The ESPON 2013 Programme

SPAN-3

Spatial Perspectives at Nuts-3 Level

Project 2013/2/6

Draft Final Report

EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

This report presents the draft final results of an Applied Research Project conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

Information on the ESPON Programme and projects can be found on www.espon.eu

The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This basic report exists only in an electronic version.

Research teams

Politecnico di Milano

Universitat Autònoma de Barcelona

TERSYN

Foreword

The main goals assigned to the project were interesting and quite ambitious:

- to show how the general ESPON approach to spatial analysis can be useful to local policy makers;
- to build new methodologies and tools which could provide support to policy makers for quantitative assessment and foresight;
- to provide new evidence on territorial relationships through the use of the above-mentioned quantitative tools;
- to develop stimulating partnership processes between scholars, local-regional policy makers and European functionaries in charge of EU regional policy.

All this implied first the updating of the spatial scenarios developed by the ESPON 2006 3.2 project, using both a qualitative and a quantitative foresight methodology (namely the MASST model), and referring in particular to the post-crisis context, globalization processes and role of emerging economies, energy trends and new roles of rural areas.

Secondly, it implied development and estimation of a new econometric tool for transferring the logics of the MASST model from the Nuts-2 level to Nuts-3: the submodel: MAN-3 (Masst-at-Nuts-3), developed with reference to three countries: Spain, France and Italy. A quantitative foresight on all Nuts-3 regions was run on the basis of the new qualitative scenarios for these countries.

Thirdly, the construction of new scenarios for the Barcelona Province (the Députaciò, as Lead Stakeholder of the project) was envisaged, building on the general results achieved in the previous phases and on a selective analysis on the economic fabric, recent performance and internal structure of this area. Similar but less thorough reflections were developed on the other two stakeholder areas, namely on the Turin province and the Hérault Department. A final, relevant and consistent part of the research project is devoted to policy messages and recommendations, mainly focusing on the Latin Arc network territories and the Barcelona province.

This huge task was accomplished in a short time span, namely 18 months, mainly thanks to the competence and the enthusiasm of all partners and stakeholders, and the continuous support of the ESPON CU. Interesting and intense interactions were organised with local officials and experts, mainly on the multiple aspects of possible policy strategies.

Judging from our experience in this project, the intuition of a necessary linkage between the ESPON research work and the natural recipient of the research output, namely regional and local government institutions and policy makers – an intuition at the base of the ESPON « targeted analyses » - proved extremely fruitful and forward looking.

Table of contents

Figures

Maps

Tables

EXECUTIVE SUMMARY

1 Analytical part including key messages and findings

The main scientific goals of the project are the following. Firstly, to update the spatial scenarios developed by the ESPON 2006 3.2 project, building new qualitative scenarios and a new quantitative foresight (namely with a revised version of the MASST model); necessary reference in particular concerns the post-crisis context, globalization processes and role of emerging economies, energy trends and new roles of rural areas.

Secondly, the development and estimation of a new econometric tool for transferring the logics and operation of the MASST model from the Nuts-2 level to Nuts-3: the submodel MAN-3 (Masst-at-Nuts-3), developed with reference to three countries - Spain, France and Italy. A quantitative foresight on all Nuts-3 regions was run on the basis of the new qualitative scenarios for these countries.

Thirdly, the construction of new scenarios for the Barcelona Province (the Députaciò, as Lead Stakeholder of the project), building on the general results achieved in the previous phases and on a selective analysis on the economic fabric, recent performance and internal structure of this area. Similar but less thorough reflections were developed on the other two stakeholder areas, namely on the Turin province and the Hérault Department. A final, relevant and consistent part of the research project is devoted to policy messages and recommendations, mainly focusing on the Latin Arc Network territories and the Barcelona province.

1.1. The new Scenarios

Three integrated scenarios are built on the basis of updated thematic scenarios (Annex 1) and taking always into considerations the new driving forces which are likely to act in the new condition brought in by the crisis.

The Reference scenario

The Reference Scenario is not a trend scenario in the conventional sense, because the simple extrapolation of past trends does not seem meaningful in a context where numerous factors of strategic significance are changing (globalization, energy paradigm, climate change, social orientation, recent economic crisis etc) giving rise to sudden breaks. Previous huge contradictions linked to debt-driven aggregate demand in advanced countries and by the financialization of western economies will call for drastic changes; China and BRICs countries supporting western consumption with low-price goods, with risks of boosting internal inflation, is also a condition due to change. The balance of the geo-political game will be different; winning assets will be different; the dollar will not be any longer the only reference currency for international exchanges; a “regionalised” globalisation will probably take place, with the large “triad” areas (Europe, America, East and South Asia) becoming more independent and more internally integrated. BRICs will enter progressively in the medium and high technology game and will become sources of international demand; on the other hand, the purchasing power in western countries, particularly of some groups (retirees, civil servants, low income groups), will be

particularly affected. Hopefully, lower wage growth and "regionalized" globalisation will enable some recovery of manufacturing activities in Europe, especially if a number of new technologies will develop: nanotech, biotech, transport technologies, new materials, green economy.

These structural changes will have differentiated effects on the Latin Arc which has a rather heterogeneous economic and geographical structure. In general terms, metropolitan areas with advanced economic functions and technological poles will be favoured with respect to cities with an economy depending upon intermediate or low technologies. After recovery, tourist functions will progress moderately. The residential economy progresses more because of accelerating population ageing in Europe. Rural areas will be affected, up to a certain extent, by the deregulation of the CAP, especially the wine producing regions. A number of rural areas benefit from the production of renewable energy, but only a modest part of the available potential is being exploited. Immigration concentrates in metropolitan and tourist areas.

The Proactive scenario ("Green Economy")
The proactive scenario is based on the assumption that the decisions adopted at international level aiming at curbing down the speed of climate change are efficiently used as an opportunity to generate significant economic growth throughout Europe. The realization of the scenario requires the active involvement of economic actors and of the civil society. A wide spectrum of sectors – manufacturing, energy, construction, agriculture, transport, R&D and advanced services – will benefit from the spread of the new "green economy paradigm"; aggregate demand will benefit from new investment opportunities.

The Proactive Scenario in the Latin Arc is favourable to the development of technology poles and of major metropolises. The strengthening of advanced activities generates spin-off effects in the production sectors towards secondary growth poles and medium size cities. In the context of the "green economy", the development of solar energy is booming along the "Latin Arc", from R&D activities down to the general implementation of related technologies in rural areas and cities. An increasing share of electricity needs is being covered by domestic production of solar, biomass and wind energy.

The realization of the "Union pour la Méditerranée" (UPM) is possible because economic growth in Europe is significant. The scenario provides good conditions for its implementation, especially for the development of complementarities and partnerships between the European Mediterranean regions and countries of the southern and eastern parts of the Mediterranean Basin. The metropolitan areas of the "Latin Arc" benefit significantly from this multilateral initiative. The "Latin Arc" is less subject to immigration because of stronger economic development in North Africa, pushed by European investments. A larger part of the immigrants of working age are integrated into the regional labour markets which are expanding.

The Defensive scenario
This scenario assumes a slow recovery from the crisis in the western economies and in Japan, resulting from a weak reactivity to the changing context and a lower perception of the new technological opportunities. Global demand remains modest. The BRIC maintain their comparative advantages in low-cost production, a factor which also constrains the development of their domestic market because of low wages. They however progress also in more technology-intensive sectors, competing more intensely with Europe. Few foreign investments are made in the less developed countries of the world, so that new external markets hardly emerge. Inflation is lower than in the reference scenario. Low interest rates could feed new speculative bubbles, threatening the stability of the global economy.

Under this scenario, the perspectives of development of the "Latin Arc" are less favourable than under the reference scenario. The lower level of public efforts in the field of research and technological development does not enable the technology poles to generate spin-off effects into second rank cities and to efficiently contribute to the modernization of the regional economies. Manufacturing industries in the "Latin Arc" based on low and intermediate technologies are sheltered by public policies in a first phase, but will be affected during a second phase; the potential existing in the field of solar and other renewable energy sources is only modestly exploited. This is also detrimental for rural areas, which are confronted, in addition, to the decline of agricultural activities and to depopulation trends. The stagnating European economy handicaps the development of tourist functions and of the residential economy along the "Latin Arc".

New activities concentrate mainly in metropolitan regions, adding to congestion and urban sprawl. External immigration is further strictly controlled, but illegal immigration continues nevertheless, because of unfavourable economic conditions in North Africa and low progress in the Union pour la Méditerranée.

1.2. Quantitative scenarios at Nuts-2 level

Qualitative scenarios are translated into quantitative foresight for all Nuts-2 European regions, through the utilization of an updated version of the MASST econometric model. (see Annex 2).

In the reference scenario, GDP growth rate is positive for almost all regions, but some regions considerably outperform while in others growth is sluggish. Results indicate that growth within countries will be mainly a centripetal process, with the core areas as the leaders in all countries. In Eastern Europe all capital regions are among the best performers overall. Rural areas in the East are on the contrary sluggish, as all rural areas around Europe. In the West too, the high income regions are those which generally outperform the others. However, many second rank areas are also thriving. This pattern is confirmed in the Latin Arc.

The Pro-Active scenario is more expansionary for all regions of Europe. However, some regions benefit more than the others from the more expansionary hypotheses of this

scenario. In the New member countries, the areas which are more able to perform a technological leap forward are the core and capital ones. Interestingly enough, especially in the West, it is not necessarily the core regions those which benefit more, but rather a number of second level and intermediate income areas.

For what concerns the Latin Arc, also in the Pro-Active scenario the core regions are peerforming well but the development spreads to second order poles. Despite the good performance of second order regions, however, rural areas are doing bad in this scenario, since they have a positive but consistently lower performance both in relative and in absolute terms.

The defensive scenario is less expansionary with respect to the reference scenario for all regions of Europe. In particular, one can observe that, among the regions more able to survive the recession, some capital regions can be found. As a last consideration, it can be observed that this scenario does not favour rural areas as expected, due to its more cohesive and "defensive" nature. On the contrary, due to lack of demand for products, insufficient investment and decline of manufacturing, these regions are those which lose more from this scenario.

The total level of European disparities increases in all three scenarios, but especially in the Defensive scenario in which only the most important metropolitan areas are able to react and the weakest countries suffer the most from the protectionist policy (see the scientific report for details).

1.3. Quantitative scenarios at Nuts-3 level

Quantitative scenarios at a more disaggregated territorial level (Nuts-3) come from the implementation of the MAN-3 (Masst at Nuts-3) sub-model (see sections 4.1. and 4.2. in the scientific report for details).

In the reference scenario (Map 1.3.1. in the report), the growth rates of European provinces are highly differentiated. With regard to the typology of the provinces, agglomerated provinces benefit more than the others from the reference scenario, while rural provinces have the lowest growth rates. By and large, peripheral rural and urban provinces are the worst performers. By contrast, provinces around MEGAs generally outperform the others.

Overall, provinces specialized in building and construction also have a lower than average growth rate. However, urban provinces benefit more than the others from this sector. The growth rate of tourism provinces is higher than average. In this respect, it is interesting to underline that rural provinces specialized in tourism grow twice as fast as other rural provinces.

The pro-active scenario differs in many respects from the reference scenario and shows higher growth levels for all provinces. Interestingly, some rural and urban provinces with a low rate of growth in the reference scenario benefit more from the pro-active scenario. This shows that the proactive scenario also favors rural provinces hosting the

development of the residential and tourist economy and the “green economy”, beyond agglomerated provinces and capitals hosting most of innovative activities.

In the defensive scenario the most heavily penalized provinces are the rural ones which show average growth rates close to zero. In fact, in the defensive scenario, a significant number of rural regions are faced with serious problems of decline of yields in agriculture and job losses in small, no longer competitive, manufacturing actiovities. Moreover, the “new paradigm” of the green economy sustaining the growth of rural provinces which emerges in the proactive does not emerge in the defensive scenario.

1.4. Fine Tuning on the Latin Arc provinces

Close collaboration with stakeholders allowed to fine-tune the econometric results, thanks to the provision of selected and targeted information on innovation and growth potentials of the regions of the Latin Arc. In particular, data on human capital, accessibility and tourism performance were considered in this light.
Provinces were ranked according to each new indicator, and finally ranked according to a combined indicator. These results allowed to give a more selective interpretation to the econometric results, especially pinpointing wider potentials in the case of some provinces: econometric results were considered as minimum values in a probable wider range of the performance of these provinces (see Map 1.3.4. in the report).

2 Options for policy development

2.1. Policy options for southern European countries

One of the most relevant efforts in economic policy making for the years to come concerns the strengthening of the link between short and long-term interventions, to be achieved through what are increasingly called “smart investments”. The general aim should be to revitalize internal demand while at the same time boosting local and national competitiveness of the production fabric.

On a scenario time span reaching 2025, the necessary structural policies become central, and in fact they represent a constituent and consistent part of the scenarios that are presented and elaborated in the present study. Even in the “reference” scenario, they are present in the form of support to the emergence of a new production paradigm, namely the “green economy” one, orienting in a consistent and synergic direction both public and private investments.

But linking short and long-term goals and tools is not the only request for effective economic and structural policies. A similar consistency is requested among the actions of different government levels, from Community to national, regional and local. This goal can be achieved through explicit coordination efforts (“multi-level governance”) or implicit synergetic behaviour, each policy layer operating with its own instruments and inside its own competences with a full complementary attitude. This requested cooperative behaviour implies, in operational terms, two main elements: a strong permeability between policy layers, and the relevance of local policies, acting on the different aspects of territorial capital and implemented through inclusionary processes of vision building and project elaboration.

Demand policies.
a. The most urgent part of demand policies concerns the design of an exit strategy from the present deficit of Member States budgets, reducing reliance on public expenditure. Direct public intervention through public demand should be substituted by less expensive, indirect public expenditure - e.g. in the form of incentives to private demand - or by appropriate regulatory policies.
b. The creation of new sources of aggregate demand, like the opening up of new international markets in developing countries.
c. The full support to the launching of new production paradigms, implying multiple technological advances, multiple applications in a wide array of sectors, multiple possibilities of product innovations.
d. The conquest of new internal and international markets through enhanced competitiveness of local production.
e. A smart utilization of existing public procurement of goods and services, although due to shrink, for the creation of an initial market for advanced, environment friendly products, in the building and construction field, in advanced telecommunication networks and services, in the provision of many e-services like health, social assistance, e-governance in general.

Supply policies
A. Supply policies mainly concern the efficiency and innovativeness of the production fabric, which, on its turn, depends widely upon national context elements but also, and particularly, upon local context elements.
B. The second task assigned to these national, supply-side policies concern wide investments with an inter-regional interest. An important case was found during this research work: the transport integration of the Latin Arc regions. In fact, the western Mediterranean macro-region, in spite of the many common characteristics and the sharing of the sea resource, still shows a striking fragmentation in terms of mobility infrastructure (and consequently, in terms of economic integration). The case is also present for exploring deeper inter-regional co-operation, in the form of the creation of "synergy networks" : between ports, with a commodity and branch specialization; in the spheres of tourism, building integrated "itineraries" in both maritime cruise and city/cultural tourism; among knowledge centres, for cooperation in R&D and advanced education.
C. But another relevant case for supply-side policies implies important responsibilities for regional and local governments: the accumulation and best utilisation of "territorial capital", as indicated by an important statement of DG Regio of the EU Commission, still not sufficiently elaborated both by the scientific and the operative policy milieu (European Commission, 2005, p. 1).

2.2. Regional and local policy strategies: territorial capital and territorial "platforms".

The concept of territorial capital was first proposed in a regional policy context by the OECD in its *Territorial Outlook* (OECD, 2001). For the sake of simplicity, we may mention four large classes of territorial capital elements:

- *infrastructure capital and settlement structure*, encompassing also the characteristics of the urban system and the quality of the environment;
- *cognitive capital*, in the form of knowledge, competence, capabilities, educational and research structure, embedded in both productive capital and human capital;
- *cultural and identitarian capital,* encompassing cultural heritage, landscape and natural capital;
- *social and relational capital,* in the form of both civicness and associative capabilities.

Acting on territorial capital in policy making means acknowledging the integrated nature of any policy strategy, the added value on intervening on different but linked localized assets at the same time, promoting network relations and supporting innovative projects emerging thanks to these relations. The main messages reside in the necessity to better integrate the traditional spatial development policies into each territory, through an harmonious merging of material and immaterial elements, functional and relational assets, economic, social and environmental aspects; to create new cooperation networks among local actors and willing and cohesive local communities; to focalize on excellence assets in the spheres of knowledge, culture, natural and cultural heritage, and support innovation through synergetic behaviour.

This integration strategy could be properly synthesized and made operational through the concept of "territorial platforms". Intervening through territorial platforms means exactly to aim at a full integration – in physical, economic, social and aesthetic terms – of new development projects into the local realm. Three main "platforms" are proposed here: *infrastructure platforms, knowledge platforms and identity platforms*.

2.2.a Infrastructure platforms.
New infrastructure platforms will allow the achievement of some basic priorities for the Latin Arc, namely: improving the internal integration of the entire area; boosting external accessibility of each region with respect to the Latin Arc and external territories, in order to achieve enhanced competitiveness and attractiveness; reaching a higher internal efficiency of large metropolitan areas through a polynuclear urban structure.

This implies:
- a better and integrated rail network along the entire Latin Arc;
- the use of new "highways of the see" in order to achieve the same goal;
- improved linkages of large metropolitan areas with the main European corridors;
- new orbital railway systems internal to the main metropolitan regions, in order to boost accessibility of second rank subcentres and avoid sprawl (the case considered here is in the Barcelona metropolitan region).

2.2.b Knowledge platforms.
Knowledge platforms represent systems of cooperation networks between the main actors of the knowledge society: advanced research institutions, high education institutions, advanced and dynamic firms. Local firms are not only the recipients of the output of the specialised knowledge plexus (institutions working on scientific and applied research),

but are the carriers of long standing local production competence and know how, and therefore they represent a crucial partner in any innovation and technological advancement strategy. Particular attention should be paid by policy makers not just to achieve fruitful cooperation between these three local actors (in line with the up-to-now successful experience of the French "*poles de compétitivité*"), but also to monitor the persistence of local production knowledge which could be jeopardised by the selective delocalisation of parts of the production *filières*.

Knowledge platforms may be structures through:

- the synergy and cooperation between the above-mentioned main actors of the knowledge society into what may be called the local "competence poles" (Sevilla, Valencia, Barcelona, Montpellier, Nice, Genoa, Turin, Pisa, Florence, Bologna, Catania);
- the inclusion of innovative firms in these cooperation agreements, working on the industrial "vocations" and the specificities of territories. Examples range from marine technologies and shipbuilding (Genoa-La Spezia-Viareggio-Livorno), to mechanical engineering and industrial automation (Bologna-Florence);
- the development of other filières, linking excellence local natural and productive assets with knowledge and competence poles. The agri-food-tourism filière supplies huge potential benefits in the Latin Arc area. Similar virtuous circles refer to the health and wellness filière, linking local know-how in medical technologies with the increasing specialisation in wellness services and accommodation facilities for an increasing population of European retirees;
- a last example concerns a possible increasing engagement in the green economy paradigm (bio-mass and solar energy production,energy technologies and research).

2.2.c. Identity platforms.

Identity platforms exploit natural wealth and local cultural heritage for the development of new economic and employment opportunities. Local identities may become effective "brands" for new, selective and sustainable forms of tourism, but also for the advertising of ancient local competences embedded in food and wine productions and in local handicraft products. An integrated strategy for linking up all the preceding elements with new physical accessibilities, careful site information, worldwide marketing and enhanced logistic receptivity may prove extremely effective.

Local identities have to be re-discovered and interpreted on a wide area level; single pieces of cultural heritage have to be linked with each other in larger and consistent "itineraries", integrated in both information and logistic terms, in order to reach appropriate critical mass and new visibility on the international tourist market.

2.3. Scenarios for the Barcelona Province: policies and ideas for the future

Reference Scenario

In this scenario it is assumed an improvement in the provision of transport and communications infrastructure that will affect both the connection to all major nodes of

the Catalan network of cities and the connection to the rest of the world. It also assumes that the full road and rail infrastructure will be completed (La Sagrera Station).

The enhancement of total factor productivity, stemming from training and research and development, and innovation, will be another key area of policy intervention. The basic idea is to articulate in a network the provision of research and education infrastructure, linking these infrastructures with the technological trajectory of the different cities and with the needs of the environment

Pro-Active Scenario
In this scenario, specific policies to ease the transition towards a more knowledge-intensive model with higher productivity levels will be implemented. The implementation of active industrial policies as the support of primary and tertiary industries and activities addressed at new eco-innovators markets is one of the fundamental master lines.

In particular, the fragmentation of labour markets will be tackled with infrastructure and endogenous development policies with the aim of developing a new pattern of growth based on high value added activities and in segments of sectors of medium or high technological intensity.

The integration of the labour markets of the whole province of Barcelona must be accompanied by policies of transport infrastructure endowment, mainly railways.

Defensive Scenario
As a whole, the Defensive scenario presupposes maintaining the present nature of the production and not act deeply on transport infrastructure and on the conditions of supply (education and R & D), which involves preserving or protecting small and poorly communicating labour markets, both in the rest of the Metropolitan Region and in the rest of the province.

2.4. Policy Indications for the Intra-Province Territories

The internal territory of the Barcelona province is split into four areas: the city of Barcelona, the metropolitan area (the conurbation), the metropolitan region (encompassing the metro area and the "metropolitan arc") and the external territories. The three scenarios suggest a positive growth rate of the employment for every infra-province territory. However, the growth rates vary across territories and remark a clear division between the pro-active scenario and the other two.

In the reference scenario, the annual employment growth rate varies from 0.76% in Barcelona to 1.04% in the metropolitan arc and 1% in the rest of the province. Under the conditions explained by these scenarios, the province of Barcelona is still able to take advantage from the agglomeration economies, labour force supply and exports, even if there is not a transformation of its productive model. More visible should be, however, the consequences on productivity.

On the other hand, the pro-active scenario suggests a growth rate of the employment between 60 and 80% higher than the reference scenario. The city of Barcelona could be

growing at an annual growth rate of 1.4% whereas the growth rates of the metropolitan arc (1.73%), the rest of the province (1.7%) and the Strategic Plan without Barcelona (1.65%) are quite similar.

Comparing with the trend 2001-2007, the growth rates of employment are significantly lower, as in the period 2001-2007 Barcelona grew at 2.2%, the rest of the Strategic Plan at 2.6%, the Metropolitan Arc at 2.8%, and the rest of the province at 2.8% (see Tab. 5.6.4. in scientific report) . This means that in the reference and defensive scenarios the growth of employment is expected to be a third of the trend 2001-2007 whereas in the pro-active scenario the growth of employment is expected to be two thirds with regard to the original trend. The slower growth of employment in the forecasts 2010-2025 is due to the forecasted higher contributions of productivity increases to GDP growth.

Infrastructure policies will determine the new strategy for the whole territory of the province of Barcelona. In particular, the transport infrastructure and technological and training infrastructure (see Fig. 2.2.4. in the report).

Regarding the transport infrastructure, policies for the Rail become fundamental. Especially, the ones affecting the heart of the metropolis, and specifically to La Sagrera Station. Similarly, the new orbital rail connection, linking Mataró and Vilanova i la Geltrú, through Granollers, Sabadell, Terrassa, Martorell and Vilafranca del Penedés, is intended to weave the network of cities in the whole Metropolitan Arch. Finally, the transversal axis linking Girona to Lleida, becomes crucial in the articulation of the whole territory of the rest of the province of Barcelona, first splits the existing highway and then building the new high speed railway line.

Along with the rail infrastructure policies, a prominent role is occupied by policies intended to integrate the whole network of cities of the province of Barcelona, with the aim of integrating its labour markets. Here the strategy is to help connect this network of cities promoting knowledge-intensive activities. The objective is to reach the benefits of specialization of each node avoiding at the same time a hyper-concentration of activities on the core city and a sprawling settlement development.

In any case, both the strategy of provision of transport infrastructure (particularly rail) as the strategy for provision of technological infrastructure or education, tend to feed each other, and to encourage a dynamic that favours the strengthening of regional economies of urbanization and localization, without falling into the problem of accentuation of the trend towards the sprawl nor of urban congestion of the centre.

0. INTRODUCTION

The main goals assigned to the project were interesting and quite ambitious:

- to show how the general ESPON approach to spatial analysis can be useful to local policy makers;
- to build new methodologies and tools which could provide support to policy makers for quantitative assessment and foresight;
- to provide new evidence on territorial relationships through the use of the above-mentioned quantitative tools;
- to develop stimulating partnership processes between scholars, local-regional policy makers and European functionaries in charge of EU regional policy.

All this implied first the updating of the spatial scenarios developed by the ESPON 2006 3.2 project, using both a qualitative and a quantitative foresight methodology (namely the MASST model), and referring in particular to the post-crisis context, globalization processes and role of emerging economies, energy trends and new roles of rural areas.

Secondly, it implied development and estimation of a new econometric tool for transferring the logics of the MASST model from the Nuts-2 level to Nuts-3: the submodel: MAN-3 (Masst-at-Nuts-3), developed with reference to three countries: Spain, France and Italy. A quantitative foresight on all Nuts-3 regions was run on the basis of the new qualitative scenarios for these countries.

Thirdly, the construction of new scenarios for the Barcelona Province (the Députaciò, as Lead Stakeholder of the project) was envisaged, building on the general results achieved in the previous phases and on a selective analysis on the economic fabric, recent performance and internal structure of this area. Similar but less thorough reflections were developed on the other two stakeholder areas, namely on the Turin province and the Hérault Department. A final, relevant and consistent part of the research project is devoted to policy messages and recommendations, mainly focusing on the Latin Arc network territories and the Barcelona province.

This huge task was accomplished in a short time span, namely 18 months, mainly thanks to the competence and the enthusiasm of all partners and stakeholders, and the continuous support of the ESPON CU. Interesting and intense interactions were organised with local officials and experts, mainly on the multiple aspects of possible policy strategies.

Judging from our experience in this project, the intuition of a necessary linkage between the ESPON research work and the natural recipient of the research output, namely regional and local government institutions and policy makers – an intuition at the base of the ESPON « targeted analyses » - proved extremely fruitful and forward looking.

1. MAIN RESULTS, TRENDS, AND IMPACTS

1.1. QUALITATIVE INTEGRATED SCENARIOS

1.1.1. Long-term challenges for EU

On the basis of updated thematic scenarios with respect to ESPON 2002 Project 3.2. (Annex 1 to the Scientific Report) and taking always into considerations the main driving forces at work, the following long-term challenges are pinpointed.

1.1.1.a Demography

Demography has turned to become a real challenge for the development of Europe. While population was abundant and showed sustained growth during the fordist period, the long-lasting decline of fertility rates has generated modest population growth (average annual growth rate below 0.5% since 2000) and progressive population ageing.

Western Europe is not homogeneous in demographic terms, with some regions showing high population growth and others showing weak growth or even decline. Population change in European regions is largely determined by migration flows. The past decade has been characterized by sustained flows of migrants from Eastern and Western Europe, but also within Western Europe, and also between neighboring countries.

Since 2000, fertility rates have increased slightly, but not enough to ensure the replacement of generations and to counterbalance population ageing.

The transformation of the demographic structure has significant impacts on the evolution of the population of working age. Since 2000, only 16% of European regions experienced annual growth rates of working age population higher than 1%.

1.1.1.b Economy

The European economy is now emerging from the most severe crisis of the post-war period. During the decade before 2008, Europe was however confronted with a series of challenges in a context of accelerating globalization. Its average per capita income was more than three times higher than the world average, but it was only 70% of the US level and lower than that of Japan. The process of convergence had come to an end at the beginning of the 1980s. Although productivity increased more dynamically in Europe, it was counteracted by weak employment performance and falling working hours. While in 1970 all of the difference in GDP/capita between Europe and the USA could be attributed to lower labour productivity, this represented only 1/3 of the difference by 2000, 1/3 being accountable to fewer working hours and 1/3 to lower employment rates. By and large, Europe had not sufficiently adopted the new economic paradigm based on new organizational forms, less vertically integrated firms, greater mobility both intra- and

inter-firm, greater flexibility of labour markets, a greater reliance on market finance and a higher demand for both R&D and higher education. Although the catching up process of the economies of central and eastern Europe has been encouraging, with the 2004 and 2007 enlargements the EU has inherited the largest levels of territorial inequality in its history. The Lisbon Strategy, adopted in 2000, addressing the issue of European technological competitiveness has been challenged by disappointing achievements. At the same time, the expansion of international trade and international investments far outpaced the growth of output and income. In this process, the emerging economies (BRIC) have been playing a major part, using mainly their comparative advantages of lower labour costs and growing domestic markets.

1.1.1.c Energy

The past 10 years have been characterized by strong fluctuations in oil price and by the price increase of other energy sources (natural gas, electricity). The strong fluctuations of oil price between 2003 and 2009 were driven by both supply and demand variations: strong increase of oil price after 2003 (supply variations related to the Iraq war, demand variations, with increasing oil demand from emerging economies and role of OPEC and speculative traders); strong decrease of oil price during the second half of 2008 caused by sharp fall in demand related to the financial/economic crisis and the attenuation of speculation; increase of oil price during the first half of 2009 driven by a modest recovery from the crisis. The price evolution of other energy sources after 2003 shows an upward trend with smaller fluctuations, driven by the average change of oil price. The liberalization of electricity markets in Europe has, so far, not resulted in a decrease of electricity prices. On the contrary, electricity producers increase domestic prices in the context of emerging competition in order to be able to invest for catching new markets abroad.

