as the Global Financial Crisis has shown.

POLHIA aims at exploring the role of macroeconomic policies in this wider sense and the nexus of macroeconomic and microeconomic/structural policies in an heterogeneous agents setting. Modern macroeconomic thinking must in fact go beyond the Representative Agent assumption because agents are indeed different -- in terms of real and financial conditions, labour market status, technical capabilities, expectations, market power etc. -- and this heterogeneity is crucial for macroeconomic outcomes. Monetary and fiscal policies affect in different ways different people just as structural policies do. Structural policies, in turn, can have macroeconomic consequences through externalities. Hence macro and micro policies are strictly intertwined: they can reinforce (or interfere with) each other.

The research group has exploited a wide range of tools. At the level of model building the development of macroeconomic frameworks in the New Keynesian tradition has been paralleled by the extensive use of Agent based models, which are particularly appropriate for the exploration of heterogeneous agents environments. Empirical research has been carried out by means of econometric models and experiments to study, for instance, the formation of expectations.

POLHIA aims at providing new insights and useful suggestions for the implementation of both macroeconomic policies and structural policies and for rethinking policy coordination (1) between monetary and fiscal policies and (2) between micro and macro policies. The natural candidates to be beneficiaries of this type of analysis, therefore, are policy makers: first and foremost central bankers and Government officials in charge of fiscal and structural policies.

4.1.3 Description of the main S&T results/foregrounds

The project consisted of 7 scientific WPs (the 8th WP was devoted to Management):

- WP1: Heterogeneous expectations, macroeconomic performance and monetary policy (scientific leader: UVA, Amsterdam),
- WP2: Heterogeneous expectations and exchange rate dynamics (scientific leader: ULE, Leuven),
- WP3: Financing constraints and firms' growth (scientific leader: SciencesPo, Paris-Nice),
- WP4: Heterogeneous financial conditions and monetary policy (scientific leader: UCSC, Milan),
- WP5: Multi-agent models for policy analysis (scientific leader: UPM, Ancona),
- WP6: Fiscal policy, sustainability and coordination (scientific leader: SciencesPo, Paris-Nice),
- WP7: Technological change, skill mismatch and human resource policies (scientific leader: URM, Rome-La Sapienza).

WPs 1 to 4 were basically focusing on monetary policy, its design and its transmission mechanism. Fiscal policy was the core of WP6 and structural policies the focus of WP7. From research carried out under WP 5 we expected to gain insights on the intertwined impacts of monetary, fiscal and structural policies in an Agent based setting.

The scientific basis on which policy recommendations rest has been laid down in the first reporting period (months 1-18). The research work of most of the POLHIA units, in fact, in this period has aimed first and foremost at developing theoretical frameworks, analytical models, empirical and experimental databases and simulation software to explore the properties of economies in which agents are heterogeneous -- in terms of mechanisms of expectation formation, financial conditions, labour market status, technical capabilities etc. – and prepare the terrain for the derivation of useful research-based policy recommendations.

In the second reporting period (months 19-36) the research work of most of the POLHIA units has aimed at exploiting the theoretical frameworks, models, databases and simulation software mainly developed in the first period to derive useful research-based policy recommendations.

Specifically, in the first reporting period:

- Units at Amsterdam and Leuven have emphasized mainly the **heterogeneity of mechanisms of expectations formation**. This research has shown that rational/fundamental expectations are indeed the exception rather than the rule when agents try to gauge future developments of relevant macro-variables. Evidence collected and analyzed during experiments with human subjects, moreover, shows that that only few rules are actually adopted by boundedly rational agents to form expectations and that agents may switch from one mechanism to another depending upon the forecasting performance of the rules. This evidence calls for building macro-dynamic models in which expectations are not formed according to a unique (rational) scheme but may follow different competing rules.
- Units at Catholic University (Milan) and Ancona have developed **multi agent models** which start from the behaviour of heterogeneous agents and their local interactions, and allow for the possibility that interaction and individual rules change in time (adaptation). In these models, statistical regularities emerge in the aggregate that cannot be inferred from the primitives of individuals (self-emerging regularities). High-levels (macroeconomic) systems possess new and different properties with respect to low-level (microeconomic) systems. Even in the absence of a centralized market-clearing mechanism, the economy shows a tendency to self-organize towards a spontaneous order which is however characterized sometimes by persistent involuntary unemployment, unsold production or excess demands, and possibly credit rationing.

