



**European Cooperation
in Science and Technology
- COST -**

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Secretariat

COST 4177/11

MEMORANDUM OF UNDERSTANDING

Subject : Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action IS1104: The EU in the new complex geography of economic systems: models, tools and policy evaluation

Delegations will find attached the Memorandum of Understanding for COST Action as approved by the COST Committee of Senior Officials (CSO) at its 183rd meeting on 30 November 2011.

MEMORANDUM OF UNDERSTANDING
For the implementation of a European Concerted Research Action designated as

COST Action IS1104
THE EU IN THE NEW COMPLEX GEOGRAPHY OF ECONOMIC SYSTEMS: MODELS,
TOOLS AND POLICY EVALUATION

The Parties to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 4154/11 “Rules and Procedures for Implementing COST Actions”, or in any new document amending or replacing it, the contents of which the Parties are fully aware of.
2. The main objective of the Action is to provide a better understanding of the EU as a complex, multi-level, evolving geographical system, taking duly into account the dynamic processes occurring within such a system and to develop improved strategies for EU regional policies. .
3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 64 million in 2011 prices.
4. The Memorandum of Understanding will take effect on being accepted by at least five Parties.
5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter V of the document referred to in Point 1 above.

A. ABSTRACT AND KEYWORDS

The uneven geographical distribution of economic activities is a huge worldwide challenge. For the European Union (EU) regions this is shown by the deep differences within and across nations. Spatial inequalities are evolving through time following complex patterns determined by economic, geographical, institutional and social factors. The New Economic Geography approach, which was initiated by P. Krugman in the early 1990's, describes economic systems as very simplified spatial structures. The Action aims at developing a more sophisticated modelling of the EU visualised as an evolving trade network with a specific topology determined by the number and strength of national, regional and local links. Economic policies should be specifically designed to take into account this pervasive network structure assessing the position of backward locations within the network and focussing on instruments that favour interconnections. The expected results will provide a basis for an improved evaluation of such policies, in particular for the European Cohesion policy, considering their impact on the welfare level of EU citizens and its geographical distribution. To achieve this objective this Action will enhance interdisciplinary networking combining recent approaches in economics with the most advanced mathematical and computational methods for analysing complex and non-linear systems.

Keywords: Geographical Economics, European Regional Policy, Complexity, Network Analysis, Nonlinear Dynamics

B. BACKGROUND**B.1 General background**

The problem of uneven geographical distribution of economic activities is a huge worldwide challenge. For the European Union (EU) regions this is shown by the deep differences within and across nations. According to the Eurostat regional yearbook 2010, the GDP per inhabitant of 67 EU-27 NUTS 2 regions, out of 271, falls below 75% of the average whereas that of 41 regions is above 125% of the average. The differences are even more marked considering the regions in the candidate EU countries (Croatia, Turkey and the Former Yugoslav Republic of Macedonia) and in the potential candidate EU countries (Albania, Bosnia and Herzegovina, Montenegro, Serbia, Kosovo under UNSC Resolution 1244/99 and Iceland).

Regional disparities are significant not only across but also within countries (especially Turkey, Slovakia, but also Italy, Germany and the UK) due to historical, economic and geographical reasons. Spatial inequalities are evolving through time following complex patterns – exemplified by the concepts of path dependence, cumulative causation, hysteresis, and so on – also determined by economic, financial, political, geographical, institutional and social factors. For the period 2000-2007 growth trends in the EU show some overall catching-up at the country level but with remarkable differences at the regional level. The economic crisis in 2008-09 has slowed down the convergence process hitting some regions and nations more than others. Taking Eurostat data during the period 2008-2010, compared to a EU-27 average rate of income growth of - 0.67, in the EU-15 Latvia (-7.83), Estonia (-5.54), Lithuania (-3.84) have been hit harder; Poland (3.52), on the other hand, enjoyed the highest growth rate. The economic recovery in Europe expected for the period 2011-2012 is also characterised by dissimilarities both at the national and regional level (IMF 2011 Regional Economic Outlook: Europe).

The complex nature of the distribution of economic activity across space and of its evolution through time require necessarily different levels and tools of analysis:

1. Geographical and territorial issues

In broad terms, the geographical distribution of economic activities across space is determined by what the literature denotes with “first nature” and “second nature” causes (Krugman, 1993). Second nature causes mainly refer to (human activity and) economic incentives. Economic activities tend to cluster together taking advantage of proximity to larger markets, scale economies, knowledge spillovers, lower transport costs and so on. Even starting from undifferentiated regions and large dispersion once the process is set in motion all activities tend to agglomerate. A fortiori, the concentration process is favoured by first nature causes determined by territorial topography, endowments of natural resources and geopolitical factors. Indeed EU core regions are typically more urbanised (capital regions are often the richest) and well-connected to the transport network hubs; whereas peripheral regions are often coastal, on borders or in rural areas, with a lower number of connections. The increase in the number and strength of territorial connections (transport networks and so on) is at the centre of many EU policies aiming to intensify economic, social and territorial cohesion and to enhance competitiveness (Fifth European Commission Report on economic, social and territorial cohesion).