1.1.1.d Transport

Europe has been facing during the past 20 years a significant increase of traffic flows at all scales. Despite significant efforts, the development of transport infrastructure has not been sufficient to counterbalance congestion (roads, motorways, railways, airports). Wide disparities in accessibility remain, both in absolute and relative terms, which are progressively alleviated by the expansion of infrastructure networks (TEN-T) and by the generalization of low-cost airlines. A major problem is the imbalance of transport modes in favour of road and air transport which counteracts the objective of sustainability.

1.1.1.e Urban systems

Between 1995 and 2004, all capital city regions in the EU, with the exception of Berlin and Dublin, increased or at least maintained their share of national GDP.

The relative growth of capital city regions is strongly related to their attraction as locations for businesses as well as for individuals. This tends to lead to unbalanced territorial development within countries. The concentration of economic activity in

capital cities brings benefits in the form, for example, of economies of scale or of agglomeration and the large size of markets. But it also involves costs, in the form of congestion, poor air quality and higher property prices. On average, the share of capital city regions in the national GDP increased by 9% between 1995 and 2004 while the population only increased by 2%. In only three countries in Europe, do second-rank metropolitan areas seem to be effective in counterbalancing the economic power of the capital city: Barcelona (Spain); Milan and Naples (Italy); Germany (multiple growth poles such as Munich, Frankfurt, Hamburg). In other countries, the capital city region tends to dominate. Only in Germany and Italy are there second-rank cities with GDP per head higher than in the capital[1].

In the context of accelerating globalization and of enterprises' relocation towards countries with low wages and booming markets (Asia in particular), medium-sized towns are generally more affected than metropolitan areas, both in Eastern and Western Europe.

The residential, patrimonial and tourist economy favors a number of attractive European regions with small and medium-sized cities. European integration is also an important factor for the development of urban systems at the intermediate scale across national boundaries.

European urban systems are also characterized by a significant progress of suburbanization. In 90% of urban agglomerations, population grew more in the suburbs than in the core city between 1996 and 2001. Growth of population in the suburbs is often accompanied by the suburbanization of economic activity. This is also the case around the capital cities in Central and Eastern Europe.

The spatial de-concentration of population and economic activities around agglomerations is accompanied by an over-proportional expansion of the urbanised area. Over the past 20 years, the extent of buildup areas in many western and eastern European countries has increased by 20% but the population has increased by only 6%. There is no apparent slowing down of these trends. The urban areas particularly at risk are in the southern, eastern and central parts of Europe.

Social tensions and polarization have been growing in a large number of European cities over the past decade. In many cities, not only are unemployment rates high, but there are huge disparities in rates. Disparities are particularly large in France, Belgium and southern Italy (for example Marseille, Catania).

Economic polarization takes place mainly in and around large cities, while demographic dispersal can be observed around an even larger number of cities, comprising also medium-sized towns. Various factors are contributing to this important trend: the deterioration of the quality of life in inner-city areas as well as in large, dense suburban housing estates, the growing concentration of low income groups in cities generating

[1] European Commission : « Growing regions, growing Europe ». Fourth Report on Economic and Social Cohesion. 2007.

social segregation and feelings of insecurity, increased housing prices in cities, growing motorization, especially in the new member countries etc.

1.1.1.f Rural areas and rural development[2]

During the past decade, the differentiation of European rural areas has further progressed, increasing the contrast between accessible rural areas under urban influence and the more remote and peripheral rural areas. Intermediate rural areas are often characterized by the increasing importance of the "New Rural Economy" (clusters, post-fordism, learning regions etc.).

The importance of agriculture in rural employment and in the outputs of rural regions is further declining. In central and eastern Europe, the share of agriculture in rural employment is still significant (above 20% in numerous rural regions), but it is also rapidly declining. Agriculture is going through a slow transition process from "productivism" to various types of para-productivist (competition on the basis of specialization, technology and strong links with the agro-business) and peri-productivist (on-farm and off-farm diversification of activities and employment for farm households members) orientations. Agriculture is also affected by changes in consumption trends. The CAP reform, introducing direct payments to farmers, as well as environmental and safety norms, has contributed to the evolution towards more sustainable forms of agriculture. Liberalization measures are however causing severe adjustment problems and significant tensions. Agricultural activities themselves show a growing contrast between large "commercially-oriented" holdings and smaller pluri-active and diversified units.

Numerous rural areas are benefitting from the increasing value placed by society upon the rural environment, culture and heritage as well as from the increasing ability of the urban population to access recreational amenities.

1.1.2. Perspectives and critical factors for the next 15 years

1.1.2.a Demography

The number of European regions where population will stagnate and then decline will be growing. Population ageing will accelerate and dependency rates as well as mortality rates will increase in most regions. The increasing number of "oldest old" (aged 75 and over) will generate a significant demand of health care. The size of the population of working age will further diminish in most regions. Winners will be more and more the regions capable of attracting qualified manpower and/or well off retirees. An open question is the amount of external in-migration towards Europe.

[2] ESPON Project EDORA (European Development Opportunities for rural Areas). Interim report. April 2009.

1.1.2.b Economy

It is likely that wages will increase and technology will significantly progress in the emerging economies. Their comparative advantage of low labor costs will progressively be replaced by a competitive advantage in segments of significantly higher added value. Integration will most probably progress more within the various world regions than between them. This may have significant consequences for the orientation of FDIs. It is also not improbable that Asian countries create a common currency in order to better protect their interests. The future of the dollar as reserve currency is more questioned than ever. Its further worldwide use in the trade of energy and raw materials is also uncertain. A weak dollar may, however, mean that significant production activities will be relocated into the dollar zone in order to better access markets and also to export under better conditions. The accumulation of capital outside Europe (BRIC, energy producing countries, sovereign funds) will facilitate the taking over of European businesses by non-European groups looking for good investment opportunities, advanced technologies and short-term profits. This may endanger the long-term prosperity of increasing segments of the European economy. The likely increase of wages and related production costs in emerging economies (especially Asian countries) may induce inflation likely to spread throughout the world economy. The emergence of higher interest rates and progressing inflation is not improbable during the recovery from the economic crisis and also for a longer period.

Being the most volatile factor of territorial development, the European economy may follow rather different paths, each having its own territorial impacts. In this respect, the most strategic issue is the way how Europe will position itself at global scale after recovering from the economic crisis.

In addition to issues related to the global and macro-economic context, intra-European issues are also relevant, such as the future extent of the catching up process of central and eastern Europe. The engine behind this process has largely been up to now the substantial amount of western FDIs in these countries.

1.1.2.c Energy

In the present context, energy prices are very closely related to the level of global economic growth at world scale. Despite strong price fluctuations in recent years, the general trend is upwards. Recovery from the crisis and further development of the BRIC countries are likely to strengthen this trend. The energy sector is largely globalised because of the concentration of large fossil energy resources in a small number of countries. The external dependency of Europe in terms of energy supply will remain high in the 15 years. Possible depletion of oil resources in some large oilfields could generate a process of oil peaking (declining supply in a context of growing demand) which would result in extremely high energy prices.

The possible scarcity and depletion of uranium resources should not be underestimated in the context of growing demand related to the construction of numerous nuclear power

plants at world scale. Coal will remain a significant energy source for the transition period between the old and the new energy paradigm. Thanks to new technologies (CO2 capture), it will be possible to reduce considerably the air pollution generated by coal-fuelled power plants.

The development speed of renewable energy sources will depend both upon the price evolution of conventional fossil energy sources and from the political willingness to depart from carbon-related energy and to promote the new energy paradigm. The introduction of substantial carbon taxes would play a major part in this respect.

1.1.2.d Transport

The main critical issues for the future in the transport sector are the elimination of congestion, the impact of transport on climate change and improvement of the accessibility of less favoured areas. The likely change of energy paradigm in relation to climate issues and the possible scarcity of oil resources, are major challenges for the transport sector. New transport technologies will emerge in the coming decade. The speed of their diffusion and generalization is however uncertain. If significant carbon taxes are introduced, the present modal split patterns will be affected to the benefit of more environmentally friendly transport modes. They will also have an impact on the mobility of people, favouring even more the development of ICT services, as a substitute to physical mobility. Public transport networks and services are likely to be strengthened, both in urban regions and between them. High-speed train networks will continue their expansion, with new cross-border connections.

1.1.2.e Cities and urban systems

Cities and urban systems will be facing a number of challenges during the coming decades. Some are the results of trend continuation, others will be generated by the emergence of exogenous factors and new global priorities.

Trend-related challenges concern the rebalancing of urban systems there where capital cities and large metropolitan areas have largely captured growth in the past. Most challenges are however to be found at the scale of metropolitan regions and urban entities. The continuation of urban sprawl in the surrounding of cities and growing social polarization with all related impacts (security, riots, social segregation, ethnic tensions etc) within cities are growing concerns in numerous European towns.

Cities will in general be less affected by population ageing issues than the countryside because of the presence of larger groups of young population. Needs for additional health care services for the elderly will nevertheless increase.

Policies addressing climate change are likely to have significant impacts on cities, especially in the field of transport systems and mobility, building and construction, urban planning, greening of the urban environment etc. Changes towards more compact cities can be expected.

Municipal finances are particularly affected by the economic crisis and its impacts. Municipalities will face increasing difficulties to meet the above-mentioned challenges with more limited resources. It is likely that local taxes will increase in a number of countries.

1.1.2.f Rural areas and rural development

As in the case of cities, future challenges for rural areas will partly result from the continuation of trends and partly from factors of exogenous, mainly policy-related origin.

Numerous rural areas are likely to be affected by population ageing and a growing number of them by population decline. Very much depends however upon the situation of rural areas in relation to cities and metropolitan areas.
The perspectives of rural areas under metropolitan influence and of those which have potential for the residential, patrimonial and tourist economy are more encouraging than those of remote rural regions with declining population, low accessibility and weak attractiveness. Agricultural activities will be significantly influenced by the further liberalization of the CAP and the growing importance of extra-European competition. The reformed CAP after 2013 will again condition a number of rural activities.

The strengthening of policies supporting the further development of renewable energy sources is of great importance for the future of numerous rural areas. The introduction of carbon taxes is likely to increase the level of profitability of renewable energy sources, but it can constrain that of agriculture which consumes also significant amounts of oil-related energy.

1.1.3. Integrated Scenarios

1.1.3.a The Reference scenario

The Reference Scenario is not a trend scenario in the conventional sense, because the simple extrapolation of trends does not seem meaningful in a context where numerous factors of strategic significance are moving.

While European demography stagnates and the ageing process intensifies, a number of changes are likely to crystallize in the macroeconomic context. The regionalization of the globalization process reduces the amount of external FDIs into Europe, with the exception of those (sovereign funds etc) aiming at taking over European businesses of strategic character (technology, brands etc). European investments are less substantial but more concentrated on Europe and on its external periphery and neighborhoods (including Ukraine, Moldova, Turkey, Egypt, North Africa). The integration of currencies takes place at the scale of large world regions (North America, Europe, Asia, Gulf States), but these fluctuate more between themselves at that scale. The US dollar loses its importance as reserve currency. The deflationist effect of Asia (mainly of China) on the world economy is strongly attenuated and progressively disappears. Inflation increases as well

as real interest rates. The growth of real income in Europe is more modest than before. The purchase power of specific groups (retirees, civil servants, low income groups) is particularly affected. The new generations maintain their standards of living in selling their heritage and properties. The regionalization of globalisation enables the recovery of manufacturing activities in Europe. Disparities in the productivity of the main economic sectors increase, especially between advanced economic functions (financed by capital) and basic services (paid by incomes, including social transfers). A number of new technologies emerge during the coming 15 years which will have significant impacts on the economy, especially in the fields of energy production and use, including the processing of biomass, the nanotechnologies, biotechnologies and transport systems.

Growing oil and gas prices favour investments in oil and gas exploration and discovery. The Arctic region becomes a strongly targeted region in this respect. Regional tensions and possible conflicts are not excluded. The expansion of nuclear energy is constrained by the progressive depletion of uranium resources. The profitability of renewable energy increases, but political support is insufficient to generate a radical change of the energy paradigm. The progress of renewable energy sources remains dispersed and fragmented, with low synergy effects. The economy hardly benefits from this process.

Territorial aspects of the Reference Scenario

The catching up process of the economies of Central and Eastern Europe continues, but at a significantly lower speed than before the economic crisis. It is also more differentiated among the countries concerned. Despite this process at macro-scale, regional disparities are likely to increase within the EU at a lower scale. The two-speed Europe is accentuated, with advanced economic functions concentrating more and more in metropolitan regions. New manufacturing activities also concentrate in well-developed regions. In addition to main metropolitan regions, second-rank cities and metropolitan areas are also beneficiary. The regions most affected by the crisis are mainly manufacturing regions with low or intermediate technologies and a relatively high intensity of manpower, both in Western and Eastern Europe.

Other regions affected by the crisis and where recovery proves difficult are those which had, up to the crisis, booming activities in the sector of building and construction. Lasting difficulties may also affect regions where economic growth before the crisis was largely based on financial speculation and related financial services or on specific fiscal niches. Numerous tourist regions have also been affected by the crisis, but tourism is very volatile and the recovery of these regions depends upon the general level of the European economy. The evolution of rural areas will be contrasting and heterogeneous, with a number of rural regions being affected by the deregulation of the CAP and trade liberalization in the context of the WTO, others benefiting from the opportunities of biomass and renewable energy production.

The regions where demographic factors may act as a constraint on the regional labour markets are those where the economic recovery is substantial in a context of rapid population ageing. Immigration further concentrates on large cities, generating a low cost

housing market at their periphery. It is also substantial in tourist areas and in areas attractive for the retirees. In these regions, it favours the increase of fertility rates.

Territorial impacts for the Latin Arc

In the Latin Arc, three types of demographic structures prevail, with different development perspectives. In the Catalan part, the young age of the population (sustained natural growth and positive migration balance) favours further population increase and limit the ageing process. In the French part, the population is, in the average, older and is still growing, although more modestly than in the Catalan part, mainly under the influence of migrations. In the Italian part, low fertility rates and a high share of elderly induces a negative natural evolution, compensated in various areas, but not uniformly, by significant in-migration flows. The number of « oldest old » increases significantly, calling for a strong development of health care services.

The "Latin Arc" has a rather heterogeneous economic structure, so that developments will contrast between regions. In general terms, metropolitan areas with advanced economic functions and technological poles are more favoured than cities with an economy depending upon intermediate or low technologies. After recovery, tourist functions progress moderately. The residential economy progresses more because of accelerating population ageing in Europe. Rural areas are affected, up to a certain extent, by the deregulation of the CAP, especially the wine producing regions. A number of rural areas benefit from the production of renewable energy, but only a modest part of the available potential is being exploited. Immigration concentrates in metropolitan and tourist areas.

Cross-border accessibility benefits from the high-speed train connections between Catalonia and France (Barcelona- Perpignan) and from the HST connection between Rhône-Alpes and Piemonte (Lyon-Torino). Along the coast, the railway connection between Nice and Genova is however not significantly improved.

The considerable potential of the Mediterranean regions in the field of solar energy is not fully exploited, because of insufficient profitability and public support.

1.1.3.b The Proactive scenario ("Green Economy")

The proactive scenario is based on the assumption that the decisions adopted at international level aiming at curbing down the speed of climate change are efficiently used as an opportunity to generate significant economic growth throughout Europe.

This proactive scenario for Europe is part of a more global context in which the large emerging countries are pulling up the world economy while moving towards more technology-intensive activities. The international financial order is stabilized by the diversification of currency reserves, the dollar having lost its monopolistic position.

Economic growth is stronger and recovery more rapid than in the reference scenario. It is not limited to Europe, but includes also the USA and Asia. The more developed economies and also the BRIC invest in the less-developed countries, especially in Africa, Latin America and Southeast Asia, in order to develop the local markets and to create demand, which is just the opposite of a protectionist attitude.

In Europe, the strategy consists of increasing significantly technological investments boosting productivity, but generating in a first stage higher unemployment rates. Only after a period of 5 to 7 years, employment is growing again. Higher skills and qualifications are required. The race for stronger tertiarisation is being attenuated thanks to a rapid development of the "green economy" which creates jobs both in R&D and in manufacturing activities. Services move towards higher added value segments. In the context of a more regional globalization, higher financial services are being re-centered on Europe. Through higher competitiveness and stronger public support, European enterprises are less in danger of being taken over by non-European groups or sovereign funds.

The concretization of the "Green Economy" is far from being an easy task. Numerous local authorities choose to take action in relation to climate change, but their resources are limited by the impacts of the economic crisis. The potential investments of SMEs are constrained by difficulties in obtaining bank credits. The transition from carbon-related energy systems towards a new energy paradigm based more largely on renewable energy sources is affected by the levels of necessary investments and by constraints of profitability. The international harmonization of policies is also a difficult issue which generates distortions.

The progressive emergence of new economic growth and the creation of significant amounts of new jobs after a few years generate however trust in the strategy related to the "Green Economy", so that more and more businesses and households invest, with encouraging returns on investment. This leads to a mass effect which ensures sustained economy growth and strengthens social cohesion.

In the demographic sector, fertility rates are subject to a revival, favoured by the positive economic evolution, but their impact remains a long-term one. The shortage of population of working age in a growing number of regions favours the immigration of qualified manpower.

Territorial impacts of the proactive scenario

The territorial impacts of the pro-active scenario change somewhat over time. During the first phase (5 to 7 years) growth is concentrated on metropolitan areas. In a second stage, production activities related to the "green economy" diffuse towards cities of second and third level and also towards regions of central and eastern Europe as well as towards the more peripheral regions of Western Europe.

The scenario favours, in the second stage, a higher degree of polycentricity of settlement systems than the reference scenario.

In addition to economic aspects, the adoption of the Green Economy has important impacts on the morphology and organization of cities. More compact urban forms are being developed in order to take advantage of the expansion of public transport networks. Urban expansion remains however more contained and compact than in the referenced scenario, the greening of cities and the further development of ICT limits the motorized mobility for working and leisure purposes. Favourable economic development has a positive impact on social cohesion.

A significant number of rural areas benefit from the “green economy”. The positive economic climate favours the development of the residential and tourist economy which is beneficial to small and medium-sized cities as well as to rural areas with an attractive natural and cultural heritage.

Territorial impacts on the Latin Arc

The scenario is favourable to the development of technology poles situated along the “Latin Arc”. The strengthening of R&D activities generates spin-off effects in the production sectors. In the context of the “Green Economy”, the development of solar energy is booming along the “Latin Arc”, from R&D activities down to the general implementation of related technologies in rural areas and cities. An increasing share of electricity needs is being covered by domestic production of solar and wind energy.

The realization of the “Union pour la Méditerranée” (UPM) is possible because economic growth in Europe is significant. The scenario provides good conditions for its implementation. The metropolitan areas of the “Latin Arc” benefit significantly from this multilateral initiative. The “Latin Arc” is less subject to immigration because of stronger economic development in North Africa. A larger part of the immigrants of working age are integrated into the regional labour markets of the “Latin Arc” which are expanding.

The adoption of electric cars and the stronger use of public transport contribute significantly to the improvement of air quality in the compact and polluted Mediterranean cities. Traffic congestion diminishes up to a certain extent.

1.1.3.c The Defensive scenario

The scenario assumes a slow recovery from the crisis in the western economies and in Japan, resulting from a weak reactivity to the changing context and also from less favourable global conditions. Global demand remains modest. In the USA, domestic demand is much weaker than before the crisis because households put higher priority on savings than on consuming on credit. The BRIC maintain their comparative advantages in low-cost production. They however progress also in more technology-intensive sectors, competing more intensely with Europe. Few foreign investments are made in the less developed countries of the world. Inflation is lower than in the reference scenario

because of low wage policies in Asia with global deflationist impacts. Low interest rates feed new speculative bubbles, threatening the stability of the global economy. The maintain of the dollar as reserve currency works in the same direction.

Europe does not invent a new technological paradigm and fails to modernise significantly its productive activities. Because of insufficient public support and modest mobilization of economic actors and civil society, the Green Economy cannot make a breakthrough. Service activities do not significantly qualify.

In the medium range (5 to 7 years) European exports are maintained, but they comprise a large share of products with modest added value. Employment is artificially protected in the medium range and the situation worsens afterwards because of insufficient competitiveness in the global context. Cost-competitive policies are maintained in central and eastern Europe in order to attract FDIs. Their impact is however limited. Exports are slowing down and unemployment increases. More European businesses are taken over by non-European groups. When the profits of such businesses are then declining because of the lack of investments in R&D and in productivity improvements, they are left out by the new owners. The European population declines in the long-range, the natural evolution being negative and immigration being strictly controlled.

Territorial impacts of the defensive scenario

In the medium range, changes in the regional patterns are modest. The catching up process of Central and Eastern Europe is however significantly affected by the fall of FDIs after the crisis of 2008/2009. The European settlement pattern is not significantly modified.

Important territorial changes take place however later on. The competitiveness of a number of activities in the sectors of agriculture, manufacturing industries and services is then declining because of insufficient adjustments and productivity-related investments. The regions most affected are those with fordist and neo-fordist manufacturing activities. A significant number of rural regions are confronted with serious problems of decline of yields from agriculture and loss of jobs in small, no more competitive manufacturing industries. The non-emergence of the Green Economy hinders the development of alternative activities in the production of renewable energy. Investments in this field remain dispersed and insufficiently profitable. The depressed economic situation does not favour the development of the residential, patrimonial and tourist economy in rural areas. The result is that outmigration from numerous rural regions intensifies, not only in central and eastern Europe. Population ageing increases significantly and demographic decline affects numerous rural regions in the long-range. The differentiation of rural areas accelerates.

New service and manufacturing activities concentrate mainly in and around metropolitan areas in order to minimize risks. There is not sufficient economic potential and elasticity in the economy for a more polycentric development of settlement systems. Interregional migrations, which are more intense than in the reference scenario, favour large cities.

Medium-sized and smaller cities which are not under metropolitan influence and the economy of which is strongly dependent upon manufacturing activities, are particularly affected. The internal evolution of metropolitan regions is raising concern. Urban sprawl accelerates under the influence of growth of population and activities and also of growing social tensions in the core cities. Social segregation, insecurity and criminality are growing in inner-city areas and densely populated suburbs, where unemployment is significant. Traffic congestion increases and the share of non-polluting cars remain low.

Territorial impacts on the Latin Arc

The lower level of public efforts in the field of research and technological development do not enable the technology poles of the "Latin Arc" to generate spin-off effects and to efficiently contribute to the modernization of the regional economies. Manufacturing industries in the "Latin Arc" based on low and intermediate technologies are affected during the second phase, while the potential existing in the field of solar and other renewable energy sources is only modestly exploited. This is also detrimental for rural areas, which are confronted, in addition, to the decline of agricultural activities and to depopulation trends. The stagnating European economy handicaps the development of tourist functions and of the residential economy along the "Latin Arc".

New activities concentrate mainly in metropolitan regions, adding to congestion and urban sprawl. External immigration is further strictly controlled, but illegal immigration continues nevertheless, because of unfavourable economic conditions in North Africa and low progress in the Union pour la Méditerranée. Second level cities and medium-sized towns benefit much less from development. A number of them are affected by the decline of manufacturing activities.

1.2. QUANTITATIVE SCENARIOS AT NUTS-2 LEVEL

1.2.1. National results

Quantitative scenarios come from the translation of the integrated qualitative scenarios presented in Section 1.1. into a quantitative model which is able to represent the results at Nuts-2 level of the European patterns of growth in the scenarios. The MASST model used to produce these foresights and the methodology to translate qualitative assumptions into quantitative ones are described in detail in Annex 2 to the report.

Nuts-2 quantitative foresights for the whole Europe allow to predict economic growth rates under different scenarios for the various regions taking into account:

- the macroeconomic conditions, which affect all Europe and the various countries, so that the growth rate of any region is not independent from the one of its respective country and the one of Europe;
- the effects of regional interactions, since no region is a world apart but its growth rate also depends on its interactions with neighbouring regions.

The main output of the MASST2 model is the GDP growth rate for each Nuts-2 region of the EU-27; other regional outputs are the population growth rates and the employment growth rates. In this report, the results on the GDP growth rate are presented, at both national and regional level.

Table 1.2.1. presents the aggregate results for each country of and all other entities of interest for this project. In the reference scenario, the MASST model projects a national GDP growth rate for the European Union 15 old member countries (around 2% yearly) which is slightly lower with respect to the one observed in the past 10-20 years, because it consolidates the effects of the crisis.

Tab. 1.2.1.-National results of the MASST model: average annual GDP per capita growth rates over the period 2005-2025.

	Reference scenario	Pro-Active scenario (A)	Defensive scenario (B)	Difference between A and Reference	Difference between B and Reference
EU27	2.06	3.06	1.09	1.00	-0.98
- Old 15	2.05	3.05	1.08	1.00	-0.97
- New 12	2.29	3.38	1.20	1.09	-1.09
Latin Arc Countries	1.96	2.94	0.98	0.98	-0.98
- Spain	2.06	3.02	1.02	0.96	-1.04
- France	1.99	2.97	1.02	0.97	-0.97
- Italy	1.83	2.83	0.89	1.00	-0.95

For the New 12, the reference scenario is more expansive than for the Old 15, but probably not as much as in the past, since its hypotheses are not specifically in favour of

the New Member States, whose convergence continue without being too strong. The performance of Latin Arc countries is around the average of the EU 15 countries, since there are no hypotheses to differentiate it from the rest of the Western countries. Still some national differences emerge among Latin Arc countries, with the performance of Spain slightly higher than the one of France and significantly higher than the one of Italy. Despite the homogenous assumptions, the three countries behave differently because of their other structural features.

The Pro-active scenario (A) is more expansionary for Europe as a whole, as well as for its countries. Eastern countries appear to benefit from it slightly more than Western countries, because of higher FDI and stronger demand. Latin Arc countries still performs around the average of the EU 15, with an average annual GDP growth rate which is 1% above the one of the reference scenario. The rankings among the three countries which compose it are unaffected, but it is Italy, the least performing country, the one which however takes an imperceptibly higher advantage from the assumptions of this scenario.

The results of the Defensive scenario (B) are as expected significantly less expansionary with respect to both the Pro-Active and the Reference scenarios. The New Member States continue to outperform the Old 15 countries, but convergence is much slower, since they are more negatively affected by the assumptions of this scenario with respect to the rest of the EU, in particular by the competition of BRICs in low-cost products. Latin Arc Countries are as negatively affected as the rest of the European Union in this scenario. For this reason, their performance is almost in line with the one of the Old 15 member countries. It is interesting to observe that, although the relative rankings of the three countries in terms of average annual GDP growth rates remain the same of the Reference scenario, the country which is most negatively affected is Spain, though it remains the best performing of the three. Defensive strategies appear hence to be particularly hard to sustain for countries which have developed a model of high growth in the past.

In our scenarios, Spain turns out to be the country which changes its development trends with respect from the past more strongly. This is clearly evidenced in the past and the short-run Eurostat projections (see Fig. B1 in the Box 1 of the Scientific Report) that witness that the three Latin Arc countries have always been rather synchronized in their cycles, so that recessions tend to hit them similarly. In periods of growth, Spain has often outperformed both France and, especially, Italy (whose growth performance has been particularly disappointing) but in recent times it appears to be hit by the recent crisis more strongly than France and is projected by Eurostat to exit from the crisis more slowly with respect to the two other countries.

Several explanations can be given to this change of trajectory. First of all, the convergence process (in terms of per capita GDP) among the three countries has changed over time with France starting highest and remaining highest despite lowering its advantage over the rest of the EU. Spain, starting lowest, has been converging, but is now projected - by Eurostat - to suffer more than the two others from the crisis (see Fig. B2 in the Box 1 of the Scientific Report). Real GDP, however is not the whole story and it is interesting to observe the convergence in terms of PPS per inhabitant. In particular, one

can see a very bad performance by Italy, whose starting advantage has been eroded by inflation, and a very good one for Spain. As a result, in 2008 the disparities between the three countries had almost faded out with respect to the initial ones. This means that Spain is around the levels of France and above the levels of Italy. In this context, should a model project significantly different growth rates for the three countries in the next 20 years, it would determine an unlikely final result in which the convergence process is reversed and some countries end up being much richer than the others.

Moreover, in recent years there has been an inversion in the pattern of FDI. As far as Spain has become richer and converged towards the rest of the EU, it has shifted from being an attractor of FDI to a net exporter of capital. As shown with data from the World Investment Report (2009), in the period 1990-2000 Spain has been importing and exporting about the same amount of capital, whereas France has been a net investor outwards and Italy a very close economy. In recent years, all three countries, but especially France and Spain, have been net exporters of capital, so that also this difference between France and Spain has faded out.

1.2.2. Regional results

The advantage of the MASST is its ability to produce GDP foresights for each Nuts 2 region of the European Union. The following maps represent the annual average GDP growth rate at regional level, starting with the Reference scenario.