- The unit at Sciences Po (Paris) has addressed essentially issues pertaining to **fiscal policy**. This research has shown that most of the arguments in favour of fiscal rules, such as the Stability and Growth Pact, could justify the imposition of rules at the national level but not at the supranational level unless externalities or credibility considerations are invoked. Due to the inconclusiveness of the available evidence, research at SciencesPo shows that the Stability and Growth Pact is a public social norm that countries obey in order to preserve reputation among the other members of the European Union. The role of the SGP as a coordinating device is thus debatable: It actually imposes a coordination from the bottom, limiting the space for fiscal policies that could in principle be beneficial in the short as well as in the long run.
- As to **educational policies**, research work in Rome shows that the interaction of educational policies and different labour market institutions affect the outcome of a skill-biased technological transition. On the one hand, educational policies speed up skill formation and thereby allow the system to escape a low productivity equilibrium. On the other hand, they relax financial constraints at the household level associated to a large decrease in the unskilled wage.

The Global Financial Crisis and the Great Recession that unfolded after the project was drafted have dramatically changed the terms of the policy debate in the academia, the political arena and on the media. The research agenda of POLHIA therefore has been deeply affected by these developments. The research work on issues pertaining to the GFC, while of course not listed among the deliverables, is nourishing our thinking and challenging our view of the future and of the design of policies.

In the second reporting period:

- Units at Amsterdam and Leuven have expanded, extended and exploited for policy purposes models inspired by the idea that **heterogeneous mechanisms of expectations formation** are key to understand market outcomes, macroeconomic performance and the effectiveness of monetary policy. This research has shown that empirical regularities that are considered puzzles if one adopts the efficient market/rational expectations approach (for instance, the so-called disconnect puzzle in the forex market) are quite straightforward market outcomes under heterogeneous expectations. In a macroeconomic perspective, NK-DSGE models with heterogeneous expectations behave quite differently – in terms of properties of the macroeconomic equilibrium – from the standard ones. Evidence collected and analyzed during experiments with human subjects shows that only few rules are actually adopted to form expectations and that agents may switch from one mechanism to another depending upon the forecasting performance of the rules. This evidence has important implications for the effectiveness of monetary policy in an experimental environment which replicates the basic features of a macrodynamic NK model.
- Units at Catholic University (Milan) and Ancona have modified a **multi agent model** characterized by heterogeneous financial conditions of firms (developed and tested in the first reporting period, see deliverable D4.2) to assess the impact of monetary and fiscal policy (see deliverable D52). As already emphasized in D4.2, even in the absence of a centralized market-clearing mechanism, the economy shows a tendency to self-organize towards a spontaneous order which is however characterized by booms and busts of economic activity. In the second reporting period simulations of the modified AB model with monetary policy has shown the stabilizing effects of a Taylor rule. Also fiscal policy has stabilizing effects, especially when the public sector is not constrained by a balanced budget rule.
- The unit at Sciences Po (Paris) has pursued a line of research already inaugurated in the first reporting period essentially in the domain of **fiscal policy**. The different proposals under discussion at the European Union level have been discussed and ranked based upon their macroeconomic outcomes. The new debt rule would certainly lead to lower debt levels, hence to larger fiscal margins for

maneuver in the future but, in steep contrast with the golden rule of public finance, it would be very costly to implement. It is true, however, that the fiscal status quo in the EU would be even worse.

- The unit at La Sapienza (Rome) has emphasized the two-way feedback between inequality, wage dispersion and labour market features on the one hand and educational attainment on the other hand.

The papers, essays and policy prescriptions generated by the research have been presented in workshops and conferences not only in Europe but also in the USA. A list of these papers can be found below (section 4.2).