2. The role of institutions

Institutions at different territorial levels (EU, national, regional and local) play a crucial role in fostering growth and reducing regional disparities. At the EU scale the growing burden of sovereign debts and large national budget deficits may endanger economic and financial integration calling for better policy coordination among national governments and monetary authorities (esp. the European Central Bank). At the national level, as a consequence of the economic crisis, the share in national GDPs of public expenditure is rising. However, a marked process of decentralisation in public expenditure has taken place in the last few years (for example, two thirds of public investment is carried out, on average in the EU, by sub-national governments, regional or local). Moreover, there are categories of public expenditure that have a strong local impact (such as transport infrastructure and environmental policies) or may attract, through complementarities, private investment. A suitable territorial allocation can contribute substantially to the reduction of regional disparities. Institutional capacities however are unevenly distributed across space. Improving the quality of governance (at the various levels) and developing better linkages and coordination between central and local governments and among local administrations become strategic issues.

3. Financial and labour markets

The recent waves of financial turmoil have revealed once more the deeply interconnected structure of the international financial market. The financial system can be described as a global network (with also an European scale) within which a great amount of funds are managed by a few large centres. It has also a local dimension which stresses the existence of a local informational advantage enjoyed by financial intermediaries located in proximity of firms. If local fund managers are more inclined to prioritize local investments projects, the tendency towards a more equal distribution of economic activities is reinforced. Accordingly, a more internationalized financial sector could increase regional disparities. Nevertheless, with increasing openness some firms, especially large ones, may have access to credit from new sources.

The labour market has also a spatial dimension emphasised by the fragmentation induced by low labour mobility, which is in turn a consequence of language, territorial, cultural, gender, ethnic, age and other barriers across European communities.

Specific European programmes aiming to remove such obstacles, promoting social inclusion or access to finance, should take into account the specificities (i.e. skill endowments, microfinance opportunities) and needs which may significantly vary across countries and regions.

4. Local interactions and networks

Decisions which impact on population well-being (labour migration movements, households residential choices as well as firms location decisions) may also be affected by lower scale interrelations: the number and strength of social ties could explain differences in occupational opportunities and wage outcomes; residential choices have a clear spatial dimension (characteristics of local housing markets, accessibility, neighbourhood quality) involving individual preferences but also linked to households interactions; firms compete in local as well as in international markets, where larger firms are involved with more aspects of strategic interactions. Firms may also interact on a cooperative basis creating bilateral or multilateral links (i.e. building the so-called innovation networks, or other types of inter-firm networks). The existence of local links enhances substantially the importance of local administration quality and interventions.

To tackle properly these issues this Action has to undertake the following steps: 1) reformulate the theoretical economic modelling envisaging the EU as an evolving trade network with a specific topology determined by the number and strength of national, regional and more local links; 2) enhance interdisciplinary networking combining recent approaches in economics with the most advanced mathematical and computational methods for analysing complex and non-linear systems; 3) assess and design of economic policies (especially, EU Cohesion policies) taking explicitly into account this pervasive network structure and the role and specificities of economic, geographical, institutional and social factors.

Cost represents the best framework to achieve the goals described above, since it provides pre-normative cooperation for the development of EU regional policies contributing to Europe's competitiveness, socioeconomic development and welfare.

B.2 Current state of knowledge

The theoretical approach concerning spatial issues adopted within economics, the so-called New Economic Geography (NEG) paradigm, initiated by the 2008 Nobel Prize laureate Paul Krugman (with his contribution in 1991) typically describes an economy with two regions (or two nations) in which at least one sector is characterised by imperfect competition, increasing returns and product differentiation. Regions are related via migration of labour, human and physical capital, technological spillovers and commodity trade; they are separated by (a simplified representation of) trade costs. A parametric change involving these costs, such as improvements in transport infrastructures or trade agreements, activates opposite agglomerative and dispersive forces (i.e. clustering in proximity to the larger markets or, contrariwise, spreading across space to avoid competitive pressures) that may disrupt the initial distribution of mobile inputs across locations and the initial sectoral composition within regions moving the economy towards a radically different configuration. The basic dynamic process is modelled as a simple continuous time evolution involving only a few aggregated variables (Fujita, Krugman and Venables, 1999). The design and evaluation of EU regional policies have often been inspired by such a theoretical framework (Midelfart, Overman, Redding and Venables, 2004). Several contributions within this approach have recently focused on the effects of public policy on industrial location and on regional inequalities brought about by different types of public intervention, such as public consumption, subsidies, tax competition, infrastructures and the provision of productive services (P. Martin and Rogers, 1995; Trionfetti 1997, 2001; Dupont and P. Martin, 2006; Baldwin and Krugman, 2004; Baldwin and P. Martin, 2004).

The main result obtained within this NEG literature is that policy interventions may have a positive impact provided that specific conditions are fulfilled, as the following examples show:

- public investment in transportation infrastructure in a less advanced region encourages business location within the region itself when the associated infrastructure improvements are intra-regional, while it may cause leakage of business when the improvements are inter-regional;

- subsidies may, in some circumstances, produce perverse effects. A subsidy directed at firms located in a less developed region may exacerbate the unequal distribution of income across regions when the share of capital owners that resides in the developed region is larger;
- public purchases of locally manufactured goods may counterbalance the increase in regional imbalances induced by economic integration depending on the expenditure financing choices and on the composition of public expenditure;
- tax competition between regions does not necessarily lead to a "race to the bottom". Regions with an agglomerated industrial sector enjoy an agglomeration rent which allows the setting of higher local tax rates without losing industrial activity.
- where the geographical proximity between firms promotes the spatial dissemination of knowledge, redistribution of industrial activity across regions may reduce efficiency and competitiveness.