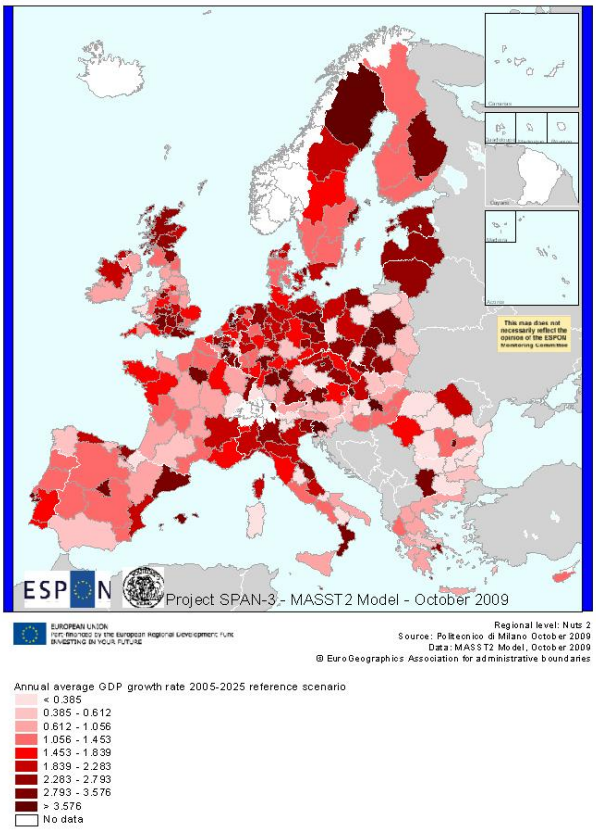
In the reference scenario (Map 1.2.1), the growth rates of European regions are highly differentiated, and the national results of Section 1.2.1 hide different patterns from different groups of regions. The growth rate is positive for all regions, but while some considerably outperform the others, the growth in the others is sluggish.

Consistently with the thematic scenarios, one can observe that growth within countries will be a centripetal process, with the strongest areas as the leaders in all countries. In Eastern Europe all capital regions, such ad Budapest, Sofia, Warsaw, are among the best performers overall, sometimes (as is the case of Prague, Bratislava and Bucharest) also pulling the regions just around them. Rural areas in the East are on the contrary sluggish, as all rural areas around Europe, being affected by the deregulation of CAP and increased international competition.

In the West, the first ranked regions are those which generally outperform the others, as shown by the performances of areas such as Stockholm, Copenhagen, Munich, Frankfurt, Brussels, Lisbon, Athens. However, second order areas are also thriving, as shown by the examples of Malmo, Hertfordshire, Edinburgh, Gent.

This pattern is confirmed in the Latin Arc. The highest growth rates within their respective countries are experienced by Ile de France, Lombardy, Madrid and Catalonia, but very high growth rates can also be found in second order economies, in regions such as Valencia, Rhone-Alpes, Piedmont, Emilia-Romagna. The performance of Languedoc-Roussillon is intermediate, being the outcome of differentiated areas within.

Map 1.2.1. - Annual average regional GDP growth rates in the Reference scenario



The Pro-Active scenario (Map 1.2.2.) is more expansionary for all regions of Europe, both in the West and in the East. However, some regions benefit more than the others from the more expansionary hypotheses of this scenario.

In the New member countries, the areas which are more able to perform the technological leap which allows to be competitive in this innovative context are the core and capital ones, the only ones endowed with the human capital and technological ability to do it (e.g. Budapest, Prague, Warsaw).

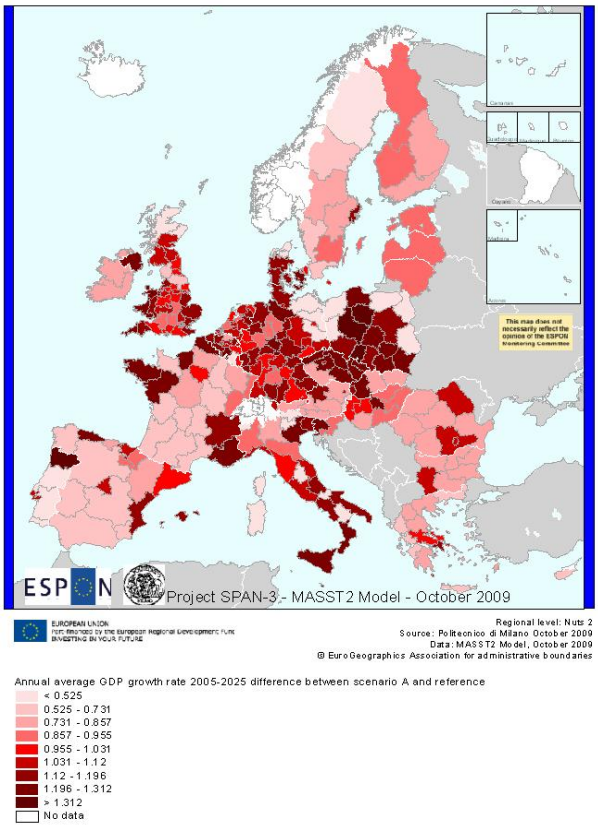
Interestingly enough, especially in the West, it is not necessarily the first level core regions those which benefit more, but rather a number of second level areas. For example, Poznan in Poland, a large number of intermediate regions in Germany, Bruges and Gent in Belgium, Porto in Portugal, all register a difference of annual GDP growth rate with respect to the reference scenario which is higher than their respective capitals.

Notice however that this scenario, though it does not have the strongest regions as the clearest winners, is still a scenario in which the absolute numbers (maps presented in the Annex) show a centripetal pattern.

For what concerns the Latin Arc, also in the Pro-Active the core regions are going well but the development spreads to second order poles. In France, despite the good

performance of Paris, Rhone-Alpes, Provence-Cote d'Azur, Haute Normandie, Bretagne and Pays de la Loire are those regions which take most advantage of the scenario. In Spain, Madrid and Barcelona are doing very well, but the highest difference is reported in Valencia and Oviedo. Also in Italy, the spread of development to secondary growth poles is even more marked, with very high differences reported in Veneto and Campania (the region of Naples). Despite the good performance of second order regions, however, rural areas are doing bad in this scenario, since they have a positive but consistently lower performance both in relative and in absolute terms.

Map 1.2.2. - Annual average regional GDP growth rate: difference between the Pro-Active and the Reference scenario

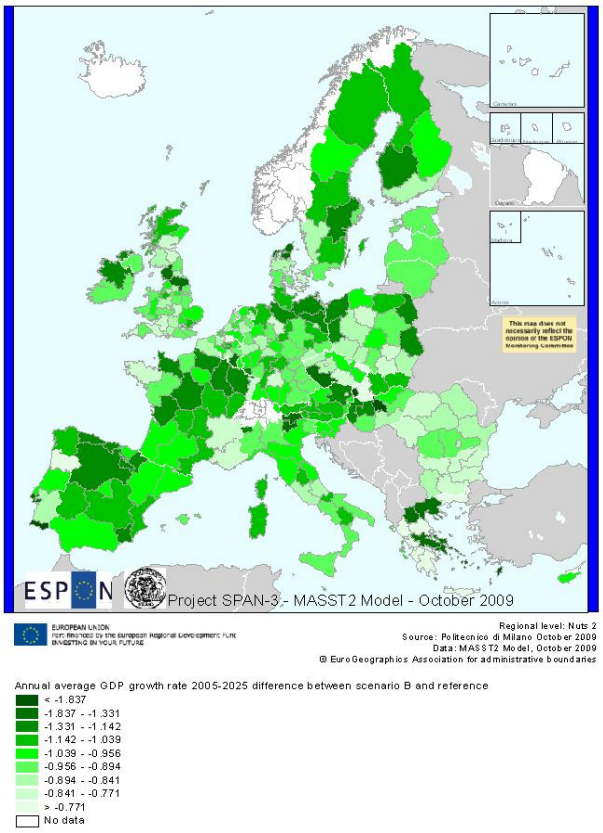


The differences between the Defensive scenario and the Reference are reported in Map 1.2.3. This scenario (see Section 3.1) is one which is characterized by low growth rates with concentration of development in the few highest level metropolitan areas. The MASST model obtains the same results.

First, it has to be observed that this scenario is less expansionary with respect to the Benchmark for all regions of Europe. In particular, one can observe that, in the East, among the regions more able to survive the recessions are some capital ones, such as Bucharest and Sofia: especially in absolute terms (mapped in the Annex for reasons of

space), the growth rates in this scenario are significantly higher for Eastern metropolitan regions.

Map 1.2.3. - Annual average regional GDP growth rate: difference between the defensive and the Reference scenario



This happens also within the Latin Arc, where in Italy the best relative performance is the one of Latium, whereas in France it is the one of Provence-Cote d'Azur and Rhone-Alpes, but Paris is not the most negatively affected region. In Spain, the differences are less marked but the regions which are better able to cope with the restrictive hypotheses are Madrid, Catalonia and Seville.

As a last consideration, it can be observed that this scenario is not in favour of rural areas. On the contrary, due to lack of demand for their products, insufficient investment and decline of manufacturing, these regions are those which lose more from this scenario.

The total level of European disparities increases in all three scenarios, but especially in the Defensive scenario in which only the most important metropolitan areas are able to react and the weakest countries suffer the most from the protectionist policy (see the scientific report for details).

1.3. QUANTITATIVE SCENARIOS AT NUTS-3 LEVEL

1.3.1. The MAN – 3 Model

Quantitative scenarios at a more disaggregated territorial level (NUTS-3) come from the implementation of the MAN-3 (Masst At Nuts-3) sub-model (see sections 4.1. and 4.2. in the scientific report for details).
The model explains differential growth rates of provinces with respect to their regions according to territorial specificities (i.e. territorial capital) by transferring the logics and the working of the MASST model (Capello, 2007; Capello et al., 2008; Capello and Fratesi, 2009) from the regional level to the province level.
Through the sub-model the main trends and driving forces present in each scenario are considered and included in the forecasting process, as well as the importance of the territorial specificities of the single regions of the three countries considered.

The reasons that explain the relative performance of a sub-regional territory have to be found in its *territorial capital,* a general concept that covers all genetic aspects of local growth.

Particularly, the territorial capital elements we include in the sub-model are (see scientific report for a detailed presentation):

- sectoral specificities, captured by the share of tertiary activity and of touristic activities, self-employment;
- human resources: quantity and quality of human capital, young population, migratory balance;
- territorial structure, captured through urban fabric and through the settlement structure of region, which is a good proxy to capture the role of agglomeration and urbanisation economies on regional performance, enabling parameters of the different explicative variables to vary across different settlement structures present in space, again emphasising the strategic elements, like agglomeration economies;
- social factors; although it is not simple to find empirical evidence of the economic role played by "social capital", some indirect measures have been proposed in the literature (Putnam, 1993). Following this literature we use the growth of the electoral turnout rate in the European elections as an indicator of civic duty and active population in public issues.

The results obtained are generally in line with our expectations and interesting considerations emerge from the interactions of variables with the country dummies (see section 4.3 in the scientific report for econometric results):

- the share of urban fabric has a positive effect. It means that provinces with a dense urban fabric grow more; generally speaking, there are economies of agglomeration and network effects. Cities grow to exploit economies of agglomeration, but large cities may attract problems of crowding and congestion. In this case the benefits of

agglomeration economies outweigh the disadvantages and congestion phenomena do not work.

- unexpectedly, the share of the endowment of touristic structures is negative and significant. In spite of the positive effect of the variable multiplied by the dummy "agglomerated", the overall effect remain negative. It is difficult to explain this negative effect in these three countries. A possible reason is an excessive increase of touristic structures which has not been matched by a proportional increase in touristic flows.

  Quite different is the effect of this variable in Spanish rural provinces, which is strongly positive, showing a new type of tourism, far from cities and close to the natural world;
- in analyzing *human capital,* as expected, we found that the migratory balance has a positive and significant effect such as the share of people with less than 20 years. This latter independent variable is significant for all countries as a whole and for each individual country. In fact, we can see that it is highly significant in French and Spanish urban areas and in Italy.
- the result on services employees is quite surprising because it has a non significant influence on GDP growth in the Arc-Latin countries with the exception of the Spanish urban areas, where the positive sign is certainly linked to the economic transformation towards the service sector. Of some interest is also the negative and significant sign in French coastal provinces which is probably correlated with the negative impact on economic growth of the endowment of touristic structures.
- an interesting result is linked to the share of craft and related trade workers. In fact, it is strongly positive and significant in mega cities, signalling that these areas are the best places for self-employment, thanks to their market dimension and the possibility of exploiting their relational capital.
- the electoral turnout growth rate in the European elections is not significant and negative for all countries, but it is strongly significant and positive in Spain. This result is explained because economic phases of growth increase civic duty and civic duty contributes to increase the economic growth in a virtuous cycle.

1.3.1.a Scenario Assumptions

An additional step towards the construction of scenarios at NUTS-3 is the adaptation of the scenario assumptions defined at European level for the provincial level.

Table 1.3.1. presents in a schematic way the quantitative levers of the MAN-3 model for each qualitative assumption and the "translation" into quali-quantitative impacts of each lever in the simulation exercise. The reasoning behind each assumption, each lever and each impact is explained in section 4.4 of the scientific report.

Tab. 1.3.1. - Adaptation of the assumptions at provincial level

Qualitative assumptions	Quantitative levers of the model (relative to the national average)	Reference	Pro-active	Re-active
Terziarization of global economy and the advanced economic functions concentrating more and more in metropolitan regions;	*share of services employment*	**positive impact**	**positive impact**	**neutral impact**
Difficulties for regions affected by the housing crisis;	*Regions specialized in construction*	**negative impact**	**neutral impact**	**neutral impact**
The "Green Economy" and the recovery of manufacturing activities in Europe;	*Share of Craft and related trades workers*	**positive impact**	**positive impact**	**negative impact**
Effects of the crisis on tourist regions;	*Endowment of touristic structures*	**positive impact**	**negative impact**	**positive impact**
Deregulation of the CAP and trade liberalization in the context of the WTO;	R*ural regions*	**negative impact**	**negative impact**	**neutral impact**
Immigration flows from the Mediterranean Basin towards "Latin Arc" countries;	M*igratory balance*	**positive impact**	**positive impact**	**negative impact**
Stagnation of European demography and the intensification of the ageing process;	*Share of people with less than 20 years*	**negative impact**	**positive impact**	**strongly negative impact**
Diffusion of economic development in urban areas.	*Urban fabric*	**neutral impact**	**strong positive impact**	**strong positive impact**

1.3.1.b Results at province level

This section reports on growth rates of provinces in the three scenarios and compares rates between the proactive and reference scenarios and the defensive and reference scenarios.

Table 1.3.2. presents the average provincial growth rate in the three scenarios. Interestingly, the growth rate of Spanish and French provinces is higher than the average of all provinces, whereas the growth rate of Italian provinces is the lowest in all scenarios.

Analysis of the Latin Arc reveals that agglomerated provinces outperform the others, as well as coastal provinces. This is explained by the fact that many of the best performer provinces are on the coast. Rural provinces are the most penalized in all scenarios and in particular in the defensive scenario, in which they have a negative rate of growth.

Barcelona shows a higher rate of growth than Hérault and Turin. However, Turin is the province that benefits more from the proactive in comparison with the reference scenario, and is also the province that is less affected by the defensive scenario. By contrast, Barcelona is the most affected by the defensive scenario.

Tab.1.3.2. – Average provincial growth rate

Average Provincial Growth Rate	***Reference***	***Proactive***	***Defensive***	***Diff Pro Ref***	***Diff Def Ref***
All countries					
- All provinces	1,96	2,94	0,98	0,98	-0,98
- Spanish provinces	2,06	3,02	1,02	0,96	-1,04
- French provinces	1,99	2,97	1,02	0,97	-0,97
- Italian provinces	1,83	2,83	0,89	1,00	-0,95
Latin Arc Provinces					
- All provinces	1,73	2,69	0,77	0,96	-0,96
- Urban provinces	1,70	2,51	0,69	0,81	-1,01
- Agglomerated provinces	1,88	2,98	0,96	1,10	-0,92
among which Megas provinces	2,03	3,17	1,12	1,14	-0,90
- Rural provinces	1,11	1,88	-0,01	0,77	-1,13
- Coastal provinces	1,84	2,89	0,90	1,05	-0,94
Barcelona	2,88	3,95	1,85	1,07	-1,03
Hérault	1,59	2,39	0,63	0,80	-0,97
Turin	2,23	3,32	1,42	1,10	-0,81

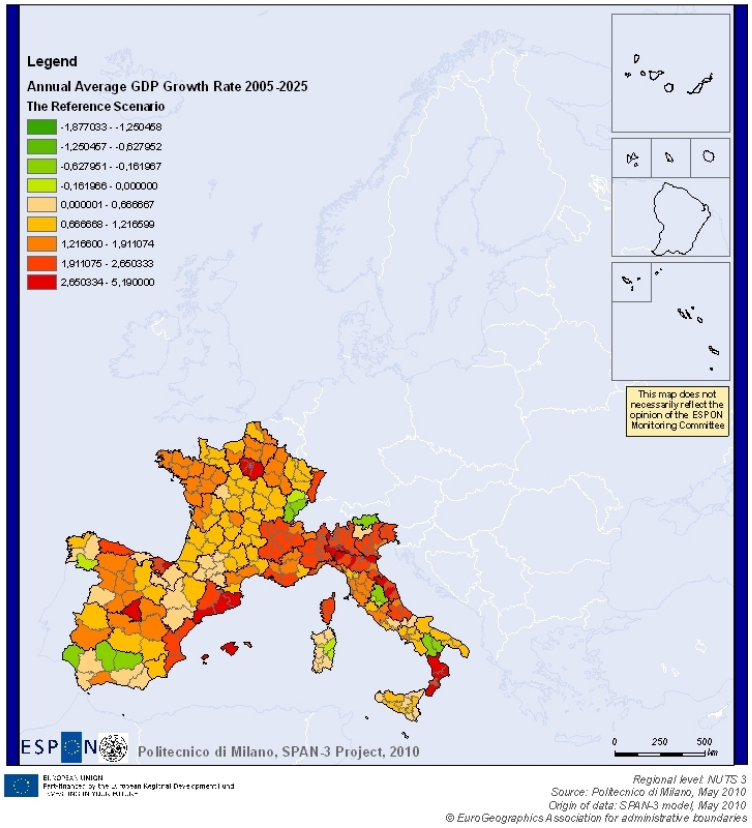
In the reference scenario (Map 1.3.1.), the growth rates of European provinces are highly differentiated. With regard to the typology of the provinces, agglomerated provinces benefit more than the others from the reference scenario, while rural provinces have the lowest growth rates.

By and large, peripheral rural and urban provinces, in particular those of the South and the North West of Spain, the South West of France, and the South of Italy are the worst performers. By contrast, provinces around MEGAs generally outperform the others.

Overall, provinces specialized in building and construction also have a lower than average growth rate. However, urban provinces benefit more than the others from this sector.

The growth rate of tourism provinces is higher than average. In this respect, it is interesting to underline that rural provinces specialized in tourism grow twice as fast as other rural provinces.

Map. 1.3.1. Annual average GDP growth rate 2005-2025 in the reference scenario



Although the agglomerated provinces show a positive trend, some interesting facts emerge from an in depth analysis. Growth rates are lower than 1.5% for all Italian agglomerated provinces and for Seville, Zaragoza, Malaga and Alpes – Maritimes. Moreover, growth rates are higher than 3% only in the French provinces of Ile de France, although Paris is an exception. Quite surprisingly, agglomerated provinces in France perform better than agglomerated provinces in other countries. With regard to other types of provinces, Spanish rural provinces have a higher growth rate than the other rural provinces and the Italian provinces are the best performers among urban provinces.

It is also interesting to note that development spreads outwards from Barcelona, Paris, and Milan to neighboring provinces which, in many cases, grow more rapidly. This is probably explained by congestion pushing activities towards second rank cities with similar services and generating a low cost housing market at the periphery of large cities. This is true only in part for Madrid and Rome, which grow more than their surrounding provinces.

Many of the best performer provinces, excepting Madrid and the provinces of Ile de France, belong to the Latin Arc (see Map. 4.5.2. in the scientific report). Moreover, coastal provinces grow more than average. An interesting finding is that provinces in the Latin Arc specialized in building and construction grow more than average. In particular,

the urban provinces outperform all the others in. This is due to the urban growth of the second rank cities which depends mainly on migrants. In fact, the Latin Arc has a strong potential to attract migrants (both nationals and foreigners), who may also be retired people. This is mainly related to the natural attractiveness of the Mediterranean coastal areas and of their hinterlands.

The pro-active scenario differs in many respects from the reference scenario and shows higher growth levels for all provinces. The differences between the pro-active and the reference scenario in terms of growth rates are shown in Map. 1.3.2.

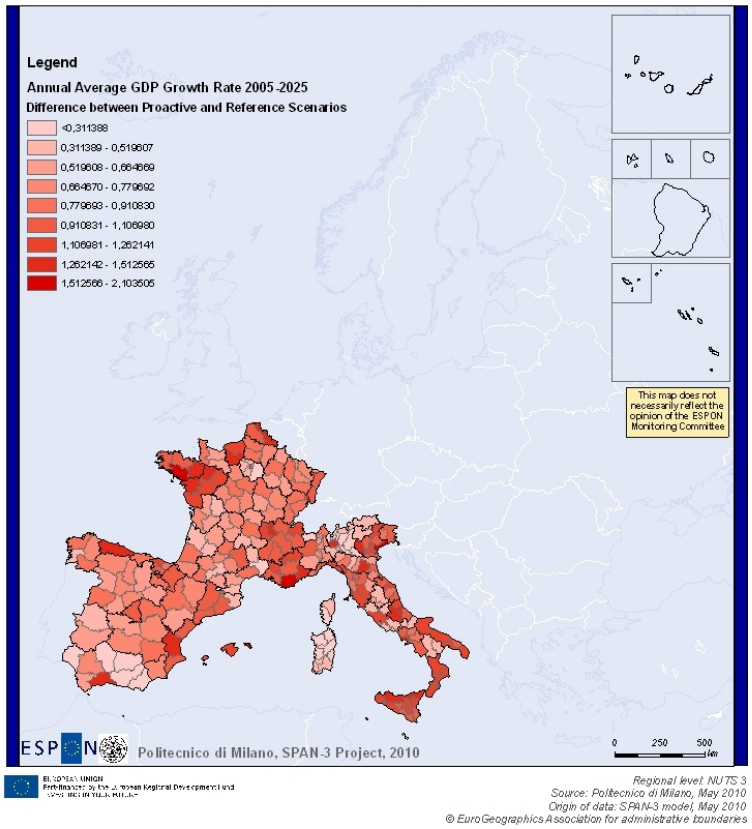
Provinces showing big differences between pro-active and reference scenarios include Rome, Madrid, and Paris, and other Megas such as Barcelona and Milan. Provinces with lower rates of growth also occur around Megas. This is the case of the provinces surrounding Paris, Milan and Rome, and also Bologna, Naples and Vizcaya. This happens because during the first phase (5 to 7 years) of the proactive scenario, growth is concentrated on metropolitan areas thanks to significant investments in advanced technologies. In a subsequent phase, "green economy" production activities spread towards second and third level cities and also towards the more peripheral provinces.

Interestingly, some provinces with a low rate of growth in the reference scenario benefit more from the pro-active scenario. This is the case, for example, of some Italian provinces in the Sicily region, the French provinces in the Franche-Comté region and Hautes-Pyrenees, Gers, Tarn-et-Garonne, Indre-et-Loire and the Spanish provinces Orense, Cantabria, La Rioja, Navarra, Huesca, Zaragoza and Salamanca. With the sole exception of Zaragoza, all these provinces are rural or urban. This shows that as well as agglomerated provinces and capitals, the proactive scenario also favors rural provinces hosting the development of the residential and tourist economy and the "green economy", especially in the field of renewable energy sources (biomass, solar and geothermal energy etc) .

With regard to the Latin Arc, coastal provinces present bigger differences than other provinces between the proactive and the reference scenarios (see Map. 4.5.4. in the scientific report).

In the defensive scenario the most heavily penalized provinces are the rural ones which have an average rate of growth near to 0. In fact, in the defensive scenario, a significant number of rural regions are faced with serious problems of decline of yields in agriculture and job losses in small, no longer competitive manufacturing industries. Moreover, the "new paradigm" of the green economy sustaining the growth of rural provinces which emerges in the proactive does not emerge in the defensive scenario.

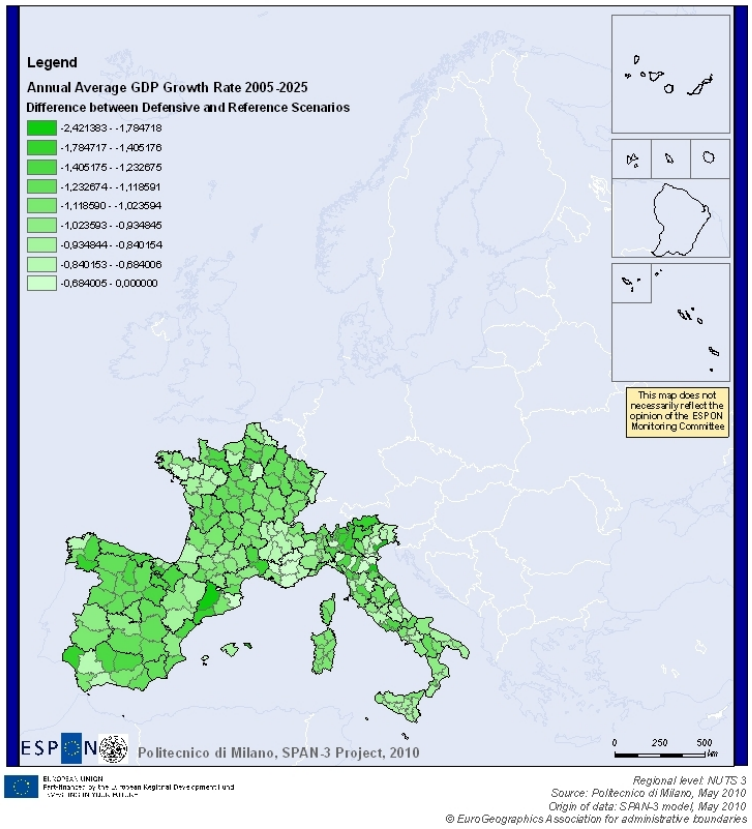
Map. 1.3.2. -Annual average GDP growth rate 2005-2025; difference between proactive and reference scenarios



Nevertheless, some rural provinces with a smaller difference in growth rates between proactive and reference scenarios also show a smaller negative difference between defensive and reference scenario (Map. 1.3.3.). This indicates that they are not particularly penalized by the defensive scenario.

Another interesting finding emerges from comparing the difference in growth in each scenario for each province with the average for all provinces. This reveals that some provinces showing a bigger difference in growth than average in the proactive scenario compared to the reference also have below average growth rate in the defensive scenario. This indicates that these provinces both benefit more from the proactive scenario and are more badly affected by the defensive scenario. This is the case of several provinces close to agglomerated provinces. It is due to the fact that in the proactive scenario they benefit from the growth of big cities that spread outwards, but in the defensive scenario, where the growth of big cities is more self-contained, they don't grow. These provinces include Lérida, Tarragona, Castellon de La Plana, Alicante, Oise, Loiret, Marne, Parma, Siena, Forlì-Cesena.

Map. 1.3.3.-Annual average GDP growth rate 2005-2025; difference between defensive and reference scenarios



More generally, provinces showing a positive trend in the proactive tend not to lose out so heavily in the defensive scenario. This pattern is confirmed in the Latin Arc (see Map. 4.5.6. in the scientific report).

1.3.2. Fine Tuning on Catalonia and Barcelona Province

1.3.2.a Barcelona, from industrial city to knowledge based metropolis

Since the openness to the international economy in 1959, Barcelona developed a new productive manufacturing basis, with a central role for medium and small firms (SMEs), and with an important presence of industrial multinational companies (French, German and Italian). The capacity of attracting population and activities led to an intense metropolitan dynamics. The crisis of the 1970's and the political transition meant for Barcelona the end of a development model based in a low capital intensive production, very intensive in low-qualified labour and basically oriented to a protected domestic market.

Since the entry of Spain in the European Economic Community (extension of markets and the attraction of external capitals) and the nomination of the city of Barcelona to host

the Olympic Games, both in 1986, Barcelona has experienced one of the most intense processes of economic and urban transformation in Europe.

Barcelona was able to take advantage of the celebration of the 1992 Olympic Games. This event enabled the city to be pointed at as an international reference city and, at the same time, it made possible to carry out investments in urbanism that had been systematically postponed. The city assumed the construction of Olympic equipments (the Olympic Ring, the Olympic Village) as well as it undertook big urban transformation works (construction of the communication belts, new terminal for the airport, opening of the city to the sea, extension of the network of drainpipes).

From 1997 on, a new municipal strategy centred in the notion of "Barcelona as a city of knowledge" began. This made possible that the city of Barcelona continue to lead the economic and urban transformation of the city. A new urban policy of transformation of land uses is deployed with the target of changing industrial uses into uses for knowledge-intensive activities: the project 22@barcelona, which pursues the transformation of the Poble Nou neighbourhood, the fisrt old industrial area where the industrial revolution took place. Furthermore the urban and infrastructural transformation continues: opening of Diagonal Avenue up to the sea, enlargement of the airport and the port, diversion of the river Llobregat, High speed train and new subway lines. This strategy is currently spreading out to the rest of the metropolitan area. Nowadays, Barcelona is considered one of the ten largest metropolises of the European Union and it shares with Lyon the territory on the eleventh Mega Region of the planet.