4.1.4 Potential impact

Work Package 1: The experimental and empirical evidence collected in WP1 shows that heterogeneity of expectations together with a mechanism of evolutionary switching between different prediction rules generally exists and has very important implication on macro-dynamics and monetary policy decisions. In addition, theoretical results also have suggested that the New Keynesian model with heterogeneous agent and prediction choice switching is capable of replicating many stylized facts on inflation persistence from macro and micro perspectives and has received more and more interests, especially from central banks. This will bring some new criteria on monetary policies and provide some challenges to the traditional rational expectations framework.

First, by investigating the joint effects of evolutionary selection of heterogeneous forecasting rules and monetary policy on the inflation persistence, the researchers found that the large intensity of selection between heterogeneous forecasting rules tends to cause high persistence while the more aggressive response of the nominal interest rate by the policy makers to the deviation of inflation from their target tends to lower the inflation persistence. Therefore, when the policy makers want to control the inflation to their target at their favoured rate, they should also take into account the effects of evolutionary selection between heterogeneous forecasting rules on the inflation persistence.

Second, based on some experimental evidence, the researchers found that individuals tend to base their predictions on past observations following simple forecasting heuristics, and that individual expectations are heterogeneous. Moreover, they observed that individual learning takes the form of switching from one heuristic to another according to past relative performance. In addition, we find that the stabilizing effect of different monetary policies depends on the ecology of forecasting rules, on agents' sensitivity to differences in forecasting performance and on how aggressively the monetary authority sets the nominal interest rate in response to inflation. Hence the policy makers should also consider the effects of heterogeneity of agents' expectations and their sensitivity to differences in forecasting performance when they choose a policy rule trying to stabilize the economy.

Third, recent papers have shown that multiple equilibria, periodic orbits and complex dynamics can arise in the New Keynesian models under dynamic predictor selection, even if the model under RE has a unique stationary solution. Given the statistical evidence found in our results for heterogeneous expectations and evolutionary switching, determinacy under RE may not be a robust recommendation and that monetary policy should be designed to account for potentially destabilizing heterogeneous expectations.

Finally, if financial markets are destabilized by financial innovation or learning, this may spill over to the macro economy and thus destabilize the economy as a whole. Hence results on asset pricing models in financial markets also have some implications on macroeconomics.

The research of WP1 has been presented in many conferences and workshops, especially in the POLHIA conferences. Some researchers from central banks have shown great interest in our results on heterogeneous agents and learning. Through the POLHIA project, more and more researchers pay more attention to the New Keynesian macro models with heterogeneous expectations instead of rational expectations. Especially in the light of the current financial crisis, this research may provide a new way on monetary policies rethinking the policies.

Cars Hommes has been invited to present UVA work on the POLHIA project at a number of international conferences including the International Research Forum on Monetary Policy, Federal Reserve Board, Washington, March 2010 and the DNB Research Conference on Complex systems: towards a better understanding of financial stability and crises of the Dutch Central Bank. These conferences were attended by academics, central bankers and policy makers with extensive discussions about policy relevance of POLHIA work.

Work Package2: The main potential impact of research in WP2 is to add to the growing literature of heterogeneous agent models. This literature has gained significant momentum over the years, particularly so since the beginning of the current financial crisis. This literature offers

an alternative where mainstream models have failed to provide a sensible explanation to several empirical regularities typically observed in financial markets. A paradigm shift started taking place since the emergence of the heterogeneous agent literature. Research in WP2 offers a clear contribution in this process. The type of models that the researchers have proposed is richer than mainstream models in the sense that they allow for the presence of multiple equilibria. In such a world, the emergence of asset price bubbles is natural. In mainstream models on the contrary assets price bubbles are not possible. This is a remarkable failure of mainstream finance models, for we know that asset price bubbles exist. Understanding why asset price bubbles emerge is absolutely necessary if one wants to create a more stable economic system. Researchers have contributed gaining further understanding of economic complex systems in a world populated by heterogeneous agents.

The main dissemination activities that have been carried out were the presentation of papers at several international conferences and workshops. By presenting research at internationally recognized conferences researchers have put their work under the scrutiny of the scientific community. This serves two main goals. On the one hand, they have been able to collect important feedback, allowing them to improve and take into consideration several of the remarks that we have received. On the other hand it allows to show to the scientific community and the public in general the research that has been carried out within the POLHIA consortium.