Standard NEG models have been criticized because of their simplifying assumptions (R. Martin and Sunley, 2011). Here the following ones are highlighted: a) a small number of symmetric and identical locations; b) simplified descriptions of agents (firms, households, workers) mobility decisions and interactions; c) no consideration of network structures; d) scarce attention at different institutional set-ups and at the impact across locations of policy decisions; e) overlooking of the geographical aspects of financial and labour markets. By relaxing these assumptions (for example, by simply increasing the number of regions, Fujita and Thisse, 2009) the results of the NEG literature do not necessarily hold.

By reformulating NEG economic modelling, this Action addresses the issues concerning the effectiveness of EU Cohesion policies aiming to reduce regional unbalances, increase welfare and enhance competitiveness. The EU is envisaged as complex evolving system with different territorial levels (with similar topological properties of the world trade web as those studied by Serrano and Bogñá, 2003). At each level agents take decisions by interacting with each other and with the institutions. Networking structures are present at various scales. The modelling of this complex and fractal structure requires a multidisciplinary approach and the development of specific tools drawing from several areas of competence such as economics, mathematics, physics, computational theory and network analysis.

B.3 Reasons for the Action

The NEG approach represents one of the cornerstones for the design and evaluation of EU regional policies. However, it overlooks the several and sophisticated interconnections that may exist at different scale levels (from the supra-national scale down to interactions among individual economic agents) and the decisions and behaviour that may follow from these interactions.

Neglecting these complexities may seriously distort the policy implications of the NEG approach. The main objectives of this Action are the reformulation of this approach and the reevaluation of policies aiming to reduce regional, social and economic disparities taking into account the complex structure of the EU.

The tools required for analysing such complex network dynamics necessarily take the same degrees of aggregation and sophistication: from aggregated group strategies, modelled by evolutionary game theory; to dynamic evolutionary analyses concerning social interactions or firms R&D networks; down to single individual firms/households represented as heterogeneous interacting agents. To tackle these issues the Action draws upon several competencies from a multidisciplinary network of experts. The Action aims both to achieve scientific advance and to address an European economic need.

The Action expected results are: a) the set up of innovative economic models; b) the development of mathematical and computational tools; c) a systematic evaluation of the impact of EU Cohesion policies; d) the design of suitable policy interventions in collaboration with the relevant stakeholders.

The COST represents the most suitable programme given the interdisciplinary nature of these issues and the need to put together and coordinate the required competencies. The means to achieve the expected results are: firstly, to coordinate the expertise (on geographical economics, industrial organization, network analysis, nonlinear dynamics, agent based modelling and complexity theory) from several countries (currently 16). Within the network many scientists have already previous experience of collaboration with each other.

Secondly, to provide both a way to intensify such collaboration and to create and extend an international open network under the objectives of the Action by inviting other established scientists to join the Action and, in particular, by capacity building and education of Early Stage Researchers (ESRs) via the organization of meetings and training schools. The achievement of the outcomes will also proceed through the dissemination of the results via workshops and publications; as well as via meetings with and involvement of stakeholders.

B.4 Complementarity with other research programmes

The COST presents complementarities with the Seventh Framework Programme (FP7) European current projects IGINEUS, MONFISPOL and POLHIA. The Project on “Impact of networks, globalization, and their interaction with EU strategies” (INGINEUS) deals with global innovation networks and focuses on the internationalization of local innovation systems from the European perspective. Compared to the Action it deepens a specific aspect and touches only marginally on the issue of EU Cohesion policies. The project on “Modelling and implementation of optimal fiscal and monetary policy algorithms in multi-country econometric models” (MONFISPOL) concerns the building of econometric models and computational tools in order to improve macro-economic policies. Compared to the Action the analysis is much more aggregated with less focus on geographical issues. The methodological approach (DSGE: Dynamic Stochastic General Equilibrium modeling) differs as well. The project on “Monetary and, fiscal and structural policies with heterogeneous agents” (POLHIA) provides some scope for collaboration. However, POLHIA has not a concern on geographical features and mostly applies an agent-based modeling approach.

Some potential for collaboration exists also with the COST Action IS0902 started in 2009 on “Systemic Risks, Financial Crisis and Credit – The roots, dynamics and consequences of the subprime crisis”. However, the COST Action IS0902 is concerned especially with the specific issue of weaknesses of the global financial market interpreted as a network structure. It employs a different methodological approach and does not consider the distribution across space of industrial activities.

Currently, not other EU projects (within the EUREKA! or the EUROCORES, European Collaborative Research, Programmes) is giving emphasis to the EU as a complex evolving economic and geographical system.

C. OBJECTIVES AND BENEFITS

C.1 Main/primary objectives

The aim of the Action is to provide a better understanding of the EU as a complex, multi-level, evolving geographical system, taking duly into account the dynamic processes occurring within such a system and to develop improved strategies for EU regional policies.

C.2 Secondary objectives

The objectives of the Action can be viewed from three perspectives:

- a) From the academic perspective, the Action will allow to build and study models of multi-level geographical systems that incorporate features neglected so far by the NEG literature: the models will comprise regions that are not identical but exhibit specific characteristics and will represent them as a multiregional network; at a more disaggregated level, the models will incorporate heterogeneous interacting firms and will extend the analysis to include financial factors that are important at a regional level. The resulting models will be too complex for conventional analytic methods. The Action integrates research activities on this topic across different disciplines, in particular it integrates specialists in economics and in regional science with specialists in mathematical and computational methods for analyzing complexity and nonlinear dynamics. This interdisciplinary approach will allow trespassing the narrow limits set by conventional analytical methods and will allow deriving results where conventional methods have reached their limits.

An additional objective within the academic perspective is the dissemination of the results in the academic community.