1.3.2.b Macroeconomic performance until 2007

Barcelona has a productive basis oriented towards the foreign market (the rest of Spain, the UE and the rest of the world) which is supported on a business network in which the average dimension of production establishments is low. Regarding the foreign market as a whole, the exportation basis shows a surplus, since the large surplus with the rest of Spain balances the commercial deficit with the rest of Europe and the world.

Barcelona has a competitive economy that increases its quota of market in the external exchanges. Between 1986 and 2007 Barcelona’s production and employment grew intensely, but the growth of the aggregated productivity was not very high. This low productivity growth reflects a production function not very high intense in capital and with a relatively low use of human capital. In the last ten years the low growth of aggregated productivity can be basically explained through the increase of the activities related to the building sector, which shows a low productivity growth (negative in some years). Conversely, the growth of the industrial productivity between 2004 and 2007 is very intense.

One of the explanatory factors of the competitive success of the economy of Barcelona relies on the existence of agglomeration economies. Their extension is a consequence of the growth of scale economies (partly due to the fast development of transport and communication infrastructures), urbanisation economies (enlargement of the metropolis

and large productive diversity), localisation economies (especially those linked to activities of high- knowledge economy) and the existence of network economies (synergies and complementarities).

Population

- The province of Barcelona is one of the largest NUTS 3 regarding its total population (5.416.000 inhabitants) and the metropolitan region of Barcelona is the tenth largest metropolis in the UE (OECD 2009).
- The population has been steady during the 1990s in about 4.6 million inhabitants. However, between the years 2000 and 2008 the population has raised to 5.4 millions, with 16% accumulated growth rate (see Table A.3.1 and Figure A.3.1 in the Annex 3).
- This rapid growth of the population from the year 2000 is due to the attractiveness of foreign born (non-Spanish) population. Foreign born population of the province rises from 150,000 in 2000 (3.2% of the population of the province) to 660,000 in 2008 (12.2% of the population of the province) with an accumulated growth rate of 440%. (see Table A.3.2, Figures A.3.2a and A.3.2b in the Annex 3). This attractiveness is due to the existence of a dynamic labour market.

Gross domestic product

- The evolution of production (GDP) between 1986 and 2009 shows several differentiated stages: fast growth between 1986 and 1992, a severe recession between 1993 and 1994, recovery and intense growth between 1997 and 2007, and again a severe recession from the second trimester of 2008 until now.
- In 1995 the GDP per capita of the province was 13,900 euro, slightly lower than the UE-27 (14,700 euro) (see Table A.3.2 in the Annex 3). This is, the GDP per capita of the province was 95% of the UE. After 12 years (2006 is the last year available of the homogeneous series), the GDP per capita of the province raised to 26,300 euro, about 111% of the UE average. As a consequence, there was a process of convergence in GDP per capita of about 16.4%, this is, about 1% every year. In fact, when the data are expressed in PPA, the figure raises to 123% of the UE average (see Table A.3.2 in the Annex 3)[3].

Employment and sectoral structure of employment

- The dynamism of employment between 1986 and 2007 is rather impressive in the province of Barcelona: from 1,852,000 to 2,775,000 jobs and 50% accumulated growth rate in 20 years (see Table A.3.3, Figure A.3.3 in the Annex 3). Growth of employment has been continuous, with the exception of 1993-1994 and after 2007 (where the growth rate is negative about 10%).
- Regarding the sectorial structure of employment between 1995 and 2006, two strong trends can be observed (see Table A.3.4, Figure A.3.4 in the Annex 3):

[3] The process of convergence is faster in the Barcelona's province than in the rest of Catalonia.

a) The relative growth has been positive in all the sectors:

- 24% in manufacturing and energy
- 29% in construction
- 55% in services

b) Absolute growth in all the sectors, particularly intense in the services sector. This means that, against the opinion of most of the analysts, the growth of the province was not based on the construction sector:

- New jobs in the tertiary sector: 602,000
- New jobs in construction: 129,000
- New jobs in manufacturing: 116,000

Notice that in this province and metropolis initially based on industry, there is a distinct growth of employment in export-oriented sectors: manufacturing and (tourist) services.

Productivity

- Despite the impressive growth of production (GDP) and employment, productivity growth has been low: it was negative between 1997 and 2001, slightly positive from 2002 to 2005, and close to zero in 2006-2007 (see Table A.3.5, Figure A.3.5 in the Annex 3).
- This is, almost all the growth of production has been explained by the growth of employment, particularly by the fast growth of sectors where productivity tend to rise slowly. Manufacturing is the sector more related to the growth of productivity in the economy of Barcelona (and in Spain as a whole). However, the growth of productivity in this sector was only important between 2004 and 2007, and it is expected to be again significant in the new period of crisis (2007-2008).
- Regarding productivity, the profile of the economy of Catalonia or Barcelona is quite similar to the profile of the Spanish economy, where Catalonia represents 20% of the production and employment.

Firm size

- One of the distinctive features of the economy of Barcelona is the small average size of firms and establishments.
- About 97% of firms have less than 50 employees, whereas medium-sized firms add up to 2.3% and large firms are only 0.41% (see Table A.3.7 in the Annex 3). The province of Barcelona have only 806 large firms and 433 are concentrated in the city of Barcelona[4]. The ratios are quite similar for the city of Barcelona, the province and Catalonia. In Catalonia, about 80% of large firms tend to concentrate in the province of Barcelona, particularly in the metropolitan region of Barcelona and the city of Barcelona.
- Medium and large firms have showed an intense growth in recent times. Thus, medium firms increased from 2,786 in the year 1996 to 4.517 in 2008. Large firms rises from 526 to 806.

[4] The data is inflated by a headquarter-effect in the city of Barcelona.

- Decentralization of some activities / incubator hypothesis

International trade

- Catalonia and Barcelona are very open economies. Exports account for 30% of GDP if the rest of Spain is not taken into account, and 68% if it does;
- Exports from Barcelona to the rest of the world have increased faster than the growth of the UE between 1991-2008;
- the total value of imports has increased more than the value of exports (negative balance of trade).

Foreign direct investment

- Catalonia has consolidated itself as one of the most dynamic regions in Europe in attracting multinationals: more than 3,000 foreign multinationals, where 600 are manufacturing firms and more than 2,000 are services firms;
- In most recent years however outward investments have grown more than inward;

Knowledge economy

- Employment growth in knowledge-based industries is faster than in non-knowledge industries. Knowledge-based jobs doubles between 1991 (398,000 jobs) and 2008 (796,000 jobs). This growth has been especially intense in services.
- Knowledge-intensive jobs resist better the effect of the crisis: in 2007 knowledge-intensive industries have lost 14,000 employees whereas non-knowledge-intensive industries have lost 84,000 employees.
- The share of R&D of Catalonia and the province of Barcelona has rise from 0.79% in 1995 to 1.49%. The total growth of this ratio has been 0.59, slightly higher than the Spanish (0.48) and much more than the UE average (0.05). Despite the ratio still lower than the UE average (1.85).
- About 63% of the expenditures in R&D belong to firms, which is more than the Spanish average (56%). Since 2004, there is a significant rise of public expenditures in R&D so that public contribution rises from 9.3% to 13.7%.

1.3.2.c Effects of the crisis: 2007-2009

Some basic facts can be pointed out to highlight the effect of the crisis on the province of Barcelona:

1. The economic crisis starts in USA at September 2007. Since the third trimester of 2007, the Spanish economy (including the province of Barcelona) declines, giving pass to a recession in the second semester of 2008.
2. Between the first quadrimester of 2007 and the third quadrimester of 2009, Barcelona's growth becomes negative (-4.7%) when until 2007 was growing at an annual growth rate of 3.6%,

3. This decline of the productive activity shows its consequences on unemployment rate (rises from 7.2% to 16%) and on employment (the city of Barcelona loss 4.15% of its jobs, the province loss 10.2%, Catalonia loss 9.91% and Spain 9.7%). This means that the effects of the crisis on the city of Barcelona are lower than on the rest of the province. Furthermore, the unemployment growth rate is higher than the destruction of employment. The labour market is quite flexible (external flexibility) and with an important cyclical sensibility.
4. The price of housing decreases 4.2% in the province.

1.3.3. Fine Tuning on the Latin Arc provinces

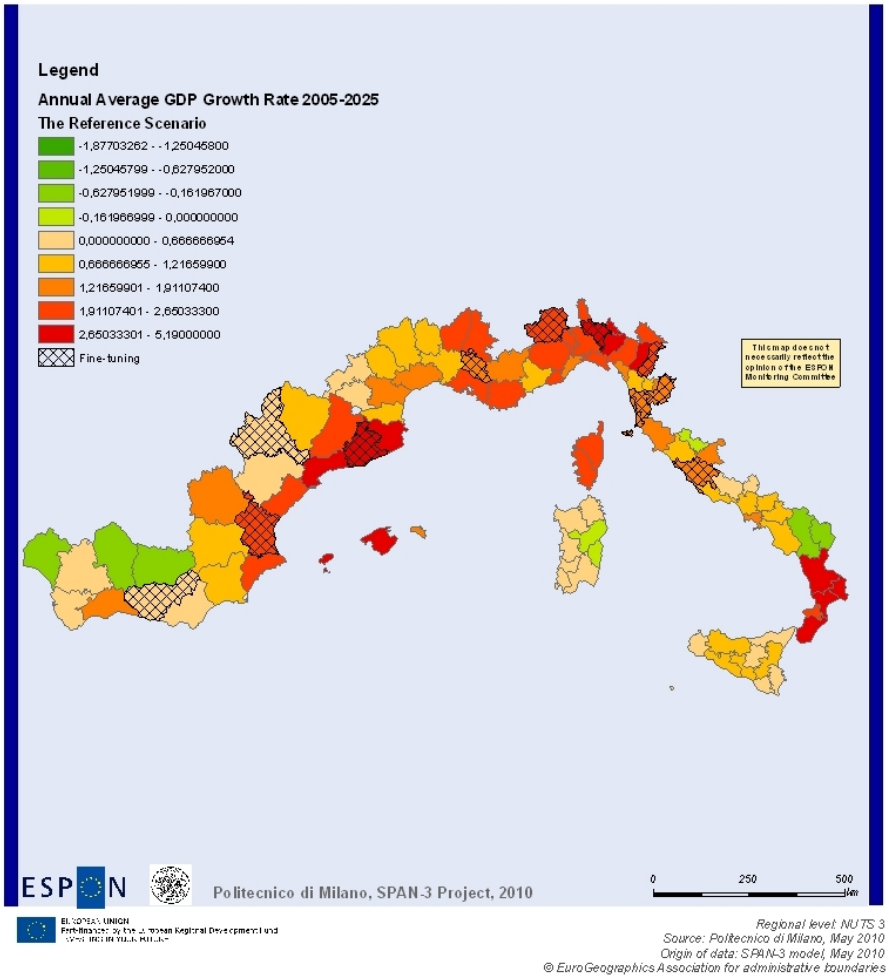
Close collaboration with stakeholders allows us to fine-tune the econometric results. Making direct inquiries and gathering and interpreting indicators at local level enables us to identify elements which explain differential growth rates between provinces in the same region. Data on human capital, accessibility, and tourism performance are considered in this light. Provinces are ranked into five classes of endowment of these elements: High, High-medium, Medium, Low-medium, and Low.

We ranked provinces for each indicator, then built a ranking for each of the three elements, human capital, accessibility, and tourist performance, and finally combined these three rankings into an overall one.

The results are interesting (see Map. 4.6.1. in the scientific report) and show that Barcelona and Turin are among provinces of the Latin Arc with the highest endowment of these three elements of territorial competitiveness. Hérault is endowed with a medium-high level of the three indicators.

On the basis of these results is possible to fine-tune the results of the MAN-3 model considering them as minimum values in a probable wider range of the performance of provinces (see Map 1.3.4.).

Map. 1.3.4.-Annual average GDP growth rate 2005-2025; Fine-tuning of the reference scenario



(Grids indicate that growth rates forecasts by the econometric model have to be intended as lower values in a wider range of possible regional performances).

2. OPTIONS FOR POLICY DEVELOPMENT

2.1. POLICY OPTIONS FOR THE LATIN ARC

2.1.1. General considerations and national policy tasks

The present post-crisis context of advanced economies is deeply characterized by a re-launch of public intervention in the economic field, in the form of:
- rescue policies, especially in the financial field,
- short-term, anti-cyclical policies, addressed towards the boosting of internal demand and mainly involving the building, construction and infrastructure sectors,
- drafting new rules and regulations mainly concerning the control on financial risks and most speculative financial products,
- long-term, structural policies addressed towards the strengthening of production sectors and their orientation towards new technologies and new production paradigms.

One of the most relevant efforts in economic policy making for the years to come concerns – according also to EU suggestions – the strengthening of the link between short and long-term interventions, to be achieved through what are increasingly called "smart investments". The general aim should be to revitalize internal demand while at the same time boosting local and national competitiveness of the production fabric.

On a scenario time span reaching 2025, the necessary structural policies become central, and in fact they represent a constituent and consistent part of the scenarios that are presented and elaborated in the present study. Even in the "reference" scenario, they are present in the form of support to the emergence of a new production paradigm, namely the "green economy" one, orienting in a consistent and synergic direction both public and private investments. But of course the centrality of long-sighted, visionary and intentional policies is most visible in the "pro-active" scenario, where a full perception and even anticipation of structural change underway is hypothesized by policy makers, and a deep involvement in new policy goals and styles is considered.

But linking short and long-term goals and tools is not the only request for effective economic and structural policies. A similar consistency is requested among the actions of different government levels, from Community to national, regional and local. This goal can be achieved through explicit coordination efforts ("multi-level governance") or implicit synergetic behaviour, each policy layer operating with its own instruments and inside its own competences with a full complementary attitude. This requested cooperative behaviour implies, in operational terms, two main elements:
- a strong permeability between policy layers, in particular linking together top-down processes of policy design, programming and financial support with bottom-up processes of project design and operational implementation; and
- the relevance of local policies, acting on the different aspects of territorial capital and implemented through inclusionary processes of vision building and project elaboration.

The main areas of policy design and implementation refer to two main fields: (aggregate but also local) demand policies and (regionalized) supply policies.

Demand policies.

a. The most urgent part of demand policies concerns the design of an exit strategy from the present deficit of Member States budgets, reducing reliance on public expenditure. Direct public intervention through public demand should be substituted by less expensive, indirect public expenditure - e.g. in the form of incentives to private demand - or by appropriate regulatory policies. This could be achieved in the fields of building and construction, through incentives and cautious de-regulation policies; in the case of those sectors in which still monopoly positions persist, like in telecommunications and many private, trade and professional services; in the support to new demand fields, like cultural and education services, more than simply trying to force an anticipation of private expenditure in durable goods, like cars and electrical appliances.
b. The creation of new sources of aggregate demand, like the opening up of new international markets in developing countries. This strategy implies trade agreements with these countries, concerning both their internal markets and the EU market, e.g. in the agricultural products field; support to their development policies, through multiple forms of cooperation; in case of emerging countries with huge surplus in trade balance, joint international effort towards an agreement on a re-evaluation of their currencies.
c. The full support to the launching of new production paradigms, implying multiple technological advances, multiple applications in a wide array of sectors, multiple possibilities of product innovations. The case of the green economy paradigm is the perfect example nowadays: its emergence could be supported by appropriate environmental regulations and some public financial support; it encompasses a wide spectrum of innovations, touching sectors like energy production, building and construction, advanced R&D and manufacturing activities, transport and agriculture. In the last case, an interesting example concerns the recent spread of the “zero-km agriculture” model, which implies only a change in public perception and preference and allows achieving important reductions in transport emissions and costs, new agricultural organization and local markets, easier defence of peri-urban agricultural land against urbanisation and real estate speculation.
d. The conquest of new internal and international markets through enhanced competitiveness of local production. Appropriate strategies at the macro-economic level concern cautious wage increases, (facilitated) private investments in technology, organization and management culture, focalization on advanced and excellence production. This strategy, though, can be widely supported by supply actions, implemented mainly at the regional and local level.
e. A smart utilization of existing public procurement of goods and services, although due to shrink, for the creation of an initial market for advanced, environment friendly products, in the building and construction field, in advanced

telecommunication networks and services, in the provision of many e-services like health, social assistance, e-governance in general.

Supply policies

Supply policies mainly concern the efficiency and innovativeness of the production fabric, which, on its turn, depends widely upon national context elements but also, and particularly, upon local context elements.

National policy actions concern the general cultural and educational context of countries, the main internal infrastructure networks, the general regulatory framework in the field of anti-trust and land-use controls, the structure of industrial incentives and regional policies. All these elements are particularly relevant in the achievement of the general goal, already mentioned, of driving a fast rescue from the crisis reorienting production towards more advanced and more innovative sectors, products and firms. Selective fiscal policies, allowing a de-taxing of firms investments but also far-looking regulatory policies in the fields of environmental characteristics of production processes, products and living standards (heating, mobility, energy production) may widely help the necessary inter-sectoral reallocation of resources.

The second task assigned to these national, supply-side policies concern wide investments with an inter-regional interest. Cooperation among regional governments (or among states in federal systems) looks particularly difficult to achieve: in the provision of large infrastructure networks, in the management of large river and hydro-geological basins, in the design of integrated, network strategies for tourism.

In this field, the role of national governments is still crucial, coupled by a relevant lobbying role of leading regional governments. An important case was found during this research work: the transport integration of the Latin Arc regions. In fact, the western Mediterranean macro-region, in spite of the many common characteristics and the sharing of the sea resource, still shows a striking fragmentation in terms of mobility infrastructure (and consequently, in terms of economic integration). This fragmentation is even more striking if compared with the clear inter-regional and also inter-national integration strategy pursued and implemented in the northern part of the EU, in the area of the large, leading capital city-regions (London-Paris-Bruxelles-Randstad Holland-Frankfurt), and with the historical territorial integration of the large central European axis running along the Rhine, the so-called “blue banana”. In particular, the condition of the rail infrastructure is not satisfactory at all: for a long time, technical problems between the French and Spanish rail systems, difficulties in the Liguria and southern Italian regions, lack of priority in the French southern east-west axis, clear priorities given, in almost all countries to north-south connections, linking the large Mediterranean ports with their continental hinterlands; all this has prevented the realization of an efficient Mediterranean network, reinforcing the historical lack of cooperation among the European southern regions.

For a long time, similarities among these regions were felt as more important than potential complementarities, and this led to explicit competition: in the field of tourism, maritime transport, agriculture. Nowadays, an increasing differentiation is emerging – among regions and among cities – potentially leading towards a deeper inter-regional specialization and consequent integration of the respective markets. The case is also present for exploring deeper inter-regional co-operation, in the form of the creation of "synergy networks" (Camagni, 1993; Camagni, Salone, 1993; Camagni Capello, 2004): between ports, with a commodity and branch specialization; in the spheres of tourism, building – and selling in the global market – integrated "itineraries" in both maritime cruise and city/cultural tourism; among knowledge centres, for cooperation in R&D and advanced education.

But another relevant case for supply-side policies implies important responsibilities for regional and local governments. Here the focus of actions refers to the accumulation and best utilisation of "territorial capital", as indicated by an important statement of DG Regio of the EU Commission, still not sufficiently elaborated both by the scientific and the operative policy milieu: "Each Region has a specific 'territorial capital' that is distinct from that of other areas and generates a higher return for specific kinds of investments than for others, since these are better suited to the area and use its assets and potential more effectively. Territorial development policies (policies with a territorial approach to development) should first and foremost help areas to develop their territorial capital" (European Commission, 2005, p. 1).

2.1.2. The concept of territorial capital and its relevance for regional policy strategies.

The concept of territorial capital was first proposed in a regional policy context by the OECD in its *Territorial Outlook* (OECD, 2001). It proposed a well-structured list of factors acting as determinants of territorial capital, which range from traditional material assets to more recent immaterial ones. "These factors may include the area's geographical location, size, factor of production endowment, climate, traditions, natural resources, quality of life or the agglomeration economies provided by its cities, but may also include its business incubators and industrial districts or other business networks that reduce transaction costs. Other factors may be 'untraded interdependencies' such as understandings, customs and informal rules that enable economic actors to work together under conditions of uncertainty, or the solidarity, mutual assistance and co-opting of ideas that often develop in clusters of small and medium-sized enterprises working in the same sector (social capital). Lastly, according to Marshall, there is an intangible factor, 'something in the air', called the 'environment' and which is the outcome of a combination of institutions, rules, practices, producers, researchers and policy makers that make a certain creativity and innovation possible" (OECD, 2001, p. 15).

Although it is clear that some items in the above list belong to the same abstract factor class and differ only in terms of the theoretical approach of their proponents, and some others are lacking, the concept appears sound and fruitful. A full and possibly complete

taxonomy of elements of territorial capital was presented elsewhere (Camagni, 2008), underlining the relevant dichotomies encompassed by the concept:

- material and immaterial elements: social overhead capital, infrastructure, public goods and private fixed capital on the one side, and human capital, entrepreneurship and social capital on the other. Agglomeration and urbanization economies present a mix of both elements;
- private and public goods, but also an intermediate category of impure public goods and club goods, for which new governance styles are requested. In fact, in order to avoid opportunistic behaviour by some actors and excessive exploitation of "commons" and public goods, new policy styles are needed, addressed towards the creation of wide consent, reciprocal trust, synergies and cooperation;
- functional and relational elements, the latter constituting the novelty and the most interesting development factors nowadays. Relational assets, in the form of inter-personal and inter-institutional linkages, represent a "capital" as they are costly to build and maintain but they facilitate innovation, creativity, enhancement of economic competitiveness.

Acting on territorial capital in policy making means acknowledging the integrated nature of any policy strategy, the added value on intervening on different but linked assets at the same time, promoting network relations and cooperative agreements and supporting innovative projects emerging thanks to these agreements instead of the single partners.

For the sake of simplicity, we may mention four large classes of territorial capital elements on which attention should be given in a policy context:

- *infrastructure capital and settlement structure*, encompassing also the characteristics of the urban system and the quality of the environment;
- *cognitive capital*, in the form of knowledge, competence, capabilities, educational and research structure, embedded in both productive capital and human capital;
- *cultural and identitarian capital*, encompassing cultural heritage, landscape and natural capital;
- *social and relational capital*, in the form of both civicness and associative capabilities.

2.1.3. Local and regional policies: acting through "territorial platforms".

As mentioned, regional supply-side policy strategies should address explicitly the conservation, best use, completion and improvement of the different forms of territorial capital. The main messages in this case reside in the necessity to better integrate the traditional spatial development policies into each territory, through an harmonious merging of material and immaterial elements, functional and relational assets, economic, social and environmental aspects; to create new cooperation networks among local actors and between them, policy makers and external bodies, acting on the creation of willing and cohesive local communities; to focalize on excellence assets in the spheres of knowledge, culture, natural and cultural heritage, and support innovation through synergetic behaviour (Camagni, 2008; Camagni, Maillat, 2006).

This integration strategy could be properly synthesized through the concept of "territorial platforms", a concept used in recent times by the Italian Government in order to depict its territorialisation strategy of main infrastructure and development actions. Intervening through territorial platforms means exactly to aim at a full integration – in physical, economic, social and aesthetic terms – of new development projects into the local realm, engaging at the same time multiple local resources in supporting public action with all possible synergies.

In parallel with the four large categories of territorial capital already mentioned, we could speak about three main forms of "platforms": *infrastructure platforms, knowledge platforms and identity platforms* (the fourth category of territorial capital, namely relational capital, providing at the same time a sort of precondition for success and a policy implementation method. The different possible actions pertaining to the three forms of platforms are symbolized in Map. 2.1.1.

2.1.3.a Infrastructure platforms

New infrastructure platforms will allow the achievement of some basic priorities for the Latin Arc, namely: improving the internal integration of the entire area; boosting external accessibility of each region with respect to the Latin Arc and external territories, in order to achieve enhanced competitiveness and attractiveness; reaching a higher internal efficiency of large metropolitan areas through a polynuclear urban structure.

New infrastructure platforms encompass (Map. 2.1.1):

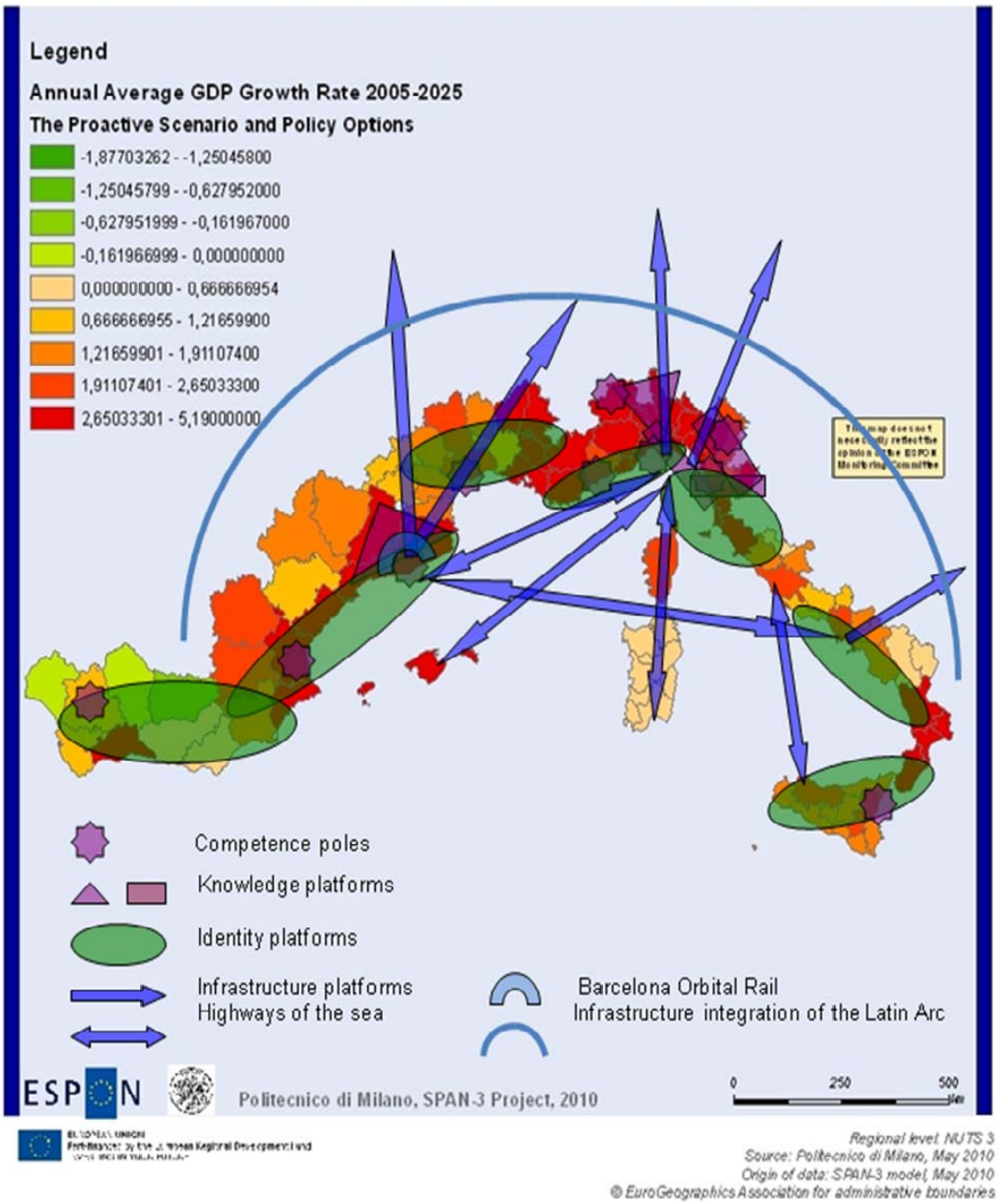
- a better and integrated rail network along the entire Latin Arc, as already stated;
- the use of new "highways of the see" in order to achieve the same goal;
- improved linkages of large metropolitan areas with the main European corridors: the Corridor of the Two Seas (Genoa-Rotterdam); links with Corridor 1 (through the new rail and road axis TI-Bre, Tirreno-Brenner from La Spezia to Parma, Mantua and the Brenner); Corridor 8 (Naples-Bari-Patras); improved infrastructure linking Barcelona with Marseille, Lyon, Turin and the Po Valley, Strasburg and Central Europe;
- an Orbital railway system internal to the Barcelona metropolitan area, allowing the structuring of a strong ring of subcenters (see Sect. 2.2.).

2.1.3.b Knowledge platforms

Knowledge platforms represent systems of cooperation networks between the main actors of the knowledge society: advanced research institutions, high education institutions, advanced and dynamic firms. Local firms are not only the recipients of the output of the specialised knowledge plexus (institutions working on scientific and applied research), but the carriers of long standing local production competence and know how, and therefore they represent a crucial partner in any innovation and technological advancement strategy. Particular attention should be paid by policy makers not just to achieve fruitful cooperation between these three local actors (in line with the up-to-now successful experience of the French "*poles de compétitivité*"), but also to monitor the

persistence of local production knowledge which could be jeopardised by the selective delocalisation of parts of the production *filières*.