Additionally, the unit at Leuven has organized an international conference in Leuven on October 15-16. The conference was titled 'Quantifying and Understanding Dysfunctions of Financial Markets' and it covered a range of topics, all related to the nature of the POLHIA project. Several members of the POLHIA consortium participated in the conference and presented their work to the audience. This was a very successful dissemination activity that called the attention of both academics and practitioners working in the private sector. As part of the dissemination policy, a special issue of the Journal of Economic Dynamics and Control was organized where several papers presented at the conference will be published in the form of proceedings. Several posters were printed and distributed in several economics departments in Europe to advertise this event. Also an invitation by email was sent to a large list of economics researchers and practitioners in Europe.

ULE also organized the 5th Workshop on Monetary, Fiscal and Structural Policies with Heterogeneous Agents organized in Leuven, Belgium, on October 14. Several members of the POLHIA consortium as well as many colleagues from different economics departments in Europe participated in this event. The event was mainly advertised by email sent to a large list of recipients all over Europe. Also an electronic poster with the conference program was distributed around.

Work Package 3: The main potential impact of research in WP3 is to contribute to the literature on financial constraint and economic activity (investment, production, export). This literature is potentially important for policy purposes inasmuch as monetary, fiscal and structural policies can relax or tighten financing constraints and therefore impact on economic activity.

Work Package 4: The main potential impact of research in WP4 is (1) to develop, in conjunction with the unit in Ancona, a macroeconomic Agent-based model (deliberable D4.2, first reporting period) whose policy implications are far reaching (deliberable D5.2, second reporting period; see also potential impact of research work carried out in Ancona); (2) to contribute to the search for a syncretic framework, one that can reconcile the simplicity of the standard macroeconomic models with the realism of agent based models (see D4.3). This "middle of the road" approach has so far not gained momentum in the literature but may be of potentially enormous impact if it is able to successfully incorporate elements or insights coming from the Agent based literature into simple macroeconomic models. The results so far are promising.

Work Package 5: The main dissemination activity of the period was the organisation in Ancona of the 16th Annual Workshop on Heterogeneous Interacting Economic Agents (WEHIA), which took place at the Faculty of Economics on June 23rd – 25th 2011. The conference, which was officially sponsored by the Polhia project, included many topics of direct interest for the project, like: Agent Based

Modelling, Emergent Macroeconomics, Econophysics, Experimental Economics, Aggregation of Heterogeneous agents, Financial Fragility Models, DSGE Models with Heterogeneous Agents, Bounded Rationality, Learning in Economics, Computational Methods in Economics and Finance, Technological change and growth, Economic Networks. The conference included some presentations of members of the consortium, and it was attended by more than 90 scholars from across the world. The keynote speakers of the conference were Giovanni Dosi (Sant'Anna School of Advanced Studies), Bruce Greenwald (Columbia University), Alan Kirman (GREQAM), Simone Landini (IRES, Torino), Thomas Lux (Universität Kiel), Rosario Mantegna (Università di Palermo).

Work Package 6: The main potential impact of research in WP6 is to contribute to the debate on the implementation of an optimal (or at least a satisfactory) governance of fiscal policy in Europe. Most of the results of this research run counter to the received view and the conventional wisdom. In particular, some of the prescriptions derived from this research would not suggest to strengthen governance only in the direction of a more rigidly disciplined fiscal policy as currently fashionable in the light of the European sovereign debt crisis.

Work Package 7: The main potential impact of research in WP7 is to contribute to the literature on technical progress, labour market institutions and educational policies. Some of the insights derived from this research run counter to the received wisdom on these issues.

4.1.5 Address of the project public website

Detailed information about the aims of POLHIA, institutions involved and the output of research are available at the dedicated project website www.polhia.eu. All the deliverables have been uploaded and will be available for download if not protected by copyright.

4.2 Use and dissemination of foreground

As mentioned above, the research output consists essentially of articles and essays published in top ranking journals, working papers and position papers presented and discussed in many occasions, mainly academic conferences and workshops held at policy making institutions.

This presentation, discussion and networking activity is the bulk of dissemination of the results of POLHIA. The collaborative effort during the project has established good working relationship among the partners which will keep collaborating in the future.