Last but not least an objective of the Action is to foster within the interdisciplinary group a common language and a common understanding of the problems at hand thus establishing a new interdisciplinary research field. Thereby, the Action will create the basis for new research projects.

- b) From an educational perspective the Action will increase the number of researchers working on the involved topics thus creating a critical mass. The Action will achieve this objective not only by motivating already established scientists to work on these questions in an interdisciplinary way, but in particular by stimulating Early Stage Researchers to enter this new interdisciplinary research field. The Action will offer topics and close supervision for Master and PhD theses and provide training schools.
- c) From policy-makers' perspective, the objective of the Action is to improve strategies in regional policy aimed at supporting regions that face the challenges of globalization. On a more tangible basis, the Action aims to reach these objectives through the following more quantifiable deliverables:
- Short-Term Scientific Missions involving individual members of the Action or frequent meetings involving small groups of the Action and, possibly, relevant stakeholders;
 - Organization of workshops: The workshops will present methods and results, as well as aspects that require further investigation;
 - Organization of International Training Schools for Early Stage Researcher on economic geography, network analysis, nonlinear dynamics and computational tools;
 - Organization of International Conferences;
 - Publication in international journals of scientific papers on results, models, and methods;
 - Executive summaries;
 - Implementation and updating of the Action Web-Site.

C.3 How will the objectives be achieved?

The current participants to this Action already possess the skills required to reach the stated objectives. Moreover, many of them share a common experience of research and take part to current research programmes on topics complementary to the Action. However, the objectives can only be reached in a genuine interdisciplinary approach for which the collaboration has to be intensified. Networking within the Action will thus be an essential contribution to reach the stated objectives and deliverables:

Meetings and Short-Term Scientific Missions (STSMs): The Action is organized in Working Groups (WG) focusing on particular subthemes. In order to fully exploit the potential offered by an interdisciplinary approach, these WGs have to exchange information on recent research progress, to coordinate future work, and to combine the results achieved separately in an interdisciplinary approach. In particular, in an early phase of the Action face-to-face interaction offered by STSMs is necessary in order to develop a common language and a common understanding of the issues involved and a common research programme. This creates also a basis for the development of new research questions leading possibly to research activities beyond the Action. In the later phases of the Action, STSMs will involve Early Stage Researchers and will provide the opportunity of learning and capacity building by collaborating directly with junior and senior members of the hosting WG.

Workshops will present methods and results, as well as aspects that require further investigation. They involve more people than the STSMs and typically address a wider audience up to all participants of the Action. The workshops will also invite external scholars to evaluate results and possibly join the Action. Some groups involved in the Action already have a consolidated tradition in the organization of such events; COST would provide important support to increase their frequency and quality and encourage the participation of young researchers and scholars, in particular from developing countries.

Similarly as for the STSMs, the function of the Workshops is twofold: they are a necessary platform to integrate the research activities of the different Work Groups in an interdisciplinary way and to consolidate the common research programme; at the same time, they offer – not only, but in particular – Early Stage Researchers the opportunity to present their work in a topically focused environment and to get specific feedback from established scientists.

Training Schools offer not only focused education for Early Stage Researchers, but also the possibility of networking with other young researchers in this field as well as with established scientists.

International Conferences will present the results and the field to a wider academic and policy oriented audience. Persons outside the Action will be invited to participate and potentially to join the Action. The Conferences will put an emphasis on inviting Early Stage Researchers and to organise special additional sessions for this group. At the Conferences, policy oriented panel discussions will be organized addressing a wider policy oriented audience as well as the general public.

Publications of scientific papers: The focused discussion during the Workshops and the International Conferences organized within the Action will allow improving the quality of the presented papers and thus will increase the scientific output in international journals that is necessary for disseminating the results within the broad scientific community. The International Training Schools organized within the Action will require as teaching material books on basic methods and tools and – at the same time – will allow improving the quality of these publications. Thus the Action will provide high quality teaching material and thus will have an educational impact beyond the Action.

Involvement of stakeholders: Meetings with relevant “stakeholders” as found in the research and policy design units within institutions at the EU-level, at a national or regional level (institutions such as governments and ministries, as well as National Banks; but also lobbying and interest groups such as the Chamber of Commerce, the Chamber of Labour and the Trade Unions; and other non-profit organizations interested in issues of globalization and regional policy). The Workshops will also invite members of these institutions to present their view on the most urgent regional problems and will organize roundtables in which the members of the Action discuss with the stakeholders their newest results and how they can contribute to improve policy design. At the International Conferences, special panel discussions will be organized involving this audience.

Executive summaries will be produced (and made available for download on the main Web-Site) for each paper published within the Action that presents the main results in a non-technical way and outlines the possible implications for improving the design of regional policies. These executive summaries will thus be accessible to a wider audience and, in particular, to an audience in policy making.

The Web-Site: The Action will create a central Web-Site, where the Action is presented, its Events are announced (Training Schools, Workshops and Conferences) and its publications are documented (each with an Executive summary). The Web-Site will contain individual domains for all members of the Action.

C.4 Benefits of the Action

We envisage three types of benefits:

First, from the academic perspective, the Action will coordinate the research across European countries on the analysis of multiregional economies; it will contribute to the construction of a novel theoretical framework; it will deepen the analysis of regional issues across different levels of aggregation and various dynamic decision rules.

The expected scientific impact thus stems from:

- the visualisation of the EU as a trade network with a specific topology determined by the number and strength of regional links;
- the provision of a more sophisticated modelling of the dynamic processes governing the spatial distribution of industrial activities and financial resources;
- the development of specific analytical tools in the field of networks analysis, agent based modelling, evolutionary game theory and nonlinear dynamics.