Map. 2.1.1. – Policy actions and territorial platforms



Knowledge platforms may be structures through (Map. 2.1.1.):

- the synergy and cooperation between the above-mentioned main actors of the knowledge society into what may be called the local "competence poles". Examples of such existing or developing poles may be found in Sevilla (bio-technologies and links with the agri-food filière), Valencia (mechanical engineering for light sectors), Barcelona (wide array of sectors), Montpellier (bio-technologies and green technologies), Nice (ICTs), Genoa (ICTs and medical appliances), Turin (industrial automation), Pisa (advanced physical applications), Florence and Bologna (mechanical engineering, bio-medical appliances), Catania (ICTs);
- the enlargement of cooperation in the applied scientific field between local competence poles and similar but complementary realities in the wider urban region or even outside it. This strategy could be realised engaging the entire Catalonian territory or the triangle Genoa-Turin-Milan;
- the inclusion of innovative firms in these cooperation agreements, working on the industrial "vocations" and the specificities of territories. Examples range from marine technologies, very advanced and incorporated by the local shipbuilding industry in the arc Genoa-La Spezia-Viareggio-Livorno, to mechanical engineering and industrial automation competences on the axis Bologna-Florence;
- the development of other filières, linking excellence local natural and productive assets with knowledge and competence poles. The agri-food-tourism filière supplies huge potential benefits in the Latin Arc area. Similar virtuous circles, building on local "vocations" and supplying wide potential synergies refer to the health and wellness filière, linking local know-how in medical technologies with the increasing specialisation in wellness services and accommodation facilities for an increasing population of European retirees. A last example concerns a possible increasing engagement in the green economy paradigm, particularly in the supply of bio-mass and solar energy production possibilities, linked with the production and servicing for new energy technologies.

2.1.3.c. Identity platforms

Identity platforms exploit natural wealth and local cultural heritage for the development of new economic and employment opportunities. Local identities may become effective "brands" for new, selective and sustainable forms of tourism, but also for the advertising of ancient local competences embedded in food and wine productions and in local handicraft products. An integrated strategy for linking up all the preceding elements with new physical accessibilities, careful site information, worldwide marketing and enhanced logistic receptivity may prove extremely effective.

Local identities have to be re-discovered and interpreted on a wide area level; single pieces of cultural heritage have to be linked with each other in larger and consistent "itineraries", integrated in both information and logistic terms, in order to reach appropriate critical mass and new visibility on the international tourist market.

In the definition of identity platforms the role of citizens and local population is crucial, as they bring in their sense of belonging and place pride, their values and expectations, adding real culture and life to what could easily end up in a trivial commodification of the local atmosphere. Beyond that, they are the natural beneficiaries not just of the new employment potential, but of the improvements that a wise development strategy could bring in terms of accessibility and services.

As it is shown in Map. 2.1.1., the possibility of devising identity platforms along the Latin Arc in wide and extremely rich: diversities are widespread, but also the commonalities brought in by history and geography are clear.

2.2. POLICY SCENARIOS FOR THE BARCELONA PROVINCE AND POSSIBLE INTRA-PROVINCE DEVELOPMENT

2.2.1. The Province of Barcelona

2.2.1.a Basic facts on the Province of Barcelona

The province of Barcelona has an area of 7.700 Km^2, with a population of 5.416.000 inhabitants and a density of 700 inhabitants/Km^2. The most important city is Barcelona (1,615,000 inhabitants) and other four cities have more than 200,000 inhabitants: L'Hospitalet de Llobregat (254,000 inhabitants) and Badalona (215,000 inhabitants) are contiguous to Barcelona, whereas Terrassa (206,000 inhabitants) and Sabadell (204,000 inhabitants) are 25 kilometres far from Barcelona. The only city of more than 50,000 inhabitants located away from the metropolitan agglomeration is Manresa (75.000 inhabitants).

Speaking about metropolitan region and local labour markets provides a better picture of the province; beyond that, the map of the city-network presents the structure of relations between the municipalities, which are the basic nodes in the province.

2.2.1.b The metropolitan region

The most relevant division of the province of Barcelona is the differentiation between the metropolitan region of Barcelona and the rest of the province. The metropolitan region is the effect of the increasing interaction between the urban continuum of Barcelona and a group of medium-sized cities that were old industrial centres (Mataró, Granollers, Sabadell, Terrassa, etc.).

The metropolitan region of Barcelona increased from 90 municipalities in 1986 to about 220 in 2006 and multiplied by three its spatial area. As a result of the spatial expansion, the population of the metropolitan region of Barcelona increased from 3.56 million inhabitants in 1986 to 4.54 in 2001, and from 1.04 million jobs in 1986 to 1.85 in 2001.

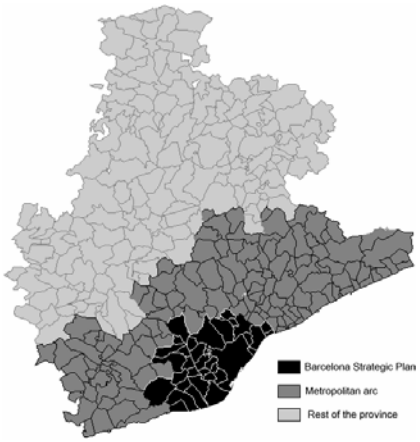
After 1996 the number of municipalities does not increase since the spatial expansion achieved the boundaries of other metropolitan areas (also in expansion).

In spite of this expansion the most used definition for planning, proposed by the *Pla Territorial Metropolità,* is quite similar to the 1991 real metropolitan region and covers 164 municipalities. The metropolitan region has currently 5.4 million inhabitants (91% of the province), 195,000 companies (91% of the province) and more than 2.4 million jobs (92.5% of the province). This area is usually divided in two parts: the core or inner part of the metropolitan area, which mainly matches up with the area of the Barcelona Metropolitan Strategic Plan (Barcelona and other 35 surrounding municipalities) and the so called "metropolitan arc" or outer part (the other 128 municipalities) (Fig. 2.2.1).

The inner part of the metropolitan region, sometimes referred as "the metropolitan area", forms an urban continuum and has currently 3,150,000 inhabitants (59% of the province), 120,000 companies (29% of the companies in the province) and more than 1.6 million jobs (67% of the province). The largest cities of the province are located in the central part of this inner area (Barcelona, L'Hospitalet de Llobregat and Badalona). The city of Barcelona is the true economic engine of the province as well as of the economy of Catalonia. Barcelona has 1.6 million inhabitants (30% of the province), 77,000 firms (39% of the province), and around 1,050,000 jobs (43% of the province)[5].

The outer part of the metropolitan region ("metropolitan arc") has 1,700,000 inhabitants (32% of the province), 57,000 companies (29% of the companies in the province) and 620,000 jobs (26% of the province).

Fig. 2.2.1. - Basic division of the province: Barcelona's Metropolitan Strategic Plan, metropolitan arc, and rest of the province



[5] Data about firms and jobs could be slightly inflated due to the existence of a "headquarter effect" in the city of Barcelona.

There are other three small-medium cities in the province of Barcelona with capacity to structure the territory: Igualada (38,000 inhabitants), Manresa (75,000 inhabitants) and Vic (39,000 inhabitants).

2.2.1.c Local labour markets

The province of Barcelona can be also divided in local labour markets that provide valuable information about the internal organization of the socioeconomic dynamics.
Although the boundaries are not exacts, the metropolitan region of Barcelona might be assimilated to the LLMAs of Barcelona, Vilafranca del Penedès, Sant Sandurní d'Anoia, Capellades, Sabadell, Granollers, La Garriga, Sant Celoni, Mataró, and Calella.

2.2.1.d Polycentric networks of cities

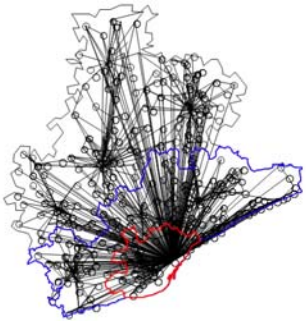
The metropolitan region of Barcelona is a polycentric network of cities well-weaved around some of the old industrial sub-centres and other newer industrial cities. Despite this fact, several parts of the metropolitan arc appear as poorly connected. The city of Barcelona serves as a common nexus connecting these spaces as the system of infrastructures continues to be highly radial. Furthermore, there is not a true differentiation between the centre of the metropolitan region and the rest of the arc.

The differentiation between the metropolitan network and the rest of the province is more evident as the flows of the metropolitan cities are more intense with Barcelona and the same metropolitan cities. The largest cities form quite compact networks which are intensely connected with the city of Barcelona; only a few are connected among them as well as with the cities of the metropolitan arc, due to the deficiencies in the infrastructure. The urban structure tends to be stable in the short and medium run, although the network becomes denser in 2001 (Fig. 2.2.2.). The ambit of influence of the city of Barcelona becomes more important in the province. At the same time, the metropolitan network becomes more connected. In the rest of the province, the most outstanding fact is a light trend to connect the networks of the largest cities thanks to some small cities increasingly belonging to more than one network.

Fig. 2.2.2. - Networks of cities in the province of Barcelona

First director flow in 2001

Four director flows in 2001



Four director flows without Barcelona in 2001

2.2.1.e Urban/rural characteristics

The province of Barcelona is classified by the OECD as predominantly urban. However, not all the municipalities of the province are considered as urban. The metropolitan region concentrates the municipalities with the highest density of the province, and only some concrete parts of the Penedès and the Vallès Oriental could be classified as rural. Most of the other part of the province has rural characteristics regarding density.

2.2.2. Three scenarios for Barcelona/NUTS3: a qualitative approach

Based on the qualitative and quantitative scenarios presented in the interim report, and on the basis of contributions made at the seminar held in Barcelona and at IERMB on 4 and 5 March 2005, a qualitative approach is presented for the three proposed scenarios focusing on spatial variables.

Regarding the territorial areas of study, the aim is to distinguish four areas within the NUTS-3 area of Barcelona: the municipality of Barcelona, the municipalities of the Metropolitan Area of Barcelona, the municipalities of the Metropolitan Region of Barcelona and the rest of the province of Barcelona.

These scenarios must be considered - on the horizon of 2025 – as an economic and territorial frame in which to inscribe the dynamics of Barcelona, dominated by the consolidation of Barcelona as a global metropolis, with an enlargement of the radius of Barcelona labour market; this will involve the incorporation of cities that exceed the territorial scope of the Diputació of Barcelona: Girona and Reus-Tarragona-Valls.

From an economic point of view the fundamental change that will affect the urban agglomeration of Barcelona is the substitution of a model of growth based on low productivity growth and high employment growth for an alternative model based on a productivity growth which is higher than employment growth.

For each scenario, the four most significant territorial and economic changes are presented. It is important to stress that in each case the implementation of active policies of local development will be requested. In the case of the Reference Scenario active policies will be less intense and targeted than in the Pro-Active scenario, but more and better targeted than in Defensive scenario. In all the scenarios, the monitoring of active local development policies is a necessary condition to achieve high levels of productivity and employment growth.

We propose to identify four major strategic economic and territorial factors for the four regional areas of study:

1) Those that affect the nature of production, its sectoral composition, its composition in terms of knowledge intensity and technological level, the origin of its territorial demand.
2) Those that affect the dynamics of local labour markets, especially those related to the interaction with the central metropolitan labour market.
3) Those that affect the provision of infrastructure, especially those related to transport and communications infrastructure.
4) Those that affect supply factors, both in the labour market (education) and technology (R & D).

2.2.3. Scenarios for the Barcelona Province: policies and ideas for the future

2.2.3.a General framework

In order to obtain information about the territorial vision of local experts on the future changes in the province of Barcelona, a series of contributions were collected, which have been incorporated in the development of the scenarios. Here are in summary some of the most important points:

1. The province of Barcelona has two great opportunities if it is able to develop: (1) the Metropolitan Arc, as a middle ground between the central area of Barcelona and the cities of central Catalonia, and (2) a kind of Network of Municipalities as a tool to reach consensus by agents located in the territory.

2. Focusing in the economic future, several experts consider that a relevant question is how to transform the economy from low value added activities to a high value added economy. Another key question is the management of the attractiveness of the Barcelona

city: Barcelona is attractive, there is no doubt about it, but the challenge is to move from mass tourism to higher quality tourism.

3. The third policy priority is to enhance the communications between Catalan cities, because it is true that much has been invested in central cities and in the high speed train, but very little in the communication system between smaller cities and between industrial areas.

4. Finally, a major problem was put forward for the future of the region: the high levels of youth unemployment. During the last 10 years young people had the chance to quit studying and start working immediately in the building sector, without any training. Now they are unemployed and uneducated with the peril to become a lost generation. This is a very important problem because it is essential to have a good human capital to succeed in the knowledge economy. Key to this transformation is the role of public administration: the proactive scenario will be more likely if the government will be efficient.

2.2.3.b Policy Indications for each scenario

Reference Scenario

In this scenario it is assumed an improvement in the provision of transport and communications infrastructure that will affect the both the connection to all major nodes of the Catalan network of cities and the connection to the rest of the world. It also assumes that the full road and rail infrastructure will be completed (La Sagrera Station). This increase in the supply of infrastructure is a key requirement to explain the increase in the efficiency of the whole economy of Barcelona.

The enhancement of total factor productivity, stemming from training and research and development, and innovation, will be another key area of policy intervention. The basic idea is to articulate in a network the provision of research and education infrastructure, linking these infrastructures with the technological trajectory of the different cities and with the needs of the environment

Pro-Active Scenario

In this scenario, specific policies to ease the transition towards a more knowledge-intensive model with higher productivity levels will be implemented.

The implementation of active industrial policies as the support of primary and tertiary industries and activities addressed at new eco-innovators markets is one of the fundamental master lines.

In particular, the fragmentation of labour markets will be tackled with infrastructure and endogenous development policies with the aim of developing a new pattern of growth based on high value added activities and in segments of sectors of medium or high technological intensity.

Accordingly, we postulate the implementation of an integrated economic and territorial strategy to strengthen the network of cities as a whole. In this sense, the integration of the labour markets of the whole province of Barcelona must be accompanied by policies of transport infrastructure endowment, mainly railways, which go beyond connecting these cities with the main high-speed rail (Sants-La Sagrera), port and airport hubs.

Policies in this scenario must include as a priority the construction of the new orbital (rail) line linking Mataró with Vilanova i la Geltrú, linking nuclei as important as Granollers, Sabadell, Terrassa, Martorell and Vilafranca del Penedès. Similarly, of great importance is the widening of the transversal (road) axis and the rail link between Girona and Lleida, articulating the axis of Vic, Manresa and Igualada.

Defensive Scenario

As a whole, the Defensive scenario presupposes maintaining the nature of the production and not act deeply on transport infrastructure and on the conditions of supply (education and R & D), which involves preserving or protecting small and poorly communicated labour markets, both in the rest of the Metropolitan Region and in the rest of the province.

2.2.4. Policy Indications for the Intra-Province Territories

2.2.4.a A shift-share simulation

There are several possibilities to translate scenarios for the entire province into internal scenarios. The proposed method is based on a shift-share division.

The shift-share analysis (see scientific report for methodological issues) is a method frequently used in regional economics that divides the causes of regional growth in three components: regional (or, in this case the province), sectoral, and local.

We take advantage of the properties of the shift-share in order to approach the performance of the several parts of the province of Barcelona under the proposed scenarios of future. This procedure also allows the international and local scenarios to be introduced into the analysis by weighting the performance of each infra-province territory by means of the Industry Mix and the Local Competitive Effect.

GDP or GVA data are not available at infra-province level with the necessary sectoral detail. For this raison the analysis and subsequent projections are carried out using employment data. The procedure is composed of three stages:

1. First, the GDP growth rate of the province in each scenario is converted to employment growth rate using the apparent labour productivity.
2. The Industry Mix and Local Competitive Effect are calculated departing from their share and composition in the previous period and adjusted by means of the international and local scenarios.

3. The sum of the three effects for each infra-province territory produces the expected employment growth rate for each scenario.

The regional effect comes from the estimates of the MAN-3 model. Regarding GDP, the annual growth rates are 2.89 for the reference scenario, 3.96 for the pro-active scenario, and 1.88 for the re-active scenario. As the shift-share analysis is carried out by using employment data, these figures are translated to employment growth rates using the contributions of the employment and productivity growth to the GDP growth rate of Catalonia[6]. The employment growth rate is 0.90 for the reference scenario, 1.56 for the pro-active scenario, and 0.88 for the reactive scenario.

Tab. 2.2.1. GDP growth rate and contribution of productivity and employment. Catalonia.

	2001-2007[1]	Forecast 2010-2025		
Barcelona	Trend	Reference	Pro-Active	Re-Active
Productivity growth rate	0.77%	2.09%	2.41%	1.09%
Employment growth rate	3.20%	0.95%	1.60%	0.97%
GDP growth rate	3.97%	3.06%	4.05%	2.07%

[1] Elaborated from INE-CRE

Tab. 2.2.2. GDP growth rate and contribution of productivity and employment. Province of Barcelona.

	2001-2007[1]	Forecast 2010-2025[2]		
Barcelona	Trend	Reference	Pro-Active	Re-Active
Productivity growth rate	0.64%	1.97%	2.36%	0.99%
Employment growth rate	3.16%	0.90%	1.56%	0.88%
GDP growth rate	3.80%	2.89%	3.96%	1.88%

The three reference scenarios suggest a positive growth rate of the employment for every intra-province territory. However, the growth rates vary across territories and remark a clear division between the pro-active scenario and the other two (Tab. 2.2.3.).

In the reference scenario, the annual employment growth rate varies from 0.76% in Barcelona to 1.04% in the metropolitan arc and 1% in the rest of the province. In fact, these growth rates do not differ very much from the defensive scenario due to two factors: the Province Effect is very similar in both cases and the LCE is not unfavourable

[6] The GDP growth rate is equivalent to the sum of the growth rate of the employment and the growth rate of productivity. For each scenario, the three figures (GDP growth rate, employment growth rate, and productivity growth rate) are provided by the leader team. The assumption of similar regional (Catalonia) and province (Barcelona) contributions of employment and productivity growth rates is feasible due to the large contribution of the province of Barcelona to the Catalonia growth. However, the Barcelona local team express some reservation about a so large contribution of productivity in the counterfactual division of the GDP growth rate.

in excess. Thus, although the technological regimes impose a certain penalty, the total effect is low. As explained in the local scenarios, under the conditions explained by these scenarios, the province of Barcelona is still able to take advantage from the agglomeration economies, labour force supply and exports, even if there is not a transformation of its productive model. More visible should be, however, the consequences on productivity.

Tab. 2.2.3. - Employment growth rates 2010-2025 in the three scenarios: province of Barcelona

	2001-2007	Annual growth rates of employment 2010-2025 in the three scenarios			Differences	
	Trend	Reference	Pro-active	Defensive	Pro-Ref	Def-Ref
Barcelona (1)	2.2%	0.76%	1.38%	0.75%	0.63%	0.00%
Metro area without Barcelona (2)	2.6%	0.97%	1.65%	0.94%	0.68%	-0.04%
Metropolitan arc (3)	2.8%	1.04%	1.73%	1.00%	0.69%	-0.04%
Metropolitan region of Barcelona (1+2+3)	2.4%	0.89%	1.55%	0.87%	0.66%	-0.02%
Rest of the province (4)	2.8%	1.00%	1.70%	1.02%	0.70%	0.02%
Total province (1+2+3+4)	2.5%	0.90%	1.56%	0.88%	0.66%	-0.02%

On the other hand, the pro-active scenario suggests a growth rate of the employment between 60 and 80% higher than the reference scenario. The city of Barcelona could be growing at an annual growth rate of 1.4% whereas the growth rates of the metropolitan arc (1.73%), the rest of the province (1.7%) and the Strategic Plan without Barcelona (1.65%) are quite similar.

Comparing with the trend 2001-2007, the growth rates of employment are significantly slower, as in the period 2001-2007 Barcelona grew at 2.2%, the rest of the Strategic Plan at 2.6%, the Metropolitan Arc at 2.8%, and the rest of the province at 2.8% (see Tab. 5.6.4. in scientific report) . This means that in the reference and defensive scenarios the growth of employment is expected to be a third of the trend 2001-2007 whereas in the pro-active scenario the growth of employment is expected to be two thirds with regard to the original trend. The slower growth of employment in the forecasts 2010-2025 is due to the forecasted contributions of employment and productivity to the GDP growth.

2.2.4.b Infrastructure policies

Infrastructure policies will determine the new strategy for the whole territory of the province of Barcelona. In particular, the transport infrastructure and technological and training infrastructure (see Fig. 2.2.4.a-c).

Regarding the transport infrastructure, rail policies become fundamental. Especially, the ones affecting the heart of the metropolis, and specifically to La Sagrera Station, which will became the core of the entire network, integrating the high-speed rail in the metropolitan and regional rail transport. Similarly, the new orbital rail connection, linking Mataró and Vilanova i la Geltrú, through Granollers, Sabadell, Terrassa, Martorell and Vilafranca del Penedés, is intended to weave the network of cities in the whole Metropolitan Arch. Finally, the transversal axis linking Girona to Lleida, becomes crucial in the articulation of the whole territory of the rest of the province of Barcelona, first splits the existing highway and then building the new high speed railway line.

Along with the rail infrastructure policies, a prominent role is occupied by policies intended to integrate the whole network of cities of the province of Barcelona, with the aim of integrating its labour markets. Here the strategy is to help connect this network of cities based on the promotion of knowledge-intensive activities, both strategically locating new technological infrastructures, and encouraging specialization in advanced education. Here the objective is to promote the benefits of specialization of each node while promoting productive diversity of the whole system of cities. From Fig. 2.2.4d and e, depicting the mobility of educated people, emerges the clear fact that many knowledge-intensive interactions happen between the secondary poles of the province and Barcelona, but also that a capability exists already in some of these poles to attract highly educated manpower – it is the case of Granollers, Terrassa, Martorell, located along the proposed orbital rail network, and, more externally, of Girona, Manresa and Lleida, interested by the new regional infrastructure projects.

In any case, both the strategy of provision of transport infrastructure (particularly rail) as the strategy for provision of technological infrastructure or education, tend to feed each other, and to encourage a doubly virtuous circle: strengthening of regional economies of urbanization and localization in secondary poles, and escaping the dilemma between hyper-concentration on Barcelona alone and increasing urban sprawl.

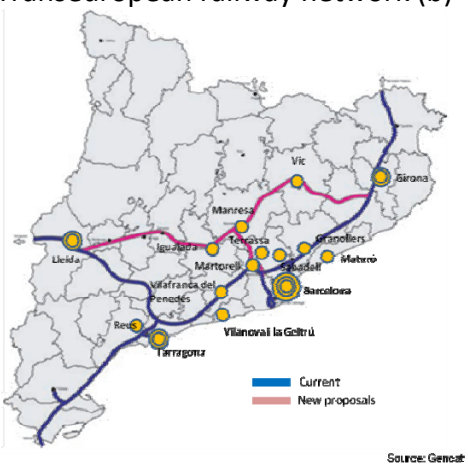
In short, a strategy that enhances the competitiveness of all the territories and especially of the nodes of the network which are more distant from the core cities of the metropolitan area.

Fig. 2.2.4. – Infrastructural projects

Transeuropean motorway network (a)

Source: Gencat

Transeuropean railway network (b)

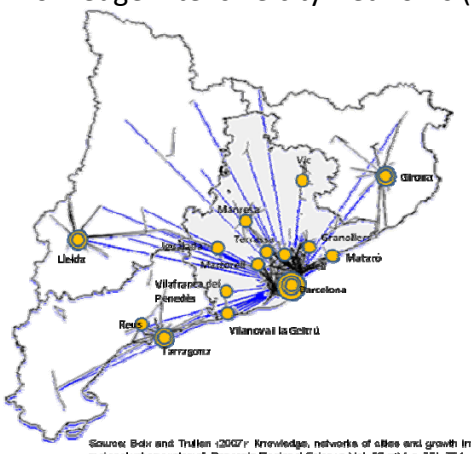


Source: Gencat

New railway axis (proposal)(c)

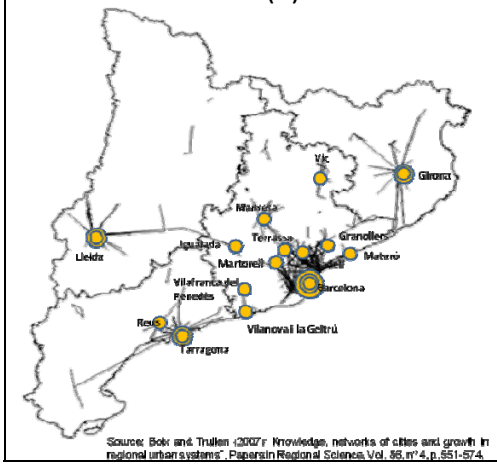
Source: Gencat

Knowledge intensive city-networks (d)



Source: Bolt and Trullen (2007) "Knowledge, networks of cities and growth in regional urban systems". Papers in Regional Science, Vol. 86, n° 4, p. 551-574.

Knowledge intensive city-networks without Barcelona (e)



Source: Bolt and Trullen (2007) "Knowledge, networks of cities and growth in regional urban systems". Papers in Regional Science, Vol. 86, n° 4, p. 551-574.

3. ISSUES FOR FURTHER ANALYTICAL WORK AND RESEARCH, DATA GAPS TO OVERCOME

On the basis of the experience of this project, the following issues for further analytical work can be suggested:

- an effort for enlarging consistently the ESPON data base at Nuts-3 level, considering in particular new elements of territorial capital, looks urgent. Social elements of territorial capital are particularly scarce, but also data on professions, level of education of population, entrepreneurship, R&D investments;
- a further deepening of the methodology for the construction of the sub-model for passing from Nuts-2 to Nuts-3 level in quantitative foresight looks also necessary, and it could benefit most from improvements in the data base;
- a new and fresh reflection on the value added of merging economic policies, regulatory and planning policies and actions on infrastructure for enhancing regional development emerged often during the research project: many policy suggestions refer to the necessity of this integration, but studies on new governance styles and their effects are scarce;
- on the political and institutional side, beyond the involvement of officials and policy makers coming from the three stakeholder institutions, a further effort to involve a wider number of administrations could be interesting, and in particular a stronger link with the association of Provinces constituting the Latin Arc network. In fact, the most relevant results of the research effort concern an inter-regional perspective, more than a zooming on a micro-territorial level on which the crucial issues differ slightly from the ones that can be managed with a pan-european scientific machine as the Espon Programme. This suggestion could be useful either for a follow-up phase of the research, sponsored by local institutions, of for the design of other “targeted” ESPON projects.

Version 01/05/2010

The ESPON 2013 Programme

SPAN-3

Spatial Perspectives at Nuts-3 Level

Project 2013/2/6

Scientific Report

EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

This report presents the draft final results of an Applied Research Project conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

Information on the ESPON Programme and projects can be found on www.espon.eu

The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This basic report exists only in an electronic version.

List of authors

Politecnico di Milano

Prof. Roberto Camagni
Prof. Roberta Capello
Dr. Antonio Affuso
Dr. Ugo Fratesi

Universitat Autònoma de Barcelona

Prof. Joan Trullen
Dr. Rafael Boix
Dr. Vittorio Galletto

TERSYN

Dr. Jacques Robert

Table of contents

Figures

Maps

Tables

EXECUTIVE SUMMARY (MAX. 10 PAGES)

1. INTRODUCTION

The main goals assigned to the project were interesting and quite ambitious:

- to show how the general ESPON approach to spatial analysis can be useful to local policy makers;
- to build new methodologies and tools which could provide support to policy makers for quantitative assessment and foresight;
- to provide new evidence on territorial relationships through the use of the above-mentioned quantitative tools;
- to develop stimulating partnership processes between scholars, local-regional policy makers and European functionaries in charge of EU regional policy.

All this implied first the updating of the spatial scenarios developed by the ESPON 2006 3.2 project, using both a qualitative and a quantitative foresight methodology (namely the MASST model), and referring in particular to the post-crisis context, globalization processes and role of emerging economies, energy trends and new roles of rural areas.

Secondly, it implied development and estimation of a new econometric tool for transferring the logics of the MASST model from the Nuts-2 level to Nuts-3: the submodel: MAN-3 (Masst-at-Nuts-3), developed with reference to three countries: Spain, France and Italy. A quantitative foresight on all Nuts-3 regions was run on the basis of the new qualitative scenarios for these countries.

Thirdly, the construction of new scenarios for the Barcelona Province (the Députaciò, as Lead Stakeholder of the project) was envisaged, building on the general results achieved in the previous phases and on a selective analysis on the economic fabric, recent performance and internal structure of this area. Similar but less thorough reflections were developed on the other two stakeholder areas, namely on the Turin province and the Hérault Department. A final, relevant and consistent part of the research project is devoted to policy messages and recommendations, mainly focusing on the Latin Arc network territories and the Barcelona province.

This huge task was accomplished in a short time span, namely 18 months, mainly thanks to the competence and the enthusiasm of all partners and stakeholders, and the continuous support of the ESPON CU. Interesting and intense interactions were organised with local officials and experts, mainly on the multiple aspects of possible policy strategies.

Judging from our experience in this project, the intuition of a necessary linkage between the ESPON research work and the natural recipient of the research output, namely regional and local government institutions and policy makers – an intuition at the base of the ESPON « targeted analyses » - proved extremely fruitful and forward looking.

2. MAIN RESULTS

2.1. Qualitative integrated scenarios

The following integrated scenarios are built on the basis of updated thematic scenarios presented in the Annex 1 and taking always into considerations the new driving forces.

2.1.1. European challenges before the crisis

2.1.1.1. Demography

Demography has turned to become a real challenge for the development of Europe. While population was abundant and showed sustained growth during the fordist period, the long-lasting decline of fertility rates has generated modest population growth (average annual growth rate below 0.5% since 2000) and progressive population ageing. The inclusion of the countries of Central and Eastern Europe into the European family has aggravated the general demographic situation, as population decline has already started in most of these countries. Strong population ageing is counteracted there only by low levels of life expectancy.