In particular, UVA (Amsterdam), UPM (Ancona) and UCSC (Milan) are partners of a FP7-ICT project funded by the European Commission “Complexity based Research Initiative for Systemic InstabilitieS” (CRISIS) which consists of 12 units and is highly interdisciplinary (economics, computer science, physics, etc.).

The above mentioned units and SciencesPo will apply for EU funds under the new FP7-SSH call.

Publications In the following we report a list of papers produced in the first and second reporting periods. Some of these papers have become published articles after the usual refereeing process.

1st reporting period

- Anufriev M., Hommes C. (2010a). “Evolution of market heuristics“. Knowledge Engineering Review, forthcoming.
- Anufriev M., Arifovic J., Panchenko V. (2010b). “Efficiency of continuous double auctions under individual evolutionary learning with full or limited information“. CeNDEF Working paper 10-01, University of Amsterdam.
- Anufriev M., Hommes C.H., Philipse R.H.S. (2010c). “Evolutionary selection of expectations in positive and negative feedback markets“. CeNDEF Working paper 10-05, University of Amsterdam.
- Anufriev M., Hommes C.H. (2009). “Evolutionary selection of individual expectations and aggregate outcomes“. CeNDEF Working paper 09-09. University of Amsterdam.
- Battiston S., Delli Gatti D., Gallegati M., Greenwald B.C., Stiglitz J.E. (2009) “Liasons dangereuses: increasing connectivity, risk sharing, and systemic risk“. NBER Working Paper Series #15611 NBER.
- Baglioni A. (2009). “Liquidity crunch in the interbank market:Is it credit or liquidity risk, or both?”. Quaderni dell'Istituto di Economia e Finanza, IEF0091 DISCE - Università Cattolica del Sacro Cuore.
- Brock W.A., Hommes C.H., Wagener F.O.O. (2009). “More hedging instruments may destabilize markets“. Journal of Economic Dynamics & Control, vol. 33(11), pp. 1912-1928.
- Creel J., Saraceno F. (2009). “Wealth effects and public debt in an endogenous growth model“. OFCE/POLHIA N° 2009-35 December, Centre de recherche en économie de SciencesPo.
- Gardini L., Tramontana F. (2010a). “Border Collision Bifurcations in 1D PWL map with onediscontinuity and negative jump. Use of the first return map1“. International Journal of Bifurcation and Chaos, forthcoming.
- Gardini L., Tramontana F., Avrutin V., Schanz M. (2010b). “Border Collision Bifurcations in 1D piecewise-linear maps and Leonov’s approach“. International Journal of Bifurcation and Chaos, forthcoming.
- Pfajfar D., Santoro E. (2010). “Heterogeneity, learning and information stickiness in inflation expectations“. Journal of Economic Behavior and Organization, forthcoming.
- Tramontana F., Westerhoff F., Gardini L. (2010). “On the complicated price dynamics of a simple one-dimensional discontinuos financial market model“. Journal of Economic Behavior & Organization, vol. 74(3), pp 187-205.

Policy Briefs

- PB-1 **“The Liquidity Crunch in the Interbank Market: Is it Credit or Liquidity Risk, or both?”** summarizes the results of a paper by Angelo Baglioni (Catholic University of Milan) on an extremely important policy issue, namely the origin of the liquidity crunch on the interbank market which has characterized the global financial crisis since its inception in the fall of 2007. Understanding the sources of the problem is the necessary condition to equip monetary authorities – both in Europe and in the USA – with adequate tools to avoid a repetition of the same problem in the future.
- PB-2 **“The structural roots of the crisis and the way out: mitigating inequality and rethinking global governance”** summarizes the paper “A Brief Narrative of the Crisis” by Jean Paul Fitoussi (OFCE), forthcoming in Anton Hemericj (ed.) Economic Crises and Institutional Choices. Fitoussi argues that the root of the crisis is structural: it is the unprecedented build up of income and wealth

disparities – the reverse redistribution of income – that has occurred in the last three decades in advanced countries. This interpretation of the crisis lead to rethink the design of policies, which ought to be structural as well.