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A particular important scientific benefit of the Action will be that it will considerably increase the visibility of the achieved results within the broader scientific community (workshops and publications in international journals) and that it will thus forcefully contribute to the establishment of a new interdisciplinary approach to the analysis of multiregional economies. This will lead to an increase in the number of established researchers working on these questions.

Last, but not least the scientific benefit of the Action extends beyond its time horizon since it contributes to the establishment of a new scientific field, in which cross EU collaboration will continue, giving rise potentially to future interdisciplinary research projects.

Second, from the educational perspective, a substantial benefit of the Action will be found in its contribution to capacity building and to increasing the number of researchers dedicated to the topics of the Action, by offering educational and career opportunities for Early Stage Researchers.

Third, from the policy makers' perspective, the Action will provide effective policy suggestions: a full understanding of the EU as a trade network will improve the design of EU regional policies (i.e. Cohesion Policy, Common Agricultural Policy, environmental regulations) as the policy design takes into account the geographical position of backward regions within the network and focus on instruments that favour regional interconnections.

This approach is more effective for addressing specific cogent issues linked to economic integration such as: easing economic disparities within and across European regions; economic and social cohesion policies; regulation of migratory flows; counteracting delocation of production towards low-wage and less regulated emerging economies; upgrading of product quality to enhance the competitive strength of European industries; containing the spread across regions of the consequences of financial markets turbulence.

C.5 Target groups/end users

In addition to the Academic and educational community, the Action targets the following end users:

- a) Research and policy design units within institutions at the EU-level, at the national and at the regional level (institutions such as governments and ministries, as well as National Banks; but also lobbying and interest groups such as the Chamber of Commerce, the Chamber of Labour and the Trade Unions).
- b) Non-profit organizations and the general public: Recently, with the EU enlargement and the financial crises, regional disparities gained more attention also in non-profit organizations and in the general public discussion. The Action will contribute to inform the general public on the causes and consequences of regional integration and on reasonable policy designs in this field, thus enabling not only a better understanding but also providing a better basis for political decisions and appraisals (last but not least in general elections).

Some stakeholders were actively involved in the preparation of the proposal.

D. SCIENTIFIC PROGRAMME

D.1 Scientific focus

European regions are characterised by deep disparities (i.e. economic, social, geographical and institutional) that impact on the distribution across space of the industrial activity. At the same time there exists a multiplicity of interconnections across regions which explain the evolution through time of such distribution. Often these interconnections take a network structure with specific topological properties. Moreover, interlinkages and interactions may also emerge at different levels involving different territorial units, institutions and individual agents. The Action develops a new theoretical framework for the understanding of the EU as a complex evolving economic system. A better design and evaluation of economic policies can be obtained following this interpretation.

The Scientific Programme of the Action is structured into four separated but complementary research lines:

(i) Economic geography modelling

The Action will promote theoretical work aiming to cope with the limitations of the New Economic Geography approach mentioned in Part B.2: Current state of knowledge (i.e. small number of locations and neutral space; absence of network structures; overlooking of the role of institutions; simplified descriptions of agents behavior). The unifying framework of the analysis will be the conception of the EU as a complex network composed of a large but finite number of trading regions. The type and number of connections among regions – other than other differences including geographical, social, political and institutional aspects – define the topological properties of the network. This complex structure will allow to describe effects across space – such as, for example, the feedbacks and spillovers generated by policy interventions or the accumulation of advantages originated from a central position (hub effect) – that cannot emerge in a simpler context.

(ii) The assessment of the role of institutions and markets

The new theoretical framework developed in the Action will allow a full understanding of the possible effects of various regional, supra-regional and supra-national policies on economic disparities and growth in multi-regional economies. The investigation should take into account the territorial level of administrations, the quality of institutions, the financing of policies (for example, through local or national taxation or through EU structural funds), the possible spreading of the effects across administrations and the strategic behaviour of neighbouring administrations.

A complementary investigation will consider the geographical dimension of the labour and the financial markets. Concerning the financial market, the Action will focus at the local dimension on the relationship between accessibility to credit and the capacity of regions to attract and foster entrepreneurial activity; and on a national and supra-national level on mechanisms that may either favour or hamper the spreading across the EU of financial turbulence. Concerning the labour market, the Action will focus on the local specificities of the labour markets and on the possible effects on labour mobility, employment and, more generally, on social inclusion of national and EU policies and Programmes.

(iii) A detailed study of social and industrial interactions

The Action will also take a more disaggregated perspective by considering individual agents behaviour and small scale interactions and networks. Concerning workers, labour migration choices are affected by the general environment of the labour market both at the origin and at the destination (the institutional characteristics, national and supra-national legislation and regulation, wage level, degree of segmentation); they are also affected by the number and strength of social interactions and networks through which information is transmitted (for example about job opportunities or residential housing characteristics) or formal and informal contacts between employers and employees are created. Firms' location decisions may also be affected by industrial interactions. They may decide either to undertake competitive relationships, through various types of strategic behaviour; or create cooperative links such as innovation networks or other types of inter-firm networks. The Action will draw on the outcomes of this line of research to provide a more sophisticated description of agents behaviour within economic geography models.

(iv) Development of mathematical and computational methods and tools

In addition, the Action will develop innovative mathematical and computational tools necessary for the analysis of complex multi-regional economic models; in particular, in the fields of network analysis, computational methods, nonlinear dynamical systems, game theory and agent based modelling.