Western Europe is not homogeneous in demographic terms, with some regions showing high population growth (Ireland's regions, northern regions of Scotland and Italy, south-eastern regions of Spain, southern regions of France, scattered regions of Switzerland, the Netherlands, Norway and Luxembourg) and others showing weak growth or even decline (north-western regions of Spain, southern regions of Portugal and Italy, several regions of Germany and Greece, northern regions of Norway and Sweden, eastern regions of Finland). Population change in European regions is largely determined by migration flows. The past decade has been characterized by sustained flows of migrants from Eastern and Western Europe, but also within Western Europe, from southern to northern Italy, from the UK to France and Spain and also between neighboring countries (Nordic countries; Czech Republic and Slovakia etc).

Since 2000, fertility rates have increased slightly, but not enough to ensure the replacement of generations and to counterbalance population ageing. Since 2000, the increase of the old age dependency ratio has been particularly strong in Germany, Greece, Italy, Estonia, Latvia and Slovenia. It has been progressing in most other European countries.

The transformation of the demographic structure has significant impacts on the evolution of the population of working age. Since 2000, this has been declining in most regions of Germany, especially in the eastern Länder, in the northern regions of Norway and Sweden, in eastern Finland, in the Baltic States as well as in several Slovak, Rumanian and Bulgarian regions. Only 16% of European regions experienced annual growth rates of working age population higher than 1%.

2.1.1.2. Economy

The European economy is now emerging from the most severe crisis of the post-war period. During the decade before 2008, Europe was however confronted with a series of challenges in a context of accelerating globalization. Its average per capita income was more than three times higher than the world average, but it was only 70% of the US level and lower than that of Japan. The process of convergence in which Europe had been previously involved, based on the assimilation of existing technology, organizational practices and increasing activity rates, had come to an end at the beginning of the 1980s. Although productivity increased more dynamically in Europe, it was counteracted by weak employment performance and falling working hours. While in 1970 all of the difference in GDP/capita between Europe and the USA could be attributed to lower labour productivity, this represented only 1/3 of the difference by 2000, 1/3 being accountable to fewer working hours and 1/3 to lower employment rates. By and large, Europe had not sufficiently adopted the new economic paradigm based on new organizational forms, less vertically integrated firms, greater mobility both intra- and inter-firm, greater flexibility of labour markets, a greater reliance on market finance and a higher demand for both R&D and higher education. Although the catching up process of the economies of central and eastern Europe has been encouraging, with the 2004 and 2007 enlargements the EU has inherited the largest levels of territorial inequality in its history. The Lisbon Strategy, adopted in 2000, addressing the issue of European technological competitiveness has been challenged by disappointing achievements. At the same time, the expansion of international trade and international investments far outpaced the growth of output and income. In this process, the emerging economies (BRIC) have been playing a major part, using mainly their comparative advantages of lower labour costs and growing domestic markets.

2.1.1.3. Energy

The past 10 years have been characterized by strong fluctuations in oil price and by the price increase of other energy sources (natural gas, electricity). The strong fluctuations of oil price between 2003 and 2009 were driven by both supply and demand variations: strong increase of oil price after 2003 (supply variations related to the Iraq war, demand variations, with increasing oil demand from emerging economies and role of OPEC and speculative traders); strong decrease of oil price during the second half of 2008 caused by sharp fall in demand related to the financial/economic crisis and the attenuation of speculation; increase of oil price during the first half of 2009 driven by a modest recovery from the crisis. The strongest price fluctuations concern crude oil and reflect very closely the relationship between supply and demand (no elasticity). The price evolution of other energy sources after 2003 shows an upward trend with smaller fluctuations, driven by the average change of oil price. The liberalization of electricity markets in Europe has, so far, not resulted in a decrease of electricity prices. On the contrary, electricity producers increase domestic prices in the context of emerging competition in order to be able to invest for catching new markets abroad.

2.1.1.4. Transport

Even in a context of relatively modest economic growth rates, especially in the EU-15, Europe has been facing during the past 20 years a significant increase of traffic flows at all scales. Several factors have cumulatively contributed to this process: the progress of European integration, and especially the East-West integration, the spatial segmentation of production processes in manufacturing activities, the growing motorization, expanding urban sprawl etc. Despite significant efforts, the development of transport infrastructure has not been sufficient to counterbalance congestion (roads, motorways, railways, airports). Wide disparities in accessibility remain, both in absolute and relative terms, which are progressively alleviated by the expansion of infrastructure networks (TEN-T) and by the generalization of low-cost airlines. A major problem is the imbalance of transport modes in favour of road and air transport which counteracts the objective of sustainability. The significant increase of oil prices between 2003 and 2008 had little effects on the volume of transport flows and on modal split.

2.1.1.5. Urban systems

Between 1995 and 2004, all capital city regions in the EU, with the exception of Berlin and Dublin, increased or at least maintained their share of national GDP. The increase was particularly marked in Warsaw, Prague, Budapest, Sofia and Bucharest.

The relative growth of capital city regions is strongly related to their attraction as locations for businesses as well as for individuals. This tends to lead to unbalanced territorial development within countries, unless there are other centres of economic activity, in particular other large cities or conurbations or even networks of smaller cities and towns to provide the same kind of attraction. The concentration of economic activity in capital cities brings benefits in the form, for example, of economies of scale or of agglomeration and the large size of markets. But it also involves costs, in the form of congestion, poor air quality and higher property prices. On average, the share of capital city regions in the national GDP increased by 9% between 1995 and 2004 while the population only increased by 2%. In only three countries in Europe, do second-rank metropolitan areas seem to be effective in counterbalancing the economic power of the capital city: Barcelona (Spain); Milan and Naples (Italy); Germany (multiple growth poles such as Munich, Frankfurt, Hamburg). In other countries, the capital city region tends to dominate, even in Poland, despite relatively large concentrations of population in Lodz, Kraków and Wroclaw. Only in Germany and Italy are there second-rank cities with GDP per head higher than in the capital[1].

In the context of accelerating globalization and of enterprises' relocation towards countries with low wages and booming markets (Asia in particular), medium-sized towns are generally more affected than metropolitan areas, both in Eastern and Western Europe.

[1] European Commission : « Growing regions, growing Europe ». Fourth Report on Economic and Social Cohesion. 2007.

The residential, patrimonial and tourist economy favours a number of attractive European regions with small and medium-sized cities. European integration is also an important factor for the development of urban systems at the intermediate scale across national boundaries.

European urban systems are also characterized by a significant progress of suburbanization. In 90% of urban agglomerations, population grew more in the suburbs than in the core city between 1996 and 2001. Population growth around second-tier cities with population loss in the centre is evident in most cases in Austria, Poland, Slovakia, Italy and Germany. Growth of population in the suburbs is often accompanied by the suburbanization of economic activity. This is also the case around the capital cities in Central and Eastern Europe.

The spatial de-concentration of population and economic activities around agglomerations is accompanied by an over-proportional expansion of the urbanised area. Over the past 20 years, the extent of buildup areas in many western and eastern European countries has increased by 20% but the population has increased by only 6%. There is no apparent slowing down of these trends. The urban areas particularly at risk are in the southern, eastern and central parts of Europe. The mix of forces behind urban sprawl includes both micro and macroeconomic trends such as the means of transportation, the price of land, individual housing preferences, demographic trends, cultural traditions and constraints, the attractiveness of existing urban areas and the application of land use planning policies at both local and regional scale.

Social tensions and polarization have been growing in a large number of European cities over the past decade. In many cities, not only are unemployment rates high, but there are huge disparities in rates. Disparities are particularly large in France, Belgium and southern Italy (for example Marseille, Catania).

Economic polarization takes place mainly in and around large cities, while demographic dispersal can be observed around an even larger number of cities, comprising also medium-sized towns. Various factors are contributing to this important trend: the deterioration of the quality of life in inner-city areas as well as in large, dense suburban housing estates, the growing concentration of low income groups in cities generating social segregation and feelings of insecurity, increased housing prices in cities, growing motorization, especially in the new member countries etc. Dispersal trends around cities are generally not spatially uniform and favour corridors along main transport infrastructure.

2.1.1.6. Rural areas and rural development[2]

During the past decade, the differentiation of European rural areas has further progressed, increasing the contrast between accessible rural areas under urban influence (stabilization or increase of population and progress of counter-urbanization; stronger development of

[2] ESPON Project EDORA (European Development Opportunities for rural Areas). Interim report. April 2009.

employment in secondary activities and private services) and the more remote and peripheral rural areas (strong population ageing; declining attractiveness for businesses and households; reduced provision of services and, in various cases, vicious circles of deprivation). Intermediate rural areas are often characterized by the increasing importance of the "New Rural Economy" (clusters, post-fordism, learning regions etc.).

The importance of agriculture in rural employment and in the outputs of rural regions is further declining. In central and eastern Europe, the share of agriculture in rural employment is still significant (above 20% in numerous rural regions), but it is also rapidly declining. Agriculture is going through a slow transition process from "productivism" to various types of para-productivist (competition on the basis of specialization, technology and strong links with the agro-business) and peri-productivist (on-farm and off-farm diversification of activities and employment for farm households members) orientations. Agriculture is also affected by changes in consumption trends (growing importance of niche markets). The CAP reform, introducing direct payments to farmers, as well as environmental and safety norms, has contributed to the evolution towards more sustainable forms of agriculture. Liberalization measures, as for instance in the milk and dairy sector, are however causing severe adjustment problems and significant tensions. Agricultural activities themselves show a growing contrast between large "commercially-oriented" holdings and smaller pluri-active and diversified units.

Numerous rural areas are benefitting from the increasing value placed by society upon the rural environment, culture and heritage as well as from the increasing ability of the urban population to access recreational amenities.

2.1.2. Perspectives and critical factors for the next 15 years

2.1.2.1. Demography

The number of European regions where population will stagnate and then decline will be growing. Population ageing will accelerate and dependency rates as well as mortality rates will increase in most regions. The increasing number of "oldest old" (aged 75 and over) will generate a significant demand of health care. The size of the population of working age will further diminish in most regions. There are however regions in Europe where the demography is still dynamic, with strong cohorts of young people. Winners will be more and more the regions capable of attracting qualified manpower and/or well off retirees. An open question is the amount of external in-migration towards Europe.

2.1.2.2. Economy

It is likely that wages will increase and technology will significantly progress in the emerging economies. Their comparative advantage of low labor costs will progressively be replaced by a competitive advantage, challenging the European economies on world markets in segments of significantly higher added value. Integration will most probably progress more within the various world regions than between them. This may have significant consequences for the orientation of FDIs. It is also not improbable that Asian

countries create a common currency in order to better protect their interests. The future of the dollar as reserve currency is more questioned than ever. Its further worldwide use in the trade of energy and raw materials is also uncertain. A weak dollar may, however, mean that significant production activities will be relocated into the dollar zone in order to better access markets and also to export under better conditions. The accumulation of capital outside Europe (BRIC, energy producing countries, sovereign funds) will facilitate the taking over of European businesses by non-European groups looking for good investment opportunities, advanced technologies and short-term profits. This may endanger the long-term prosperity of increasing segments of the European economy. The likely increase of wages and related production costs in emerging economies (especially Asian countries) may induce inflation likely to spread throughout the world economy. The emergence of higher interest rates and progressing inflation is not improbable during the recovery from the economic crisis and also for a longer period.

Being the most volatile factor of territorial development, the European economy may follow rather different paths, each having its own territorial impacts. In this respect, the most strategic issue is the way how Europe will position itself at global scale after recovering from the economic crisis. Will the emerging economies (BRIC) become stronger competitors and bring Europe into a defensive attitude or will Europe be boosted by the shock of the crisis and invest massively in new technologies in order to gain largest shares of external markets? Will the internal EU market of 500 million inhabitants be more efficiently used to let new forms of endogenous growth emerge, taking advantage of the complementarities existing between European regions? Will the political priority to curb down climate change be utilized to change massively the energy paradigm and to generate economic growth through a "Green New Deal"?

In addition to issues related to the global and macro-economic context, intra-European issues are also relevant, such as the future extent of the catching up process of central and eastern Europe. The engine behind this process has largely been up to now the substantial amount of western FDIs in these countries. Will the flow of FDIs continue with the same intensity and in the same direction after the recovery from the crisis or will western FDIs be significantly re-directed towards countries outside EU borders, farther in the East and in the eastern and southern parts of the Mediterranean Basin? Will the countries of central and eastern Europe generate sufficient endogenous growth in order to compensate for a likely reduction of FDIs?

In how far will European regions become handicapped by the decline of the working age population and by the scarcity of qualified manpower?

2.1.2.3. Energy

In the present context, energy prices are very closely related to the level of global economic growth at world scale. Despite strong price fluctuations in recent years, the general trend is upwards. Recovery from the crisis and further development of the BRIC countries are likely to strengthen this trend. The energy sector is largely globalised because of the concentration of large fossil energy resources in a small number of

countries. The external dependency of Europe in terms of energy supply will remain high in the 15 years to come and therefore subject to the inelastic relation between global supply and demand. Possible depletion of oil resources in some large oilfields could generate a process of oil peaking (declining supply in a context of growing demand) which would result in extremely high energy prices.

The possible scarcity and depletion of uranium resources should not be underestimated in the context of growing demand related to the construction of numerous nuclear power plants at world scale. Coal will remain a significant energy source for the transition period between the old and the new energy paradigm. Thanks to new technologies (CO2 capture), it will be possible to reduce considerably the air pollution generated by coal-fuelled power plants.

The development speed of renewable energy sources will depend both upon the price evolution of conventional fossil energy sources and from the political willingness to depart from carbon-related energy and to promote the new energy paradigm. The introduction of substantial carbon taxes would play a major part in this respect.

2.1.2.4. Transport

The main critical issues for the future in the transport sector are the elimination of congestion, the impact of transport on climate change and improvement of the accessibility of less favoured areas. The likely change of energy paradigm in relation to climate issues and the possible scarcity of oil resources, are major challenges for the transport sector. They will significantly affect transport costs and therefore locations (households, businesses) and mobility patterns. New transport technologies will emerge in the coming decade. The speed of their diffusion and generalization is however uncertain. If significant carbon taxes are introduced, the present modal split patterns will be affected to the benefit of more environmentally friendly transport modes. They will also have an impact on the mobility of people, favouring even more the development of ICT services, as a substitute to physical mobility. Public transport networks and services are likely to be strengthened, both in urban regions and between them. High-speed train networks will continue their expansion, with new cross-border connections.

2.1.2.5. Cities and urban systems

Cities and urban systems will be facing a number of challenges during the coming decades. Some are the results of trend continuation, others will be generated by the emergence of exogenous factors and new global priorities, especially those related to climate change.

Trend-related challenges concern the rebalancing of urban systems there where capital cities and large metropolitan areas have largely captured growth in the past. This is a particular challenge for the countries of Central and Eastern Europe. Most challenges are however to be found at the scale of metropolitan regions and urban entities. The continuation of urban sprawl in the surrounding of cities and growing social polarization

with all related impacts (security, riots, social segregation, ethnic tensions etc) within cities are growing concerns in numerous European towns.

Cities will in general be less affected by population ageing issues than the countryside because of the presence of larger groups of young population. Needs for additional health care services for the elderly will nevertheless increase.

Policies addressing climate change are likely to have significant impacts on cities, especially in the field of transport systems and mobility, building and construction, urban planning, greening of the urban environment etc. In case energy price will substantially increase and/or carbon taxes will be sufficiently high, changes towards more compact cities, especially with stronger concentration of settlements around the stations of public transport networks can be expected.

Municipal finances are particularly affected by the economic crisis and its impacts. Municipalities will face increasing difficulties to meet the above-mentioned challenges with more limited resources. It is likely that local taxes will increase in a number of countries.

2.1.2.6. Rural areas and rural development

As in the case of cities, future challenges for rural areas will partly result from the continuation of trends and partly from factors of exogenous, mainly policy-related origin.

Numerous rural areas are likely to be affected by population ageing and a growing number of them by population decline. Very much depends however upon the situation of rural areas in relation to cities and metropolitan areas. This factor will play in future a growing role with regard to the demographic and economic evolution of rural areas as well as to the provision of services. This will contribute to stronger differentiation in the evolution of rural areas. The perspectives of rural areas under metropolitan influence and of those which have potential for the residential, patrimonial and tourist economy are more encouraging than those of remote rural regions with declining population, low accessibility and weak attractiveness. Agricultural activities will be significantly influenced by the further liberalization of the CAP and the growing importance of extra-European competition. The reformed CAP after 2013 will again condition a number of rural activities.

The strengthening of policies supporting the further development of renewable energy sources is of great importance for the future of numerous rural areas. Potentials exist in many rural regions, but can only be extensively exploited if the conditions of profitability improve. The introduction of carbon taxes is likely to increase the level of profitability of renewable energy sources, but it can constrain that of agriculture which consumes also significant amounts of oil-related energy.

2.1.3. Scenarios

2.1.3.1. The Reference scenario

The Reference Scenario is not a trend scenario in the conventional sense, because the simple extrapolation of trends does not seem meaningful in a context where numerous factors of strategic significance are moving (globalization, energy paradigm, climate change, social orientation, recent economic crises etc). The Reference Scenario takes into account a number of recent structural changes in addition to more long-term evolutions.

While European demography stagnates and the ageing process intensifies, a number of changes are likely to crystallize in the macroeconomic context. The regionalization of the globalization process reduces the amount of external FDIs into Europe, with the exception of those (sovereign funds etc) aiming at taking over European businesses of strategic character (technology, brands etc). European investments are less substantial but more concentrated on Europe and on its external periphery and neighborhoods (including Ukraine, Moldova, Turkey, Egypt, North Africa). The integration of currencies takes place at the scale of large world regions (North America, Europe, Asia, Gulf States), but these fluctuate more between themselves at that scale. The US dollar loses its importance as reserve currency. The deflationist effect of Asia (mainly of China) on the world economy is strongly attenuated and progressively disappears. Inflation increases as well as real interest rates. The growth of real income in Europe is more modest than before. The purchase power of specific groups (retirees, civil servants, low income groups) is particularly affected. The new generations maintain their standards of living in selling their heritage and properties. The regionalization of globalisation enables the recovery of manufacturing activities in Europe. Disparities in the productivity of the main economic sectors increase, especially between advanced economic functions (financed by capital) and basic services (paid by incomes, including social transfers). Such disparities are projected also on territorial development. A number of new technologies emerge during the coming 15 years which will have significant impacts on the economy, especially in the fields of energy production and use, including the processing of biomass, the nanotechnologies, biotechnologies and transport systems.

Growing oil and gas prices favour investments in oil and gas exploration and discovery. The Arctic region becomes a strongly targeted region in this respect. Regional tensions and possible conflicts are not excluded. The expansion of nuclear energy is constrained by the progressive depletion of uranium resources. The profitability of renewable energy increases, but political support is insufficient to generate a radical change of the energy paradigm. The progress of renewable energy sources remains dispersed and fragmented, with low synergy effects. The economy hardly benefits from this process.

Territorial aspects of the Reference Scenario

The catching up process of the economies of Central and Eastern Europe continues, but at a significantly lower speed than before the economic crisis. It is also more differentiated among the countries concerned. Despite this process at macro-scale, regional disparities

are likely to increase within the EU at a lower scale. The two-speed Europe is accentuated, with advanced economic functions concentrating more and more in metropolitan regions. New manufacturing activities, benefiting from significant technological progress and from related productivity growth, also concentrate in well-developed regions. In addition to main metropolitan regions, second-rank cities and metropolitan areas are also beneficiary, but the process is weaker in the case of a number of second-rank cities in Central and Eastern Europe which are handicapped by their low accessibility. The regions most affected by the crisis and where development perspectives are not easy to identify, are mainly manufacturing regions with low or intermediate technologies and a relatively high intensity of manpower, both in Western and Eastern Europe.

Other regions affected by the crisis and where recovery proves difficult are those which had, up to the crisis, booming activities in the sector of building and construction, largely based on speculation in the real estate sector, as for instance in Spain. Lasting difficulties may also affect regions where economic growth before the crisis was largely based on financial speculation and related financial services or on specific fiscal niches as in Ireland and in the UK. Numerous tourist regions have also been affected by the crisis, but tourism is very volatile and the recovery of these regions depends upon the general level of the European economy. In the hypothesis of moderate economic growth in the medium range, and number of tourist regions have a satisfactory recovery, a fact which does not exclude that others, especially those based on mass tourism with low added value, may face a less favourable evolution. The evolution of rural areas will be contrasting and heterogeneous, with a number of rural regions being affected by the deregulation of the CAP and trade liberalization in the context of the WTO, others benefiting from the opportunities of biomass and renewable energy production. In addition, other factors influence the future of rural areas, such as their attractiveness for retirees, their potential for rural tourism and also the impacts of climate change.

The regions where demographic factors may act as a constraint on the regional labour markets are those where the economic recovery is substantial in a context of rapid population ageing. This may be the case for metropolitan regions with low immigration in the past decades as well as for a number of rural areas subject to economic revival. Immigration further concentrates on large cities, generating a low cost housing market at their periphery. It is also substantial in tourist areas and in areas attractive for the retirees. In these regions, it favours the increase of fertility rates.

Territorial impacts for the Latin Arc

In the Latin Arc, three types of demographic structures prevail, with different development perspectives. In the Catalan part, the young age of the population (sustained natural growth and positive migration balance) favours further population increase and limit the ageing process. In the French part, the population is, in the average, older and is still growing, although more modestly than in the Catalan part, mainly under the influence of migrations. In the Italian part, low fertility rates and a high share of elderly induces a negative natural evolution, compensated in various areas, but not uniformly, by

significant in-migration flows. The number of « oldest old » increases significantly, calling for a strong development of health care services.

The "Latin Arc" has a rather heterogeneous economic structure, so that developments will contrast between regions. In general terms, metropolitan areas with advanced economic functions and technological poles are more favoured than cities with an economy depending upon intermediate or low technologies. After recovery, tourist functions progress moderately. The residential economy progresses more because of accelerating population ageing in Europe. Rural areas are affected, up to a certain extent, by the deregulation of the CAP, especially the wine producing regions. A number of rural areas benefit from the production of renewable energy, but only a modest part of the available potential is being exploited. Immigration concentrates in metropolitan and tourist areas.

Cross-border accessibility benefits from the high-speed train connections between Catalonia and France (Barcelona- Perpignan) and from the HST connection between Rhône-Alpes and Piemonte (Lyon-Torino). Along the coast, the railway connection between Nice and Genova is however not significantly improved.

The considerable potential of the Mediterranean regions in the field of solar energy is not fully exploited, because of insufficient profitability and public support.

2.1.3.2. The Proactive scenario ("Green Economy")

The proactive scenario is based on the assumption that the decisions adopted at international level aiming at curbing down the speed of climate change are efficiently used as an opportunity to generate significant economic growth throughout Europe. The realization of the scenario requires not only substantial, courageous and well coordinated public policies (such as the introduction of high carbon taxes), but also the active involvement of economic actors and of the civil society.

This proactive scenario for Europe is part of a more global context in which the large emerging countries are pulling up the world economy while moving towards more technology-intensive activities. The international financial order is stabilized by the diversification of currency reserves, the dollar having lost its monopolistic position.

Economic growth is stronger and recovery more rapid than in the reference scenario. It is not limited to Europe, but includes also the USA and Asia. The more developed economies and also the BRIC invest in the less-developed countries, especially in Africa, Latin America and Southeast Asia, in order to develop the local markets and to create demand, which is just the opposite of a protectionist attitude.

In Europe, the strategy consists of increasing significantly technological investments boosting productivity, but generating in a first stage higher unemployment rates. Only after a period of 5 to 7 years, employment is growing again. Higher skills and qualifications are required, which doesn't mean that Europe's employment is mainly

composed of managers. The race for stronger tertiarisation is being attenuated thanks to a rapid development of the "green economy" which creates jobs both in R&D and in manufacturing activities. Services move towards higher added value segments. In the context of a more regional globalization, higher financial services are being re-centered on Europe. Through higher competitiveness and stronger public support, European enterprises are less in danger of being taken over by non-European groups or sovereign funds.

The concretization of the "Green Economy" is far from being an easy task, especially in the medium range, as long as the benefits are not tangible. The introduction of significant taxes in the context of declining purchase power and high unemployment levels is not popular at all. Numerous local authorities choose to take action in relation to climate change, but their resources are limited by the impacts of the economic crisis. The potential investments of SMEs are constrained by difficulties in obtaining bank credits. The transition from carbon-related energy systems towards a new energy paradigm based more largely on renewable energy sources is affected by the levels of necessary investments and by constraints of profitability. The international harmonization of policies is also a difficult issue which generates distortions.

The progressive emergence of new economic growth and the creation of significant amounts of new jobs after a few years generate however trust in the strategy related to the "Green Economy", so that more and more businesses and households invest, with encouraging returns on investment. This leads to a mass effect which ensures sustained economy growth and strengthens social cohesion.

In the demographic sector, fertility rates are subject to a revival, favoured by the positive economic evolution, but their impact remains a long-term one. The shortage of population of working age in a growing number of regions favours the immigration of qualified manpower.

Territorial impacts of the proactive scenario

The territorial impacts of the pro-active scenario change somewhat over time. During the first phase (5 to 7 years) growth is concentrated on metropolitan areas, especially in Western Europe, because of significant investments in advanced technologies. In a second stage, production activities related to the "green economy" diffuse towards cities of second and third level and also towards regions of central and eastern Europe as well as towards the more peripheral regions of Western Europe.

The scenario favours, in the second stage, a higher degree of polycentricity of settlement systems than the reference scenario, especially with regard to regional cities, showing that specific contexts favour more polycentricity than others.

In addition to economic aspects, the adoption of the Green Economy has important impacts on the morphology and organization of cities. More compact urban forms are being developed in order to take advantage of the expansion of public transport networks.

The use of electric cars is increasing, but more slowly than expected, because of limited autonomy and technical issues. Hybrid cars appear as a more flexible option, despite higher fuel price. Urban expansion, driven by economic development, remains however more contained and compact than in the referenced scenario, the greening of cities and the further development of ICT limits the motorized mobility for working and leisure purposes. Favourable economic development, including the provision of jobs with medium level qualifications, has a positive impact on social cohesion.

A significant number of rural areas benefit from the "green economy", especially in the field of renewable energy sources (biomass, solar and geothermal energy etc). The positive economic climate favours the development of the residential and tourist economy which is beneficial to small and medium-sized cities as well as to rural areas with an attractive natural and cultural heritage. This is helpful in maintaining services and containing outmigration trends. It also counteracts the negative impact of the further liberalization of agriculture in providing additional resources.

Territorial impacts on the Latin Arc

The scenario is favourable to the development of technology poles situated along the "Latin Arc". The strengthening of R&D activities generates spin-off effects in the production sectors. In the context of the "Green Economy", the development of solar energy is booming along the "Latin Arc", from R&D activities down to the general implementation of related technologies in rural areas and cities. An increasing share of electricity needs is being covered by domestic production of solar and wind energy.

The realization of the "Union pour la Méditerranée" (UPM) is possible because economic growth in Europe is significant. The scenario provides good conditions for its implementation, especially for the development of complementarities and partnerships between the European Mediterranean regions and countries of the southern and eastern parts of the Mediterranean Basin. The metropolitan areas of the "Latin Arc" benefit significantly from this multilateral initiative. The "Latin Arc" is less subject to immigration because of stronger economic development in North Africa. A larger part of the immigrants of working age are integrated into the regional labour markets of the "Latin Arc" which are expanding.

The adoption of electric cars and the stronger use of public transport contribute significantly to the improvement of air quality in the compact and polluted Mediterranean cities. Traffic congestion diminishes up to a certain extent.

2.1.3.3.The Defensive scenario

The scenario assumes a slow recovery from the crisis in the western economies and in Japan, resulting from a weak reactivity to the changing context and also from less favourable global conditions. Global demand remains modest. In the USA, domestic demand is much weaker than before the crisis because households put higher priority on savings than on consuming on credit. The BRIC maintain their comparative advantages

in low-cost production, a factor which also constrains the development of their domestic demand because of low wages. They however progress also in more technology-intensive sectors, competing more intensely with Europe. Few foreign investments are made in the less developed countries of the world, so that new external markets hardly emerge. Inflation is lower than in the reference scenario because of low wage policies in Asia with global deflationist impacts. Low interest rates feed new speculative bubbles, threatening the stability of the global economy. The maintain of the dollar as reserve currency works in the same direction.

Europe does not invent a new technological paradigm and fails to modernise significantly its productive activities, so that productivity progress is weak. Because of insufficient public support and modest mobilization of economic actors and civil society, the Green Economy cannot make a breakthrough. The profitability of investments in the sector is uncertain. Low and not well coordinated carbon taxes have no significant impact on energy systems, the traditional ones remaining powerful. Service activities do not significantly qualify, with low-profile businesses, such as call centres, being largely represented.