- PB-3 “**Liaisons Dangereuses: Increasing Connectivity, Risk Sharing and Systemic Risk**” summarizes the results of a paper by Stefano Battiston, Domenico Delli Gatti, Mauro Gallegati, Bruce C. Greenwald and Joseph E. Stiglitz on the role of “connectivity” (i.e. the capability of an agent to develop partnerships with other agents in a network of credit relationships) in the generation of systemic risk, i.e. the propagation of financial distress and bankruptcies. The paper circulates as NBER Working Paper #15611.

2nd reporting period

- Baglioni A. - Liquidity crunch in the interbank market: Is it credit or liquidity risk, or both? J Financ Serv Res 2011; in press; 1-18 (previously circulated as Quaderni dell'Istituto di Economia e Finanza - 2009, IEF0091)
- Delli Gatti D., Gallegati M., Greenwald B., Russo A., Stiglitz J.E. - The financial accelerator in an evolving credit network - Journal of Economic Dynamics and Control - 2010; 34(9); 1627-1650
- Hommes C., Wagener F. - Does educative stability imply evolutionary stability? Journal of Economic Behavior & Organization - 2010; 75(1); 25-39
- Bargigli L., Gallegati M. Random digraphs with given expected degree sequences: A model for economic networks - Journal of Economic Behavior & Organization - 2011; 78(3); 396-411
- Zhu M., Wang D., Guo M. - Stochastic equilibria of an asset pricing model with heterogeneous beliefs and random dividends - Journal of Economic Dynamics and Control - 2011; 35(1); 131-147
- Berardi M. - Fundamentalists vs. chartists: Learning and predictor choice dynamics - Journal of Economic Dynamics and Control - 2011; 35(5); 776-792
- Hommes C. - The heterogeneous expectations hypothesis: Some evidence from the lab - Journal of Economic Dynamics and Control - 2011; 35(1); 1-24
- Vona F., Patriarca F. - Income inequality and the development of environmental technologies - Ecological Economics - 2011 9/15; 70(11); 2201-2213
- Femminis G., Martini G. - Irreversible investment and R&D spillovers in a dynamic duopoly - Journal of Economic Dynamics and Control - 2011; 35(7); 1061-1090
- Levasseur S. - International outsourcing over the business cycle: some intuition for Germany, the Czech Republic and Slovakia - Eastern Journal of European Studies - 2010; 1(2); 165-185
- Anufriev M., Hommes C.H., Philipse R.H.S. - Evolutionary selection of expectations in positive and negative feedback markets - J Evol Econ - 2011; online first
- Tramontata F. - Economics as a compartmental system: a simple macroeconomic example - Int Rev Econ - 2010; 57; 347-360
- Creel J., Saraceno F. - European Fiscal Rules after the crisis - Journal of Innovation Economics - 2010; 6(2); 95-122
- Anufriev M., Arifovic J., Ledyard J., Panchenko V. - Efficiency of continuous double auctions under individual evolutionary learning with full or limited information - Journal of Evolutionary Economics - 2011; in press; 1-35
- Gaffard J.L., Saraceno F. - International trade and domestic distortion - Journal of Evolutionary Economics - 2011, in press

Forthcoming

- Anufriev, M., Hommes, C. - Evolution of market heuristics - Knowledge Engineering, Review, 2011, forthcoming.
- Bao, T., Hommes, C., Sonnemans, J., Tuinstra, J., - Individual Expectation, Limited Rationality and Aggregate Outcomes, Journal of Economic Dynamics & Control, 2011, forthcoming.
- Hommes, C.H. and Lux, T. - Individual expectations and aggregate behaviour in learning to forecast experiments - Macroeconomic Dynamics, 2011, forthcoming.
- Anufriev, M., Assenza, T., Hommes, C., Massaro, D. - Interest rate rules and macroeconomic stability under heterogeneous expectations - Macroeconomic Dynamics, 2011, forthcoming.
- De Grauwe P., Rovira Kaltwasser P. - The Exchange Rate in a Behavioural Finance Framework, forthcoming in James, Marsh and Sarno eds - The Handbook of Exchange Rates, 2012
- De Grauwe P., Rovira Kaltwasser P. - Animal Spirits in the Foreign Exchange Market, forthcoming Journal of Economic Dynamics and Control.