On the basis of the Scientific Programme, the following is a synthetic and extensible list of the research tasks:

- a) development of a new theoretical approach to economic geography modeling based on complex, multi-level, evolving geographical systems;
- b) empirical analyses to discover the topological properties of the EU regional trade network;
- c) calibrations to validate the theoretical framework;
- d) computational simulations of different economic policy scenarios;
- e) evaluations of the impact of regional policies on the spatial distribution of economic activities and on economic welfare.

Human and technical means

The expertise required in order to achieve the stated objectives covers several disciplines: geographical economics, financial economics, labour economics, regional sciences, nonlinear dynamics, game theory, computational analysis, networks and complexity analysis. The current participants of this Action, already possess the skills required. Moreover, many of them share a common experience of research and take part in current research programmes on topics complementary to the Action. Further human resources will be attracted through invitation or through the organization of specific training schools for PhD students and young researcher. Concerning technical means, for the dissemination activities of the Action a Web-Site will be required and consequently a Web-master. Further, some external expertise for programming and software developing will also be necessary.

D.2 Scientific work plan methods and means

The Scientific work plan involves the composition of four working groups (WGs). Each WG will carry out separate but complementary tasks with different methodologies and objectives along the research lines laid down in the Scientific Programme. Research activity across the WGs will be highly connected with a continuous feedback process. The research activity of WG1 will provide a constant input for the other WGs.

WG1: Economic Geography modelling

Objectives and work plan

The main objective of WG1 is to put forward a representation of the EU as a multi-level complex evolving system that will provide the theoretical and conceptual basis for the research work of the other WGs. In broad terms, the work plan includes the following steps: i) a throughout assessment of the literature on economic geography modelling (year one); ii) building multiregional NEG models (year two); iii) in collaboration with the other WGs, incorporate results and outcomes originated from the various lines of research (year three); iv) in collaboration with the other WGs, validate the results through empirical analyses and computational calibrations (year four).

Methodology

In order to achieve the stated objectives of WG1, the required methodology involves the formulation of NEG multi-regional models, empirical investigations, complex systems analysis, network analysis and nonlinear dynamics. WG1 will be mainly composed of experts of economic geography, regional science, network and computational analysis.

WG2: Institutions and markets

Objectives and work plan

The main objective of WG2 is threefold: to assess within the new theoretical framework the impact of various economic policy instruments on regional inequalities, economic welfare and competitiveness; to investigate on the geographical characteristics of the financial and labour markets; and, finally, to evaluate how the economic environment determined by these characteristics affects the capacity of regions to attract entrepreneurial activity. The work plan involves the following steps: i) a complete assessment of the NEG literature dealing with the effects of policy intervention on the spatial distribution of the economic activity (year one); ii) extension of existing models to include labour and financial markets with different regional characteristics (for example, different degrees of credit accessibility, different wage levels) (year two); iii) in collaboration with the other WGs, verify the economic impact of different policy interventions in the context of multiregional models (year three); in collaboration with the other WGs, extend these models to account for the spatial dimension of the labour and credit markets (year four);

Methodology

In order to achieve the stated objectives of WG2, the methodology required is economic modeling and empirical investigations. WG2 will undertake continuous and fruitful interchanges of ideas and collaboration between economists, regional scientists, policymakers and other stakeholders.

WG3: Social and industrial interactions

Objectives and work plan

The main objective of WG3 is threefold: to provide disaggregated analyses of multi-level spatial economic systems. These analyses will focus on the interrelationship between individual location choices and the economic, social and institutional environment; to analyze the social and economic networks that may emerge at various scales; and, finally, to identify possible interconnections among networks. This will help, for example, to highlight how the properties of a network at some level (for example, the degree of interconnectedness) can be affected by processes taking place within networks at a different level; a secondary objective is to provide more sophisticated descriptions of agents behaviour within NEG models.

The work plan involves the following steps: 1) reformulate NEG models by introducing different assumptions on individual agents behaviour (i.e. strategic interaction between firms; workers decisions based on social interactions) (year one); 2) in collaboration with WG4, build models of social and economic interactions and networks for different aggregation levels (year two); in collaboration with the other WGs, incorporate these network structures in a more general framework in which the different levels are interconnected (year three); in collaboration with the other WGs, validate the results through empirical analyses and computational calibrations (year four).

Methodology

In order to achieve the stated objectives of WG3, the methodology required involves economic geography modelling, analyses within industrial organization theory, game theory, networks analysis, agent based modelling and more generally computational economics. WG3 will include experts in geographical economics, microeconomics, nonlinear dynamics and computational analysis.

WG4: Mathematical and computational methods and tools.

Objectives and work plan

The main objective of WG4 is to develop mathematical and computational methods and tools for analysing strategic interaction, heterogeneity, complexity and nonlinear dynamics. The activity of WG4 will be constantly coordinated with that of the other groups. More specific tasks will be accomplished according to the following work plan: collection of data required to understand the topological properties of the EU as a complex trade network (year one); preliminary work on multiregional economic geography models and on disaggregated models of economic and social networks (year two); building of more sophisticated models that takes into account the research carried out by the other WGs (year three); calibration exercises and empirical analysis to validate the theoretical results (year four).

Methodology

In order to achieve the stated objectives of WG4, the methodology involved requires the construction of specific algorithms and source codes to be implemented, at least at the first stages of the research, within existing software simulators. These softwares will be aptly improved with the progress of the research activity of the Action. The group of experts involved in WG4 will include mathematical economists, mathematicians, physics and experts in computational analysis.