In the medium range (5 to 7 years) European exports are maintained, but they comprise a large share of products with modest added value. In addition, employment is artificially protected. A significant example is the strong public support to motor car industries, despite an existing production overcapacity of 20% in Europe. Cost-competitive policies are maintained in central and eastern Europe in order to attract FDIs. Their impact is however limited. While employment remains relatively well protected in the medium range, the situation worsens afterwards because of insufficient competitiveness in the global context. Exports are slowing down and unemployment increases. More European businesses are taken over by non-European groups, which look for short-term profits and for the appropriation of technology. When the profits of such businesses are then declining because of the lack of investments in R&D and in productivity improvements, they are left out by the new owners. The European population declines in the long-range, the natural evolution being negative and immigration being strictly controlled.

Territorial impacts of the defensive scenario

In the medium range, changes in the regional patterns are modest. The catching up process of Central and Eastern Europe is however significantly affected by the fall of FDIs after the crisis of 2008/2009. The European settlement pattern is not significantly modified.

Important territorial changes take place however later on. The competitiveness of a number of activities in the sectors of agriculture, manufacturing industries and services is then declining because of insufficient adjustments and productivity-related investments. The process of decline shows similarities with the economic crisis of 2008/2009. The regions most affected are those with fordist and neo-fordist manufacturing activities. A significant number of rural regions are confronted with serious problems of decline of yields from agriculture and loss of jobs in small, no more competitive manufacturing

industries. The non-emergence of the Green Economy hinders the development of alternative activities in the production of renewable energy. Investments in this field remain dispersed and insufficiently profitable. The depressed economic situation does not favour the development of the residential, patrimonial and tourist economy in rural areas. The result is that outmigration from numerous rural regions intensifies, not only in central and eastern Europe. Population ageing increases significantly and demographic decline affects numerous rural regions in the long-range. The differentiation of rural areas accelerates.

New service and manufacturing activities concentrate mainly in and around metropolitan areas in order to minimize risks. There is not sufficient economic potential and elasticity in the economy for a more polycentric development of settlement systems. Interregional migrations, which are more intense than in the reference scenario, favour large cities. Medium-sized and smaller cities which are not under metropolitan influence and the economy of which is strongly dependent upon manufacturing activities, are particularly affected. The internal evolution of metropolitan regions is raising concern. Urban sprawl accelerates under the influence of growth of population and activities and also of growing social tensions in the core cities. Social segregation, insecurity and criminality are growing in inner-city areas and densely populated suburbs, where unemployment is significant. Traffic congestion increases and the share of non-polluting cars remain low.

Territorial impacts on the Latin Arc

Under this scenario, the perspectives of development of the "Latin Arc" are less favourable than under the reference scenario. The lower level of public efforts in the field of research and technological development do not enable the technology poles of the "Latin Arc" to generate spin-off effects and to efficiently contribute to the modernization of the regional economies. Manufacturing industries in the "Latin Arc" based on low and intermediate technologies are affected during the second phase, while the potential existing in the field of solar and other renewable energy sources is only modestly exploited. This is also detrimental for rural areas, which are confronted, in addition, to the decline of agricultural activities and to depopulation trends. The stagnating European economy handicaps the development of tourist functions and of the residential economy along the "Latin Arc".

New activities concentrate mainly in metropolitan regions, adding to congestion and urban sprawl. External immigration is further strictly controlled, but illegal immigration continues nevertheless, because of unfavourable economic conditions in North Africa and low progress in the Union pour la Méditerranée. Second level cities and medium-sized towns benefit much less from development. A number of them are affected by the decline of manufacturing activities.

3. Quantitative scenarios at Nuts-2 level

3.1. Quantitative scenario Assumptions

Quantitative scenarios come from the translation of the integrated scenarios of Section 2.1 into a quantitative model which is able to represent the results at Nuts-2 level of the European patterns of growth in the scenarios.
Nuts-2 foresights for the whole Europe are necessary in this project since they allow to predict economic growth rates under different scenarios for the various regions taking into account:

- the macroeconomic conditions, which affect all Europe and the various countries, so that the growth rate of any region is not independent from the one of its respective country and the one of Europe;
- the effects of regional interactions, since no region is a world apart but its growth rate also depends on its interactions with neighbouring regions.

The model which is used to produce these foresights is the MASST2 model, which is described in detail in Annex 2 to the report. Its main characteristics consists in the fact that it is composed by a national component, able to consider the macroeconomic variables which affect the economy at national and international level and a regional component which is able to consider the regional specificities and the regional interactions.
The main output of the MASST2 model is the GDP growth rate for each Nuts-2 region of the EU-27; other regional outputs are the population growth rates and the employment growth rates.

In order to produce foresights with the MASST2 model, the qualitative hypotheses of the integrated scenarios need to be translated into quantitative assumptions, i.e. hypotheses on the actual value that some exogenous variables will take at the end of the simulation period (i.e. in 2025).
These are called the quantitative levers of the model, and can be observed in Table 3.2.1., where reported is the correspondence between the quantitative assumptions and the levers which are touched in the model.

For example, the attenuation of the deflationary effect of Asia on the world economies is reflected on different assumptions in the value of inflation within the EU, with inflation assumed higher in the Pro-active scenario, where BRIC countries move towards technology-intensive activities and the deflationary effect disappears, and lower in the Defensive scenario where the deflationary effect is strong.
Another example is the qualitative assumption of the Dollar as the reference currency. If the Dollar is no longer the reference currency (as it is the case in the Pro-Active scenario), the exchange rates of the European currencies, and the Euro in particular, revaluate.
The same mechanism also works at regional level, with in addition the possibility to introduce differentiations by type of region. For example, the assumption of population

aging is translated in quantitative assumption in the MASST through an increase of the mortality rate and a decrease of the fertility rate.
Finally, some hypotheses act at sectoral level, so that the hypothesis of the Defensive scenario that low-level activities dominate is reflected by a relatively higher growth rate of low level service activities and a relatively lower growth rate of open sectors.
In this way, the quantitative scenarios presented here are fully consistent with the qualitative scenarios of Section 2.1: the quantitative exercise allows to test whether the logic expectations that are presented in the qualitative scenarios are confirmed by a strictly ligical and consistent macroeconomic model.
The Hypotheses which are inserted in the MASST2 model are presented in the Annex, as well as how they are translated in the three scenarios. In next section the analysis of the forecasting results will be presented.

Tab. 3.1.1.-Link between the qualitative and the quantitative assumptions in the MASST2 model.

Qualitative assumptions	**Quantitative levers of the model**
Towards a regionalised globalisation:	
- deflationary effect of Asia on world economies attenuated	- change in the inflation target;
- Recovery of some manufacturing activities in Europe	- change in European average growth rate of some sectors
- Stability of international financial order	- change in interest rates in the EU;
- Investments from BRICs	- change in the share of FDI attracted by Eastern countries.
- Limited trade increase	- Change in the constant of the export and import growth equations;
- Technological investments and productivity in Europe	- Change in unit labour costs
- Reserve currency	- Change in exchange rate
- Internal demand in US, BRIC and J	- Change in real growth GDP in those countries
- Quality of the service sector	- Change in the share of service activities
	- Change in the share of S&T employees
Rise in energy price	- change in energy prices in the EU;
A new paradigm: "the green economy"	- change in European average growth rate of some sectors
	- change in the share of different professions;

3.2. Scenario Results

3.2.1. National results

The simulations with the MASST model under the hypotheses of Section 3.1 have produced results at national and regional level.
The aggregate results of the three scenarios can be seen in Table 3.2.1., for each country of and all other entities of interest for this project.

The MASST model in the reference scenario projects a national GDP growth rate for the European Union 15 old member countries (around 2% yearly) which is slighly lower with respect to the one observed in the past 10-20 years, because it consolidates the effects of

the crisis, but whose value is consistent in terms of magnitute (see Box 1). We remember that the reference scenario is not an extrapolative one, yet its hypotheses lead to the confirmation of the past trends.
For the New 12, the reference scenario is more expansive than for the Old 15, but probably not as much as in the past, since its hypotheses are not specifically in favour of the New Member States, whose convergence continue without being too strong.
The performance of Latin Arc countries is around the average of the EU 15 countries, since there are no hypotheses to differentiate it from the rest of the Western countries. Still some national differences emerge among Latin Arc countries, with the performance of Spain slightly higher than the one of France and significantly higher than the one of Italy.
Despite the homogenous assumptions, the three countries behave differently because of their other structural features.

Tab. 3.2.1.-National results of the MASST model: average annual GDP per capita growth rates over the period 2005-2025.

	Reference scenario	Pro-Active scenario (A)	Defensive scenario (B)	Difference between A and Reference	Difference between B and Reference
EU27	2.06	3.06	1.09	1.00	-0.98
- Old 15	2.05	3.05	1.08	1.00	-0.97
- New 12	2.29	3.38	1.20	1.09	-1.09
Latin Arc Countries	1.96	2.94	0.98	0.98	-0.98
- Spain	2.06	3.02	1.02	0.96	-1.04
- France	1.99	2.97	1.02	0.97	-0.97
- Italy	1.83	2.83	0.89	1.00	-0.95

For the New 12, the reference scenario is more expansive than for the Old 15, but probably not as much as in the past, since its hypotheses are not specifically in favour of the New Member States, whose convergence continue without being too strong. The performance of Latin Arc countries is around the average of the EU 15 countries, since there are no hypotheses to differentiate it from the rest of the Western countries. Still some national differences emerge among Latin Arc countries, with the performance of Spain slightly higher than the one of France and significantly higher than the one of Italy. Despite the homogenous assumptions, the three countries behave differently because of their other structural features.

The Pro-active scenario (A) is more expansionary for Europe as a whole, as well as for its countries. Eastern countries appear to benefit from it slightly more than Western countries, because of higher FDI and stronger demand. Latin Arc countries still performs around the average of the EU 15, with an average annual GDP growth rate which is 1% above the one of the reference scenario. The rankings among the three countries which compose it are unaffected, but it is Italy, the least performing country, the one which however takes an imperceptibly higher advantage from the assumptions of this scenario.

The results of the Defensive scenario (B) are as expected significantly less expansionary with respect to both the Pro-Active and the Reference scenarios. The New Member States continue to outperform the Old 15 countries, but convergence is much slower, since they are more negatively affected by the assumptions of this scenario with respect to the rest of the EU, in particular by the competition of BRICs in low-cost products. Latin Arc Countries are as negatively affected as the rest of the European Union in this scenario. For this reason, their performance is almost in line with the one of the Old 15 member countries. It is interesting to observe that, although the relative rankings of the three countries in terms of average annual GDP growth rates remain the same of the Reference scenario, the country which is most negatively affected is Spain, though it remains the best performing of the three. Defensive strategies appear hence to be particularly hard to sustain for countries which have developed a model of high growth in the past.

In our scenarios, Spain turns out to be the country which changes its development trends with respect from the past more strongly. This is clearly evidenced in the past and the short-run Eurostat projections (see Fig. B1 in the Box 1) that witness that the three Latin Arc countries have always been rather synchronized in their cycles, so that recessions tend to hit them similarly. In periods of growth, Spain has often outperformed both France and, especially, Italy (whose growth performance has been particularly disappointing) but in recent times it appears to be hit by the recent crisis more strongly than France and is projected by Eurostat to exit from the crisis more slowly with respect to the two other countries.

Several explanations can be given to this change of trajectory. First of all, the convergence process (in terms of per capita GDP) among the three countries has changed over time with France starting highest and remaining highest despite lowering its advantage over the rest of the EU. Spain, starting lowest, has been converging, but is now projected - by Eurostat - to suffer more than the two others from the crisis (see Fig. B2 in the Box 1). Real GDP, however is not the whole story and it is interesting to observe the convergence in terms of PPS per inhabitant. In particular, one can see a very bad performance by Italy, whose starting advantage has been eroded by inflation, and a very good one for Spain. As a result, in 2008 the disparities between the three countries had almost faded out with respect to the initial ones. This means that Spain is around the levels of France and above the levels of Italy. In this context, should a model project significantly different growth rates for the three countries in the next 20 years, it would determine an unlikely final result in which the convergence process is reversed and some countries end up being much richer than the others.

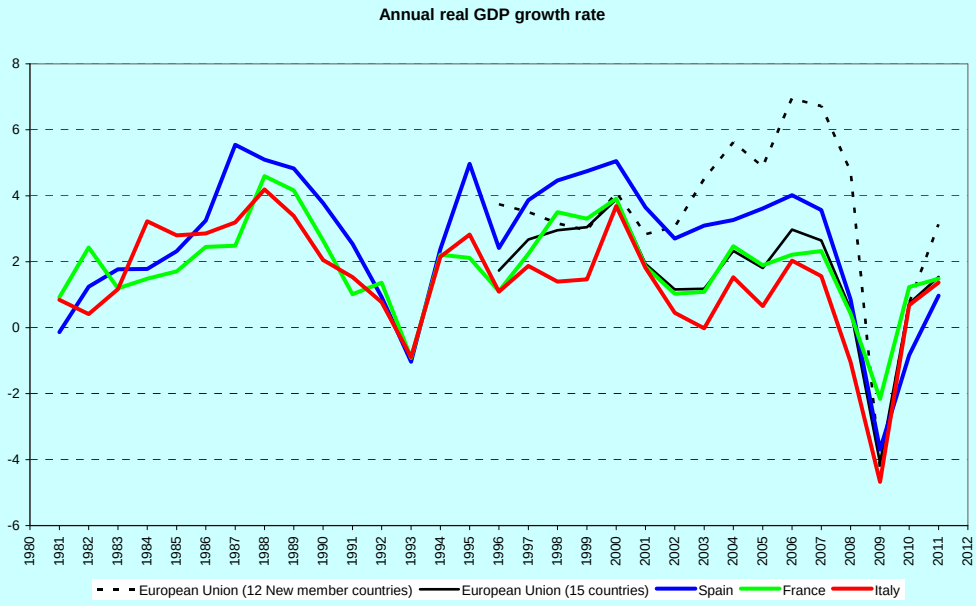
Moreover, in recent years there has been an inversion in the pattern of FDI. As far as Spain has become richer and converged towards the rest of the EU, it has shifted from being an attractor of FDI to a net exporter of capital. As shown with data from the World Investment Report (2009), in the period 1990-2000 Spain has been importing and exporting about the same amount of capital, whereas France has been a net investor outwards and Italy a very close economy. In recent years, all three countries, but

especially France and Spain, have been net exporters of capital, so that also this difference between France and Spain has faded out.

Box 1
Confronting the MASST results with past performances and short term forecasts

Having seen the results projected by the MASST model, we would like to compare them with the past performance of the European Union and the Latin Arc.
In Figure B1 it can be observed the real annual GDP growth rate (the same variable which is projected by MASST) from Eurostat statistics updated in November 2009.
Obviously, the data up to 2008 are actual data, whereas the ones for the following years are short term projections. It is important to remember here that the MASST does not perform projections (i.e. the most precise estimate of short term future growth), but rather foresights in long term scenarios, based on possible bifurcations.
In the table, it is possible to observe that the three Latin Arc countries are rather synchronized in their cycles, so that recessions tend to hit them similarly. In periods of growth, Spain has often outperformed both France and, especially, Italy (whose growth performance has been particularly disappointing) but now appears to be hit by the recent crisis more strongly than France and is projected by Eurostat to exit from the crisis more slowly with respect to the two other countries.

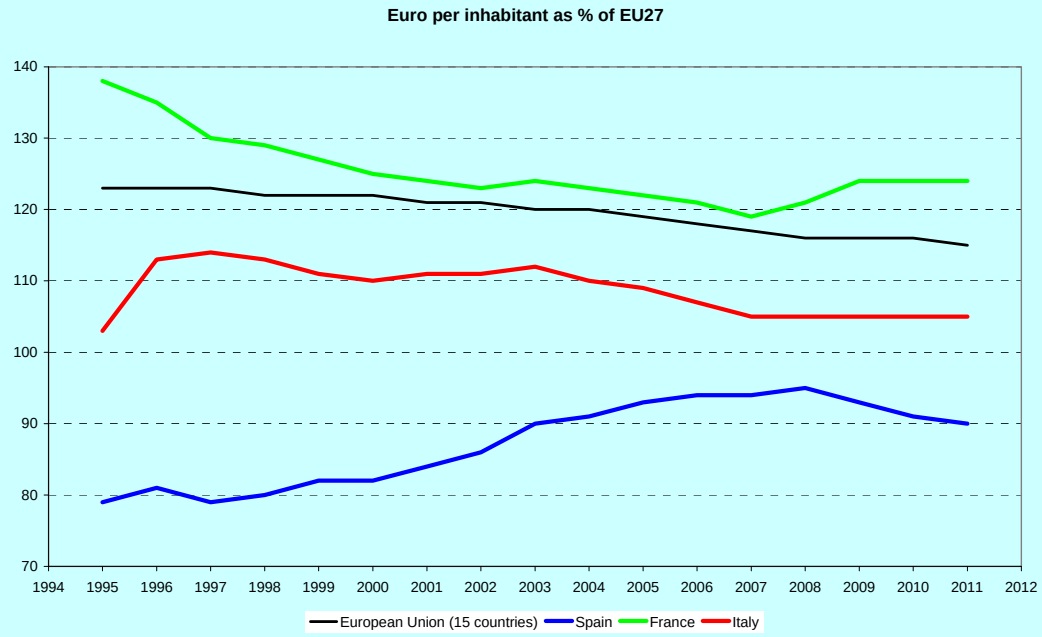
Fig. B1: GDP growth performance of Latin Arc countries in the past and short-run Eurostat projections.



The MASST model projects that in all three scenarios the relative ranking of the three Latin Arc economies in terms of growth rate will remain the same of the past, i.e. Spain, then France and then Italy.
However, the differences projected by MASST are weaker than those of the past.

The first reason for this is the fact that the MASST provides with an average annual growth rate over 20 years, which is a long time span where also small differences may have a consistent effect.
The other reason is due to the fact that there has been a convergence process between the three countries which is probably going to slow down. In fact, as it can be seen in Figure B2 which represents the pattern of the GDP per capita with respect to the EU average, there has been a convergence process with France starting highest and remaining highest despite lowering its advantage over the rest of the EU. Spain, starting lowest, has been converging, but is now projected - by Eurostat - to suffer more than the two others from the crisis.

Fig. B2: Convergence of the Latin Arc countries in terms of real GDP per capita



Real GDP, however is not the whole story and it is interesting to observe the convergence in terms of PPS per inhabitant (Figure B3).
In particular, one can see a very bad performance by Italy, whose starting advantage has been eroded by inflation, and a very good one for Spain.
As a result, in 2008 the disparities between the three countries had almost faded out with respect to the initial ones. This means that Spain is around the levels of France and above the levels of Italy.
In this context, should a model project significantly different growth rates for the three countries in the next 20 years, it would determine an unlikely final result in which the convergence process is reversed and some countries end up being much richer than the others.

Beyond this consideration, one can look at the growth model of Spain, which has been so successful with respect to the one of the two other countries up to 2007. This model was based on a high increase of employment and lower increases of labour productivity;

moreover, the house bubble appears to characterize Spain much more than France or Italy, as signalled by the fact that the construction sector accounted in 2008 for 9.22% of GDP in Spain with respect to 5.11% for France and 5.36% for Italy (Figure B4), and by the fact that, in a period in which construction lost importance for the rest of the EU15, including France and Italy, only in Spain it increased its share.

Fig. B3: Convergence of the Latin Arc countries in terms of purchasing Power system

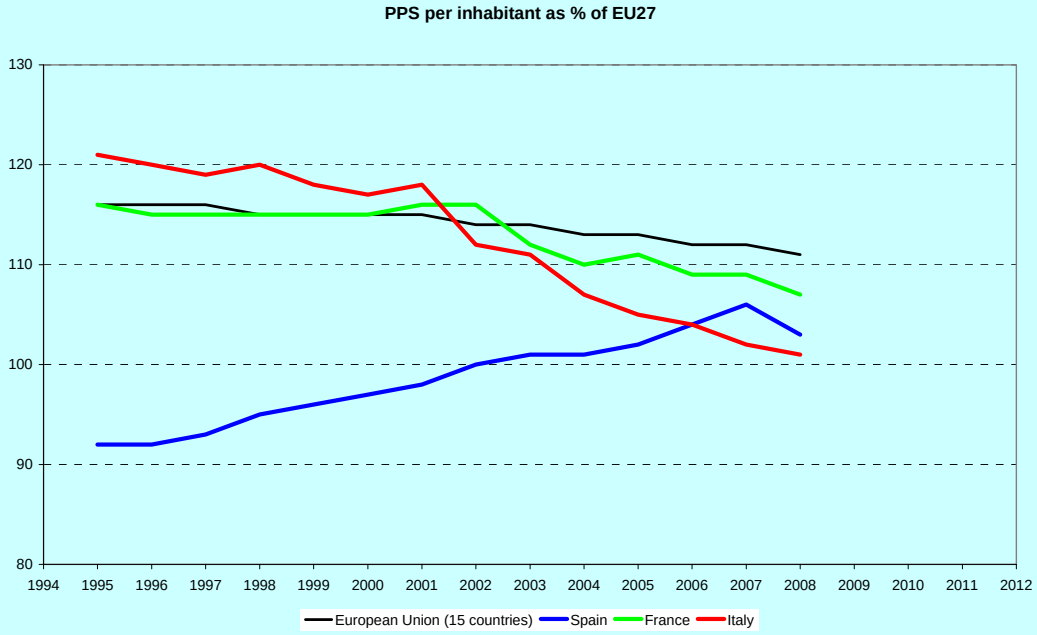
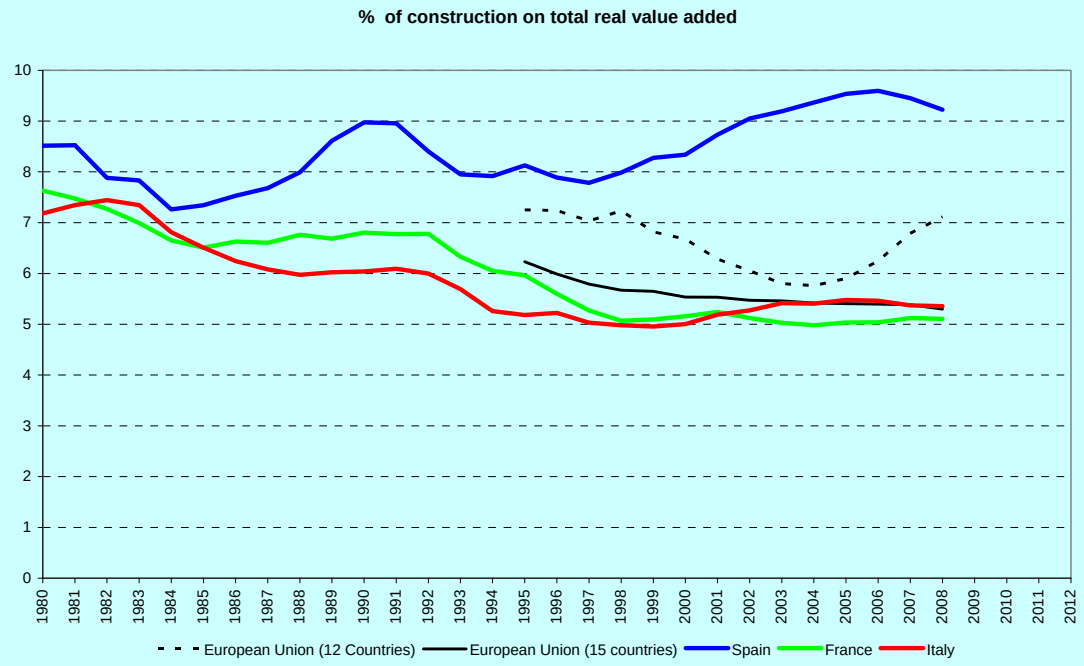


Fig. B4: Percentage of real value added generated by the construction sector



Finally, there is an inversion in the pattern of FDI. As far as Spain has become richer and converged towards the rest of the EU, it has shifted from being an attractor of FDI to a net exporter of capital. As shown with data from the World Investment Report (2009), in the period 1990-2000 Spain has been importing and exporting about the same amount of capital, whereas France has been a net investor outwards and Italy a very close economy. In recent years, all three countries, but especially France and Spain, have been net exporters of capital, so that also this difference between France and Spain has faded out. Doubts on the sustainability of Spain's outstanding performance already existed in 2007[3], and are more consistent now[4].

[3] See for Example: http://www.eurointelligence.com/Article3.1018+M5fffb2fbd30.0.html

[4] A. Torrero Manas (2009) La crisis financiera internacional. Repercusión sobre la Economía Española, Documentos de Trabajo Instituto Universitario de Análisis Económico y Social, 98/09, Universidad de Alcalà.

Tab. B1: Foreign direct investment (FDI) as a percentage of gross fixed capital formation (source: World Investment Report 2009)

		1990-2000 (annual average)	2006	2007	2008
Spain	Inward	10.9	9.9	6.3	13.9
	Outward	11.5	26.6	21.5	16.4
France	Inward	9.3	16.7	28.2	18.8
	Outward	19.6	25.9	40.1	35.2
Italy	Inward	2.2	9.9	9.0	3.5
	Outward	3.6	10.7	20.3	9.1

3.2.2. Regional results

The advantage of the MASST is its ability to produce GDP foresights for each Nuts 2 region of the European Union.
The following maps represent the annual average GDP growth rate at regional level, starting with the Reference scenario.

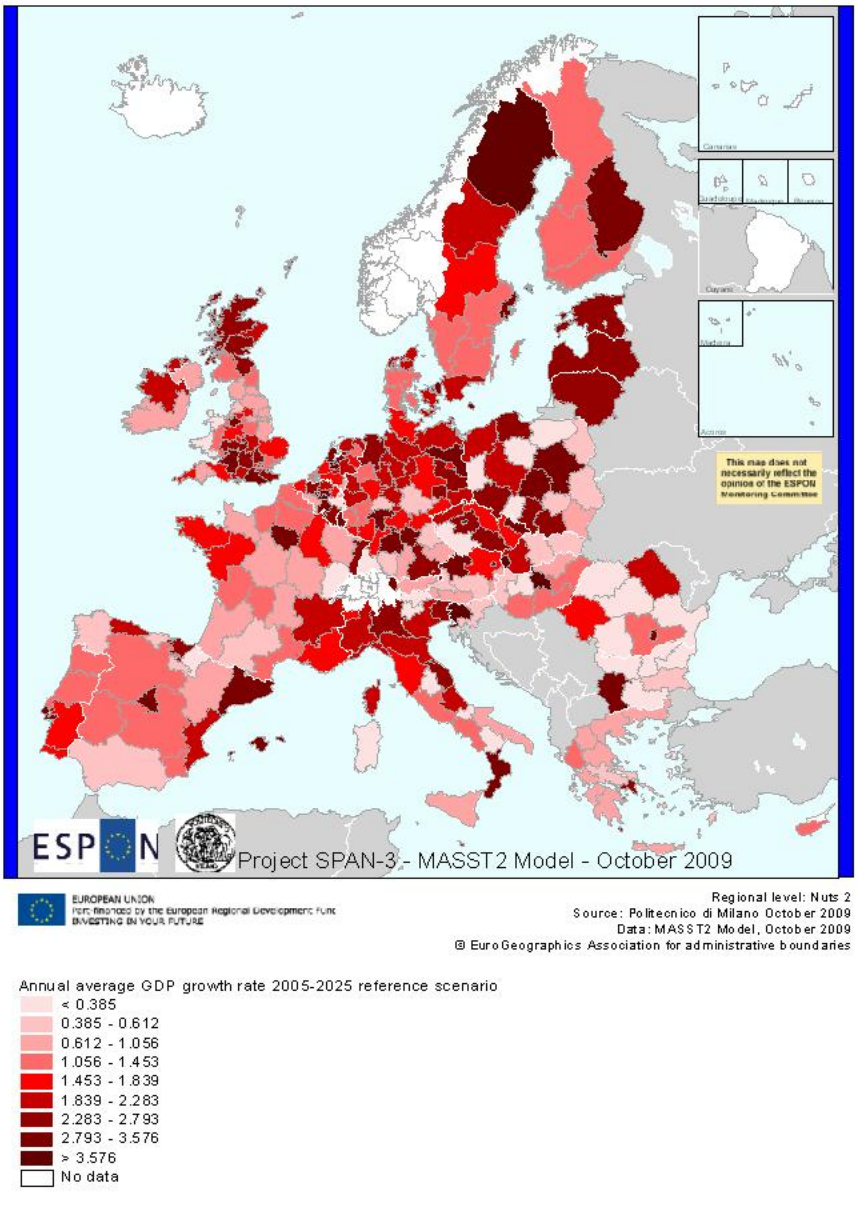
In the reference scenario (Map 3.2.1), the growth rates of European regions are highly differentiated, and the national results of Section 3.2.1. hide different patterns from different groups of regions.
The growth rate is positive for all regions, but while some considerably outperform the others, the growth in the others is sluggish.

Consistently with the thematic scenarios, one can observe that growth within countries will be a centripetal process, with the strongest areas as the leaders in all countries.
In Eastern Europe all capital regions, such ad Budapest, Sofia, Warsaw, are among the best performers overall, sometimes (as is the case of Prague, Bratislava and Bucharest) also pulling the regions just around them. Rural areas in the East are on the contrary sluggish, as all rural areas around Europe, being affected by the deregulation of CAP and increased international competition.

In the West, the first ranked regions are those which generally outperform the others, as shown by the performances of areas such as Stockholm, Copenhagen, Munich, Frankfurt, Brussels, Lisbon, Athens. However, second order areas are also thriving, as shown by the examples of Malmo, Hertfordshire, Edinburgh, Gent.
This pattern is confirmed in the Latin Arc. The highest growth rates within their respective countries are experienced by Ile de France, Lombardy, Madrid and Catalonia, but very high growth rates can also be found in second order economies, in regions such

as Valencia, Rhone-Alpes, Piedmont, Emilia-Romagna. The performance of Languedoc-Roussillon is intermediate, being the outcome of differentiated areas within.