Working papers

- Learning, forecasting and optimizing: an experimental study, Bao, T., Duffy, J., Hommes, C., 2011.
- Behavioral learning equilibria, Hommes, C., Zhu, M., 2011a.
- Behavioral learning equilibria and inflation persistence with heterogeneous agents, Hommes, C., Zhu, M., 2011b.

Policy Briefs

- PB-4 summarizes the results of a paper by Luca Colombo and Gianluca Femminis on "**The welfare implications of the acquisition and use of information when agents' actions**" (output choices, price setting, investment decisions) are interdependent in that they are either strategic complement or substitutes. The Liquidity Crunch in the Interbank Market: Is it Credit or Liquidity Risk, or both?
- PB-5 summarizes the result of a paper by Jean Luc Gaffard "**Monetary Policy, Macroeconomic Stability and Structural Change**". The poor macroeconomic performance of the last two decades and the difficulty of elaborating an exit strategy from the crisis and the ensuing recession revealed a fundamental failure of economic policy in Europe. In this Policy Brief Jean Luc Gaffard reconsiders objectives and instruments of monetary policy and tries to redefine the policy mix in a macroeconomic setting, such as the European one, which is affected by systematic imbalances due to changes in technology, in the composition of demand or in the distribution of income. The structural roots of the crisis and the way out: mitigating inequality and rethinking global governance
- PB-6 summarizes the result of a paper by Cars Hommes "**Is financial innovation "beneficial" or "harmful"?**". The conventional wisdom in financial economics says that futures and derivative markets are "beneficial" because they increase social welfare. The main reason is that agents in the economy are heterogeneous in their risk attitudes and financial innovation (e.g. more securitization, more futures markets, more derivatives) provides better opportunities to allocate risks onto the shoulders of those who can bear it most easily. Another benefit of futures markets is the increasing informational quality of prices. With more futures and derivative markets prices of the underlying assets are

forced to move closer to their “true” fundamental value. According to the conventional view financial innovation thus contributes to price discovery and increased market efficiency. It should be stressed however that these results hold under the strong (and unrealistic) assumption that all agents in the economy behave rationally and, in particular, hold rational expectations about the future state of the economy. In a rational world in the limiting case of complete markets, where financial innovation is “complete” in the sense that insurance for every possible uncertain state of the world can be obtained, the two basic welfare theorems of standard Walrasian general equilibrium theory apply and the allocation of risk is Pareto optimal. In the academic literature on incomplete markets, that is, when the number of financial instruments is smaller than the number of uncertain states of the world, counterexamples have been constructed where adding a new futures market to an incomplete markets general equilibrium system can decrease welfare (e.g. Hart, 1975) and/or increase price volatility (e.g. Citanna and Schmedders, 2005). Although these counter examples are well known to specialists in economic theory, the results are rather abstract and the conventional wisdom in financial economics remains that financial innovation is beneficial. But is financial innovation beneficial under the more realistic assumption that some agents in the economy behave non-rationally? Liaisons Dangereuses: Increasing Connectivity, Risk Sharing and Systemic Risk

Dissemination activities

Participation in Workshops and International Conferences:

POLHIA partners have taken part in several workshops and international conferences in Europe and outside Europe. The participation to these meetings was not only a chance to disseminate broadly around the profession POLHIA scopes and main findings, but also a fruitful opportunity to establish new professional interactions and to consolidate old collaborations with researchers outside the project that are working on similar issues. The main events of the project were the workshops (and associated meetings of the Steering Committee) which occurred approximately every six months. After the kick off meeting (Milan, November 2008), these workshops have been hosted at Rome (May 2009), Amsterdam (November 2009), Ancona (May 2010), Leuven (October 2010), Paris (May 2011).

The final event of POLHIA and the most important dissemination effort has been the International Conference “Rethinking Economic Policies in a Landscape of Heterogeneous Agents” (REPLHA) organized at UCSC, Milan, in October 2011.

Moreover POLHIA has promoted and sponsored The Anglo-French-Italian (AFI) Macroeconomics Workshop (June 2011) and the Workshop on Economics with Heterogeneous Interacting Agents (WEHIA, June 2011).

The type of research output is not amenable to patents and does not raise IPR issues (beyond the usual copyright).