E. ORGANISATION

E.1 Coordination and organisation

The COST Action will be supervised and coordinated by a Management Committee (MC). The MC will be formed and will proceed according to the COST Rules and Procedures. The MC will comprise of up to two representatives for each signatory country and the Chair of Action. The MC will be assisted by a Steering Committee (SC) composed of the Chair and Vice-Chair of the Action and the WG Leaders.

The MC will be responsible for

- Appointing the Chair, the Vice Chair and WG Leaders during the first meeting;
- Addressing the research topics and providing the guidelines for the research work;
- Budget planning and allocation of funds;
- Coordinating the organization of Workshops, Training Schools, Conferences and STSMs;
- Coordinating and facilitating the network activity of the participants to the Action;
- Coordinating the activity of the WGs;
- Exploring the possible inclusion of new participants to the Action;
- Promoting exchange of information with external experts and stakeholders and, where possible, favouring their direct involvement to the Action activities;
- Creating and strengthening the links to other relevant EU Programmes;
- Promoting the fulfilling of research objectives;
- Ensuring the meeting of milestones and deliverables;
- Promoting the disseminations of the results;

- Supporting publications of results from research collaborations within the Action on special issues of scientific journals;
- Supporting the evaluation procedures that are finalised in the preparation of the annual and final progress reports;
- Supervising the implementation and update of the Action's website.

The SC will support the decision process of the MC.

The research activity performed by the participants to the Action will be financed independently of COST by local, national or international funding agencies. The Action organisational structure draws upon research collectives that already exist within the confines of traditional scientific discipline and are already producing interesting results published in international journals. The Action brings together their competences and abilities aiming to find a common language and intensify interdisciplinary research. It will provide the necessary co-ordination by giving financial support to meetings, workshops and Short-Term Scientific Missions and to the organization of the Training School for young researchers.

The following milestones can be identified:

First Year

- The First meeting where the MC, WG Leaders and SC will be defined as well as work plan implementation and tasks distribution;
- Launching of the website;
- Separate Workshops for the four WGs where specific work plans are laid down and the discussion and presentation of state-of-the-art reviews will be made;
- Training School and Conference on the themes of one of the WGs; STSMs;
- Beside the Conference: MC and SC meetings where the first year activity is assessed and the coordination of the second year activity is initiated.
- Dissemination of preliminary results (working papers).
- Annual report on the Action activities;

Second Year

- Separate Workshops for the four WGs where preliminary results are discussed;
- Joint Workshop for all WGs where knowledge is exchanged on scientific results and methodologies; preliminary discussion on the utilization of the Action results as a groundwork for a joint interdisciplinary research project lasting beyond the Action;
- Training School and Conference on the themes of one of the WGs; STSMs;
- Beside the Conference: MC and SC meetings where the second year activity is assessed and the coordination of the third year activity is initiated.
- Dissemination of intermediate results (working papers, collected volumes).
- Annual report on the Action activities;

Third Year

- Separate Workshops for the four WGs where intermediate results are discussed;
- Training School and Conference on the themes of one of the WGs; STSMs;
- Beside the Conference: MC and SC meetings where the third year activity is assessed and the coordination of the fourth year activity is initiated.
- Dissemination of more advanced results (working papers, journal articles, collected volumes).
- Annual report on the Action activities;

Fourth Year

- Separate Workshops for the four WGs where more advanced results are discussed;
- Joint Workshop for all WGs where knowledge is exchanged on scientific results and methodologies; utilization of the Action results as a groundwork for a joint interdisciplinary research project lasting beyond the Action;
- Training School on the themes of one of the WGs and Concluding Conference where a comprehensive state-of-the-art result of the Action will be made; STSMs;
- Beside the Conference: Management and Steering Committee meetings where the fourth year activity is coordinated and assessed;
- Dissemination of final results (working papers, journal articles, collected volumes);
- Final report on the Action activities.

The Action website will be continuously updated to serve to optimise communication and dissemination of results. It will provide information on Workshops, Conferences and Training Schools. It will also serve as the Action's repository for Working Papers, Reports and other documents.

E.2 Working Groups

The action will be composed of four Working Groups (WG) the description of which has been given in full detail in Part D: Scientific programme. The composition of the WGs will be established by the MC on the basis of the preferences expressed by the participants. In general, membership to workgroups is open to all participants. Moreover, due to the complementarities of the WG tasks each Action members and other participants can be involved in more than one WG. WGs will organize Training Schools and Conferences that will be dedicated specifically to their research themes under the Supervision of the MC. The MC appoints the WG Leaders who will be responsible for:

- The internal organization of the WGs;
- Setting and monitoring specific research goals in accordance with the main objectives of the Action;
- Appointing of a team within the WG that will organize one or more of the main Action Events, i.e. Training Schools and Conferences, dedicated to the WG research theme;
- Active and proactive participation in the SC.

WGs will meet every year exchanging information and implementing work plans for the coordination of the following research activity. They will promote the launching of STSMs and Training Schools with the specific objective to encourage the participation of early stage researchers.

E.3 Liaison and interaction with other research programmes

As mentioned in Part B.4: Complementarities with other research programmes there is a potential for collaboration with the FP7 EU project POLHIA and the COST Action IS0902. However, POLHIA terminates at the end of 2011. Therefore there will be limited time for exchanging information and work together in joint seminars and meetings. A strong effort will be made to create links with the next round FP EU projects that will be related to the topic of the Action. Moreover, one of the expected outcomes of the Action is a groundwork for an application to EU research funding Programmes. Concerning the COST Action IS0902 an exchange of information will be organised on network properties of the European financial market. Link with the participants of the COST Action IS0902 could be established through joint seminars and external participation to WGs meetings.

E.4 Gender balance and involvement of early-stage researchers

Involvement of early-stage researchers

The Action aims to achieve the largest possible involvement of early-stage researchers (ESRs) in several ways: the organisation of Training Schools which are typically aimed to early-stage researchers; giving priority in the STSM to ESRs in order to facilitate the exchange of information and create scope for collaboration between ESRs and Senior researchers; special Conference Sessions and meetings especially organised for ESRs; promote participation of ESRs in the Action activities.

Gender balance

The list of invited participants does not achieve gender balance. However, it is worth mentioning that the research group that constitutes the backbone of this Action involves already a substantial number of ESRs and female scientists. The MC and the WGs Leaders put particular effort to extend the participation of female scientists.

F. TIMETABLE

The Action will last four years and the following table shows its time schedule:

Year	Date	Activity
1	1 st Half	First meeting: implementation of work plan and task distribution; Launching of the website; Separate Workshops for the four WGs: implementation of specific work plans; Short-term scientific missions
	2 nd Half	Training School and Conference on the themes of one of the WGs: presentation; MC and SC meetings beside the Conference; Short-term scientific missions; Dissemination of preliminary results; Annual report on the Action activities;
2	1 st Half	<ul style="list-style-type: none"> • Separate Workshops for the four WGs: discussion of preliminary results; Short-term scientific missions; Joint Workshop of the WGs of the Action: coordination of the activities of the WGs through a multidisciplinary perspective;
	2 nd Half	Short-term scientific missions; <ul style="list-style-type: none"> • Training School and Conference on the themes of one of the WGs; MC and SC meetings beside the Conference; • Dissemination of intermediate results; • Annual report on the Action activities;
3	1 st Half	<ul style="list-style-type: none"> • Separate Workshops for the four WGs: discussion of intermediate results; Short-term scientific missions
	2 nd Half	<ul style="list-style-type: none"> • Training School and Conference on the themes of one of the WGs; MC and SC meetings beside the Conference; Short-term scientific missions; Dissemination of more advanced results; <ul style="list-style-type: none"> • Annual report on the Action activities;

4	1 st Half	<ul style="list-style-type: none"> • Separate Workshops for the four WGs: discussion of final results; Joint Workshop of the WGs of the Action: scientific evaluation of final results through a multidisciplinary perspective; Short-term scientific missions
	2 nd Half	Training School and Conference on the themes of one of the WGs: presentation of the main results of the Action; MC and SC meetings beside the conference; Short-term scientific missions; Dissemination of final results; <ul style="list-style-type: none"> • Final report on the Action activities

G. ECONOMIC DIMENSION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest: AT, BE, BG, DE, EE, EL, ES, FR, HU, IT, LU, NL, PT, SE, SK, UK. On the basis of national estimates, the economic dimension of the activities to be carried out under the Action has been estimated at 64 Million € for the total duration of the Action. This estimate is valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

H. DISSEMINATION PLAN

H.1 Who?

From an academic and educational perspective, the Action addresses

- a) other researchers working in the field or a related field in Research Institutes inside and outside universities; and b) Early Stage Researchers not yet embedded in research institutions.

From a policy makers' perspective, the Action addresses

- a) Research and policy design units within institutions at the EU-level, at the national and regional level (institutions such as governments and ministries, as well as National Banks; but also lobbying and interest groups such as the Chamber of Commerce, the Chamber of Labour and the Trade Unions); and
- b) non-profit organizations and general public. Recently, with the EU enlargement and the financial crises, regional disparities gained more attention also in non-profit organizations and in the general public discussion.

H.2 What?

The Action will primarily use five dissemination methods: Web-Site, electronic communication network, events (such as workshops and conferences), training schools, academic publications, and non-technical publications (such as executive summaries). Occasionally, individual participants may also use other dissemination tools (like writing comments in newspapers or giving interviews).

	Academic and educational audience	Policy makers and general public
Public website	X	X
Electronic communication network	X	
Events: Workshops and Conferences	X	X
Academic publications	X	
Non-technical publications	X	X

H.3 How?

The Web-Site of the Action will be an important tool for dissemination: It will contain general information on the Action, its aims, participants and research topics. In addition, it will offer an online calendar including all information on the events organised within the Action (announcement, call for contributions, programme). In addition, it will list references to all publications produced within the Action and introduce each of the publication by a non-technical executive summary (accessible to the general public).

An electronic communication network will be set up for exchanging information within the Action: It will contain mailing lists and file sharing facilities such as e.g. Drop-Box, Google docs and so on. Such an electronic communication network is already established between some of the members of the Action and was used in preparing the proposal; it will be extended to all participants.

Events organised within the Action such as Workshops and Conferences will be open for academic and educational audiences, but also for a policy makers' audience and to the general public. In particular, Workshops will invite policy makers working in research and policy design units within institutions at the EU-level, at the national or regional level (institutions such as governments and ministries, as well as National Banks; but also lobbying and interest groups such as the Chamber of Commerce, the Chamber of Labour and the Trade Unions). Conferences will organize panel discussion addressing the policy makers' audience, but also non-profit organisations and the general public.

Academic publications will involve scientific books and articles in peer-reviewed scientific journals.

Non-technical publications will consist primarily of executive summaries introducing each publication to a non-technical audience and made available on the Web-Site.