Map 3.2.1.-Annual average regional GDP growth rates in the Reference scenario

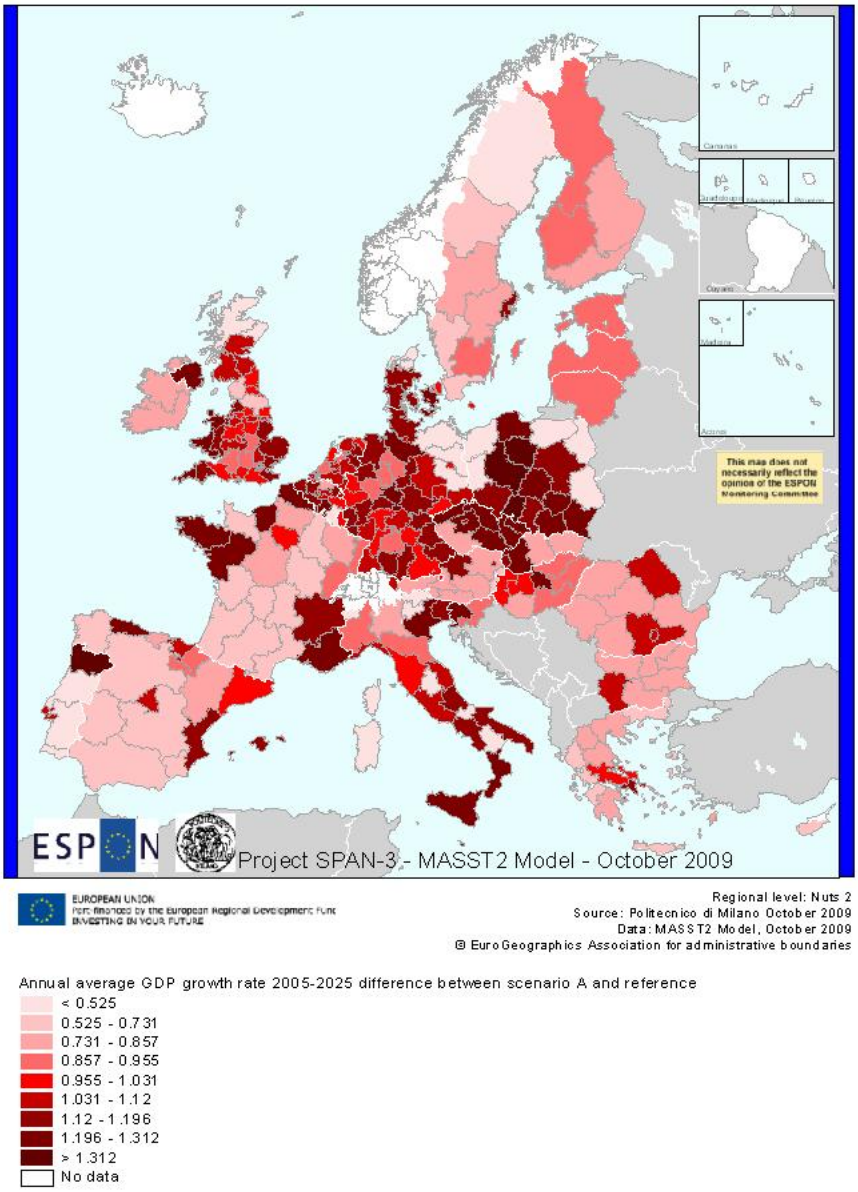


The Pro-Active scenario (Map 3.2.2.) is more expansionary for all regions of Europe, both in the West and in the East.
However, some regions benefit more than the others from the more expansionary hypotheses of this scenario.
In the New member countries, the areas which are more able to perform the technological leap which allows to be competitive in this innovative context are the core and capital ones, the only ones endowed with the human capital and technological ability to do it (e.g. Budapest, Prague, Warsaw).
Interestingly enough, especially in the West, it is not necessarily the first level core regions those which benefit more, but rather a number of second level areas. For example, Poznan in Poland, a large number of intermediate regions in Germany, Bruges and Gent in Belgium, Porto in Portugal, all register a difference of annual GDP growth rate with respect to the reference scenario which is higher than their respective capitals.
Notice however that this scenario, though it does not have the strongest regions as the clearest winners, is still a scenario in which the absolute numbers (mapped in the Annex for reasons of space) show a centripetal pattern.

For what concerns the Latin Arc, also in the Pro-Active the core regions are going well but the development spreads to second order poles.
In France, despite the good performance of Paris, Rhone-Alpes, Provence-Cote d'Azur, Haute Normandie, Bretagne and Pays de la Loire are those regions which take most advantage of the scenario.
In Spain, Madrid and Barcelona are doing very well, but the highest difference is reported in Valencia and Oviedo.
Also in Italy, the spread of development to secondary growth poles is even more marked, with very high differences reported in Veneto and Campania (the region of Naples).

Despite the good performance of second order regions, however, rural areas are doing bad in this scenario, since they have a positive but consistently lower performance both in relative and in absolute terms.

Map 3.2.2.-Annual average regional GDP growth rate: difference between the Pro-Active and the Reference scenario



The differences between the Defensive scenario and the Reference are reported in Map 3.2.3.

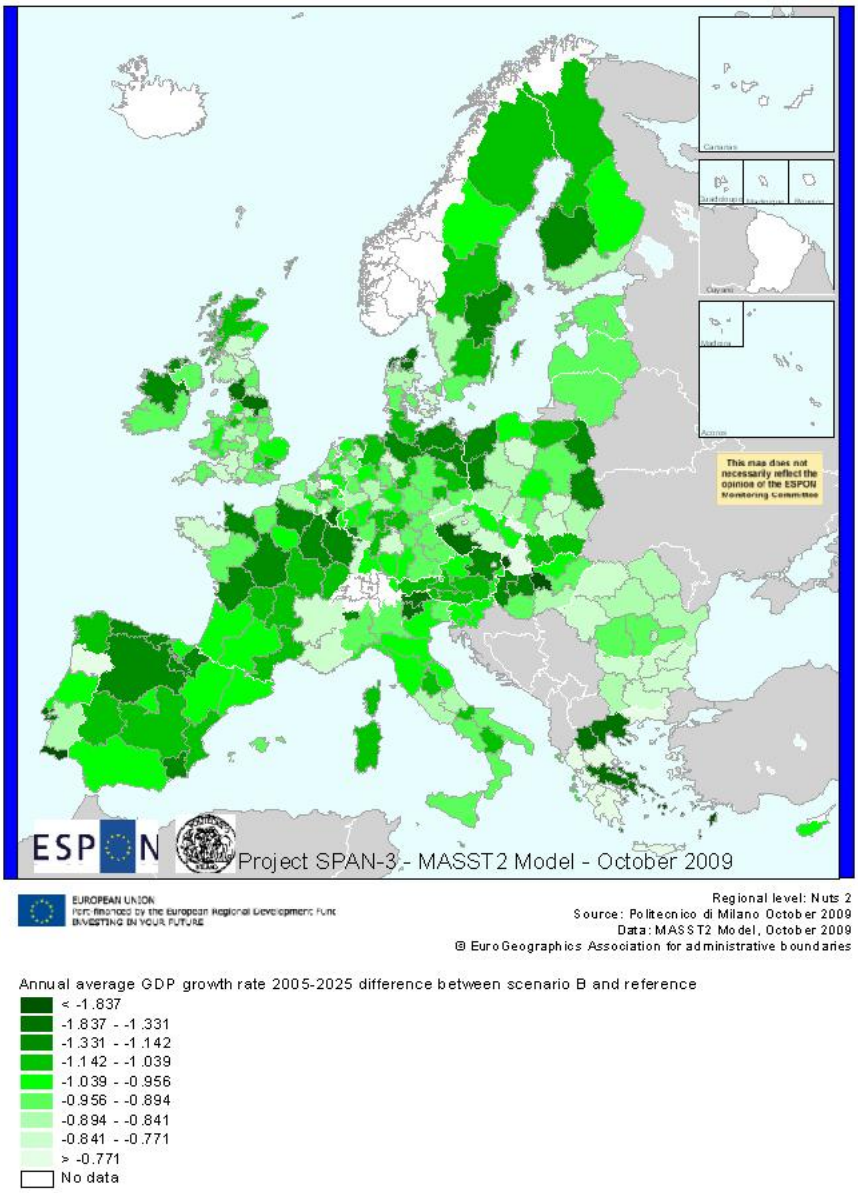
This scenario (see Section 2.1) is one which is characterized by low growth rates with concentration of development in the few highest level metropolitan areas. The MASST model obtains the same results.

First, it has to be observed that this scenario is less expansionary with respect to the Benchmark for all regions of Europe.

In particular, one can observe that, in the East, among the regions more able to survive the recessions are some capital ones, such as Bucharest and Sofia: especially in absolute

terms (mapped in the Annex for reasons of space), the growth rates in this scenario are significantly higher for Eastern metropolitan regions.

Map 3.2.3.-Annual average regional GDP growth rate: difference between the defensive and the Reference scenario



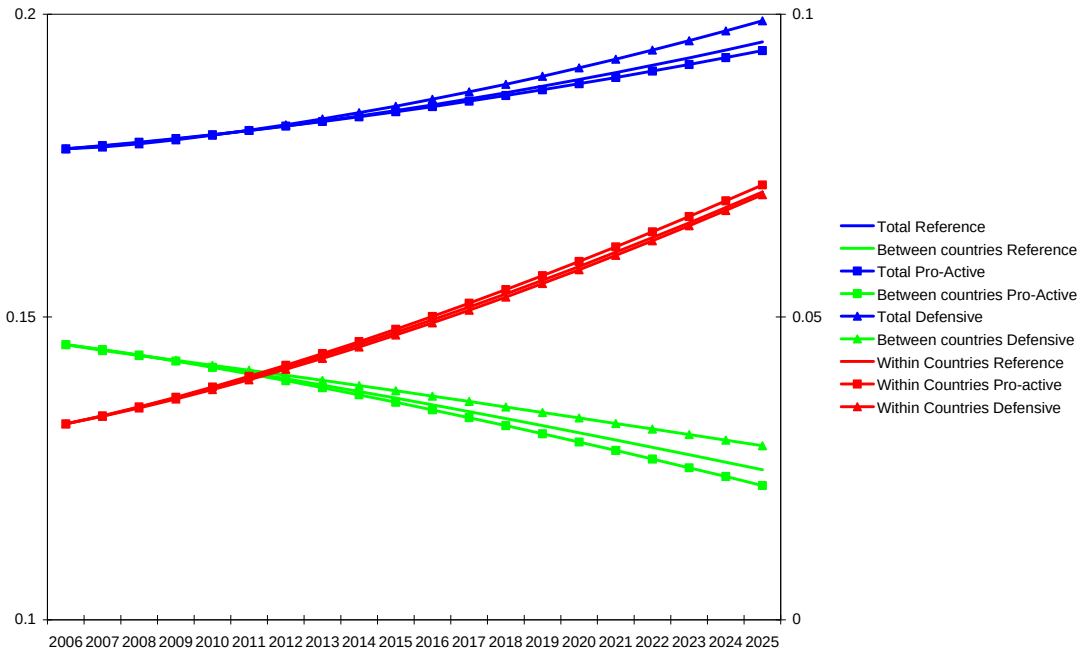
This happens also within the Latin Arc, where in Italy the best relative performance is the one of Latium, whereas in France it is the one of Provence-Cote d'Azur and Rhone-Alpes, but Paris is not the most negatively affected region.
In Spain, the differences are less marked but the regions which are better able to cope with the restrictive hypotheses are Madrid, Catalonia and Seville.

As a last consideration, it can be observed that this scenario is not in favour of rural areas. On the contrary, due to lack of demand for their products, insufficient investment and decline of manufacturing, these regions are those which lose more from this scenario.

3.2.3. Regional disparities

With the results of the MASST model it is possible to analyze the trends of regional disparities in the three scenarios.
To do this, we use the Theil index because it allows to disentangle the level of total disparities due to within countries disparities (i.e. intra-national disparities between regions of the same country) or due to between country disparities (i.e. the disparities between the various countries of the EU); both can be seen in Figure 3.2.1.

Fig. 3.2.1.-Theil index of regional disparities in the three scenarios



It can be observed that the total level of European disparities increases in all three scenarios, but especially in the Defensive scenario where only the most important metropolitan areas are able to react and weaker countries are often more negatively affected.
Distinguishing its two components, we can notice that the level of disparities between countries decreases in all three scenarios, whereas the disparities within countries increase. In fact, we foresight in the three scenarios (See Table 3.2.1. presented before) higher growth rates for those countries (especially the New Member States) which start with a lower GDP per capita. This is especially true for the Pro-Active scenario, where the growth rate is higher for all countries and especially higher for the Eastern countries.
Within countries disparities are lower (they are depicted on the rightern axis) but, differently from between countries disparities, they are foresight to increase in all three

scenarios, and slightly more in the Pro-Active one, where first and second level regions perform better than rural and peripheral areas.
The sum of the decrease of between countries disparities and the increase of within countries disparities determines the slight increase in total disparities.

4. QUANTITATIVE SCENARIO AT NUTS-3 LEVEL

4.1. The methodology

This chapter is aimed at developing a new econometric model at the province level that explains differential growth rates of provinces with respect to their regions according to territorial specificities (i.e. territorial capital) by transferring the logics and the working of the MASST model (Capello, 2007; Capello et al., 2008; Capello and Fratesi, 2009) from the regional level to the province level.
The methodology that we suggest in order to build scenarios at a more disaggregated territorial level than NUTS 2 foresees an important step in moving the quantitative results of the MASST model to the NUTS 3 level.
This step is developed thanks to the implementation of a simplified, extrapolative / comparative sub-model, called the MAN-3 (Masst At Nuts-3) model. The sub-model is built in a way that the main trends and driving forces present in each scenario are considered and included in the forecasting process, as well as the importance of the territorial specificities of the single regions of the three countries considered. The aspect of the MASST model that will not be replicated at NUTS 3 is the comprehensive interregional interaction logic of the whole model (with the international interregional spill-over effects) and the internal consistency of the macroeconomic forecasts.
The existence of these two models (MASST at NUTS 2 and MAN-3) has some advantages in the creation of the scenarios:

- MASST allows a more general and consistent scenario framework at NUTS 2, with a strong inter-linkage among all regions of Europe;
- MAN-3 allows the "fine-tuning" of the conditional foresights to the structural characteristics of the model

Particularly, the territorial capital elements we include in the sub-model are:

- local material inputs and resources, and share of tertiary activity;
- structural and sectoral resources and human capital;
- the territorial structure, captured through the settlement structure of region, is a good proxy to capture the role of agglomeration and urbanisation economies on regional performance, enabling parameters of the different explicative variables to vary across different settlement structures present in space, again emphasising the strategic elements, like agglomeration economies;
- social factors; although it is not simple to find empirical evidence of the economic role played by "social capital", some indirect measure have been proposed in the literature (Putnam, 1993). Following this literature we use the growth of the electoral turnout rate in the European elections as an indicator of civic duty and active population in public issues.

4.2. The Model

The model is a simulation model to **distribute the GDP growth rates** obtained by MASST at NUTS-2 level, among the NUTS-3 areas of each region for the three countries of Latin Arc (Italy, France and Spain).

The simulation model is based on a two step procedures:

1) An **estimate procedure** of the territorial elements that explain the relative growth of each NUTS3 with respect to its NUTS2;

2) A **simulation procedure** where independent target variables are formulated and the NUTS3 growth differential is distributed according to the estimations and the assumptions made on the target variables.

In the model we assume that the relative provincial GDP growth rates with respect to the region, depend linearly on the vector X_i of structural and territorial variables:

$$\Delta y_p - \Delta y_r = f(X_i)$$

In the analysis we use similar information for the three countries and we take the differences between countries into consideration by interacting the independent variables with the dummies of countries. In fact, the goal is to make the best use of existing information on the different structural elements that characterize sub-regional territories (their "territorial capital"), both those already taken into consideration in the MASST model and other ones.

According to the elements of territorial capital the explanatory variables are grouped into the four sets of factors: *the territorial structure, local material inputs and resources, structural and sectoral resources and human capital* and *social factors.*

In order to explain the territorial structure, we use the following dummies belonging to the first set of factors and interacted with different explicative variables:

- dummy for Coastal provinces;
- dummy for Rural provinces;
- dummy for Urban provinces
- dummy for Agglomerated provinces;
- dummy for Mega provinces.

The second set of factors is related to the local material inputs and resources and contains:

- *the share of services employees*, this variable is useful to capture the role of services in explaining the economic performance. We expect that this variable positively

affect the provincial performance since the service sector is on average a more value-added activity than manufacturing;
- *the share of craft and related trades workers,* which is used as a proxy of self-employment;
- *the share of touristic structures*; considering the geographic position and vocation of the Arc-Latin countries it is not possible to leave apart from tourism and its impact on the economic growth. Our expectation is that it positively affects the provincial differential growth;
- *the share of urban fabric*, its effects could be negative or positive, depending on the existence of congestion effects.

A third set of factors relates to:

- *the share of people with less than 20 years*, this variable can be thought as a proxy of future growth and it should positively affect the economic performance. In fact, young people are the most dynamic part of the population and ensure the basis of the economic growth;
- *the migratory balance*, a positive migratory balance helps those provinces which have a low fertility rate to have an adequate labour force. Moreover, it shows the attractiveness capacity of the territory. We expect that this variable also has a positive impact on economic growth.

Finally, as a proxy of social elements we use:

- *the electoral turnout growth rate in the European elections*, used as an indicator of civic duty and active population in public issues. The expectation is that the civic duty is positively correlated with the economic growth.

All variables are calculated in differential with respect to the relative region. The regression uses as dependent variable the average annual differential GDP growth rate 2001-2005, and all the independent variables are at the beginning of the period in order to avoid the problems of endogeneity and reverse causation.

Tab. 4.2.1. - Variables used by the MAN-3 model

Indicators	*Definition*	*Source of raw data*
GDP growth rate of province with respect to its region	The difference between Province (NUTS3) GDP growth rate and the Regional (NUTS2) GDP growth rate, in real terms in the period 2001-2005, computed from the nominal one, using national GDP deflators.	Eurostat
Differential of the share of services employees	The difference between the share of services employees at Nuts3 level and the share of services employees at NUTS2 level, in the year 2001.	Eurostat
Differential of the share of craft and related trades workers	The difference between the share of craft and related trades workers at Nuts3 level and the share of craft and related trades workers at NUTS2 level, in the year 2001.	Eurostat
Differential of the share of touristic structures	The difference between the share of touristic structures per Km2 at Nuts3 level and the share of touristic structures perkm2 at NUTS2 level, in the year 2001.	Eurostat
Differential of the share of urban fabric	The difference between the share of urban fabric at Nuts3 level and the share of urban fabric at NUTS2 level, 1986-1996.	Espon Database (Project 3.1)
Differential of the share of people with less than 20 years	The difference between the share of people with less than 20 years at Nuts3 level and the share of people with less than 20 years at NUTS2 level, 2001.	Eurostat
Differential of the share of migratory balance	The difference between the share of migratory balance on population at Nuts3 level and the share of migratory balance on population at NUTS2 level, 1996-1999.	Espon Database
Differential of the growth of the electoral turnout growth rate in the European elections	The difference between the the electoral turnout growth rate in the European elections at Nuts3 level and the electoral turnout growth rate in the European elections at NUTS2 level, 1994-1999.	NSD European Election Database

4.3. Econometric Results

The results obtained are generally in line with our expectations and interesting considerations emerge from the interactions of variables with the dummies of countries (Tab 4.3.1).

Tab. 4.3.1.-Results

Variables	
Provincial differential of the share of urban fabric	0.023***
Provincial differential of the share of the endowment of touristic structures	-2.885***
Provincial differential of the share of the endowment of touristic structures in agglomerated provinces	2.738***
Provincial differential of the share of the migratory balance	0.014***
Provincial differential of the share of people with less than 20 years	-0.000***
Provincial differential of the share of the endowment of craft and related trades workers	-1,220
Provincial differential of the share of the endowment of craft and related trades workers in "megas"	17.756*
Provincial differential of the share of the endowment of services employees	2,323
Provincial differential of the electoral turnout growth rate in the european elections (1994-1999)	-0.042
Provincial differential of the share of people with less than 20 years in Spanish urban areas	0.369***
Provincial differential of the share of the endowment of touristic structures in Spanish rural provinces	19.042***
Provincial differential of the share of the endowment of services employees in Spanish urban areas	12.300***
Provincial differential of the electoral turnout growth rate in the european elections (1994-1999) in Spain	2.905***
Provincial differential of the share of people with less than 20 years in French urban areas	0.002*
Provincial differential of the share of the endowment of services employees in French coastal provinces	-9.166***
Provincial differential of the share of people with less than 20 years in Italy	0.295***
Dummy for Italian coastals	0.291*
Constant	-0.171**
Number of obs.	222
R-squared	0.255
Legend: *p<0.1;**p<0.05;***p<0.01	

- the share of urban fabric has a positive effect. It means that provinces with a dense urban fabric grow more; generally speaking, there are economies of agglomeration and network effects. Cities grow to exploit economies of agglomeration, but large cities may attract problems of crowding and congestion. In this case the benefits of agglomeration economies outweigh the disadvantages and congestion phenomena do not work.

- unexpectedly, the share of the endowment of touristic structures is negative and significant. In spite of the positive effect of the variable multiplied by the dummy "agglomerated", the overall effect remain negative. It is difficult to explain this negative effect in these three countries. A possible reason is an excessive increase of touristic structures which has not been matched by a proportional increase in touristic flows.

Quite different is the effect of this variable in Spanish rural provinces, which is strongly positive, showing a new type of tourism, far from cities and close to the natural world;

- in analyzing *human capital,* as expected, we found that the migratory balance has a positive and significant effect such as the share of people with less than 20 years. This latter independent variable is significant for all countries as a whole and for each individual country. In fact, we can see that it is highly significant in French and Spanish urban areas and in Italy.

- the result on services employees is quite surprising because it has a non significant influence on GDP growth in the Arc-Latin countries with the exception of the Spanish urban areas, where the positive sign is certainly linked to the economic transformation towards the service sector. Of some interest is also the negative and significant sign in French coastal provinces which is probably correlated with the negative impact on economic growth of the endowment of touristic structures.

- an interesting result is linked to the share of craft and related trade workers. In fact, it is strongly positive and significant in mega cities, signalling that these areas are the best places for self-employment, thanks to their market dimension and the possibility of exploiting their relational capital.

- the electoral turnout growth rate in the European elections is not significant and negative for all countries, but it is strongly significant and positive in Spain. This result is explained because economic phases of growth increase civic duty and civic duty contributes to increase the economic growth in a virtuous cycle.

4.4. Scenario Assumptions

An additional step towards the construction of scenarios at NUTS-3 is the adaptation of the scenario assumptions defined at European level for the provincial level.

Table 4.4.1. presents in a schematic way the quantitative levers of the MAN-3 model for each qualitative assumption and the "translation" into quali-quantitative impacts of each lever in the simulation exercise.

Tab. 4.4.1. - Adaptation of the assumptions at provincial level

Qualitative assumptions	Quantitative levers of the model (relative to the national average)	Reference	Pro-active	Re-active
Terziarization of global economy and the advanced economic functions concentrating more and more in metropolitan regions;	*share of services employment*	**positive impact**	**positive impact**	**neutral impact**
Difficulties for regions affected by the housing crisis;	*Regions specialized in construction*	**negative impact**	**neutral impact**	**neutral impact**
The "Green Economy" and the recovery of manufacturing activities in Europe;	*Share of Craft and related trades workers*	**positive impact**	**positive impact**	**negative impact**
Effects of the crisis on tourist regions;	*Endowment of touristic structures*	**positive impact**	**negative impact**	**positive impact**
Deregulation of the CAP and trade liberalization in the context of the WTO;	R*ural regions*	**negative impact**	**negative impact**	**neutral impact**
Immigration flows from the Mediterranean Basin towards "Latin Arc" countries;	M*igratory balance*	**positive impact**	**positive impact**	**negative impact**
Stagnation of European demography and the intensification of the ageing process;	*Share of people with less than 20 years*	**negative impact**	**positive impact**	**strongly negative impact**
Diffusion of economic development in urban areas.	*Urban fabric*	**neutral impact**	**strong positive impact**	**strong positive impact**

In the reference scenario, the spread of globalization into regions helps the recovery of manufacturing activities in Europe. The process has a twofold effect. On one hand, there is an increase in manufacturing activities thanks to significant technological progress. This is to the advantage of developed regions and second-rank cities and metropolitan areas, although the effect is weaker in manufacturing areas with low or intermediate technologies and a relatively high intensity of manpower.

On the other hand, given the recovery of manufacturing activities, the tertiarization of the economy slows down. But services still have a positive effect on economic growth. These effects have a positive effect on both the *share of service employment* and the share of c*raft and related trade workers*, our proxy for entrepreneurship. For these reasons, in the simulation exercise these two factors positively influence the differential growth rate of a province compared to its region, but less in the reference and defensive scenarios than in the pro-active scenario.

In the proactive scenario, there is a rapid development of the "green economy" which creates jobs in R&D and manufacturing activities. The "green economy" also generates new opportunities for self-employment in non agricultural rural regions. In this scenario, the distribution of economic growth over regions varies as the share of craft and related trade workers varies.
In the defensive scenario these regions are negatively affected because the "green economy" doesn't make a breakthrough.

From the point of view of services, the proactive scenario is characterized by a movement towards higher added value segments, particularly concentrated in mega cities. So, in this scenario, provinces with a higher share of service employment grow more than the region as a whole, and provinces containing mega cities even more.
In the defensive scenario, these effects are weaker because new service and manufacturing activities are mainly concentrated in and around metropolitan areas, so medium-sized and smaller cities where the economy is strongly dependent on manufacturing activities are particularly affected.

In the reference scenario, the numerous tourist areas affected by the crisis show slow recovery, especially those based on mass tourism with low added value. This implies that areas with more extensive tourist infrastructure are harder hit. To reproduce this effect in the simulation, the *endowment of tourism structures* in each province is hit by a negative shock to change the distribution of regional economic growth between the provinces.
This mechanism also works in the defensive scenario, where the stagnating European economy handicaps the development of tourist functions and the residential economy along the "Latin Arc".
But in the proactive scenario, provinces having tourism structures are favored by the positive economic climate driving the development of the tourist economy. This is beneficial to small and medium-sized cities as well as rural areas with an attractive natural and cultural heritage. In the proactive scenario, the endowment of tourism structures contributes positively to distributing regional economic growth.

In the reference scenario, evolution in rural areas is contrasting and heterogeneous. Some rural areas benefit from the production of renewable energy, but rural regions specialized in agriculture are negatively affected by CAP reform and trade liberalization in the context of the WTO.
In the proactive scenario, rural agricultural regions are also negatively affected, because recovery from the crisis is rapid and favors manufacturing activities.

This is all the more true in the defensive scenario. Although the effects of CAP reform and trade liberalization are slower, a significant number of rural regions are faced with serious problems of decline in agricultural yields which is not offset by the development of alternative activities such as the production of renewable energy. Moreover, the depressed economic situation does not favor the tourist economy.

In a context of rapid population ageing where demographic factors may act as a constraint on labor markets, immigration plays an important role in driving economic growth. In the reference scenario, immigration is mainly concentrated in metropolitan areas, so the *migratory balance* has a positive weight in redistributing economic growth towards agglomerated areas.

The stagnation of European demography and the intensification of the ageing process also affect the role of young people in economic growth. Endowment of young people is a competitive advantage, because they are the most productive part of the population. This means that a province with a higher share of young people than other provinces has a greater share of regional growth, especially with the intensification of the ageing process.

Provinces specialized in construction are penalized in all three scenarios because recovery from the crisis is slow.

The importance of urban fabric and of the use of land is different between the scenarios. In the reference scenario, the urban structure remains about the same as present, with the same spatial division of economic activities between first and lower level cities. In the pro-active scenario, growth is diffuse and spills over from the core areas to secondary poles, which are only able to accommodate the activities which cannot be concentrated in the central areas if they are endowed with urban fabric. For this reason, in the pro-active scenario the share of urban fabric increases in importance in second order cities (i.e. urban regions) and remains the same elsewhere.
On the other hand, in the defensive scenario, growth is centripetal and only the most agglomerated areas are competitive and attractive for economic activities. So in this scenario the share of urban fabric increases in importance in agglomerated areas, because it gives rise to more opportunities, and remains the same in other areas.

4.5. Provincial Results

This section reports on growth rates of provinces in the three scenarios and compares rates between the proactive and reference scenarios and the defensive and reference scenarios.

Table 4.5.1. presents the average provincial growth rate in the three scenarios. Interestingly, the growth rate of Spanish and French provinces is higher than the average of all provinces, whereas the growth rate of Italian provinces is the lowest in all scenarios.

Analysis of the Latin Arc reveals that agglomerated provinces outperform the others, as well as coastal provinces. This is explained by the fact that many of the best performer provinces are on the coast. Rural provinces are the most penalized in all scenarios and in particular in the defensive scenario, in which they have a negative rate of growth.

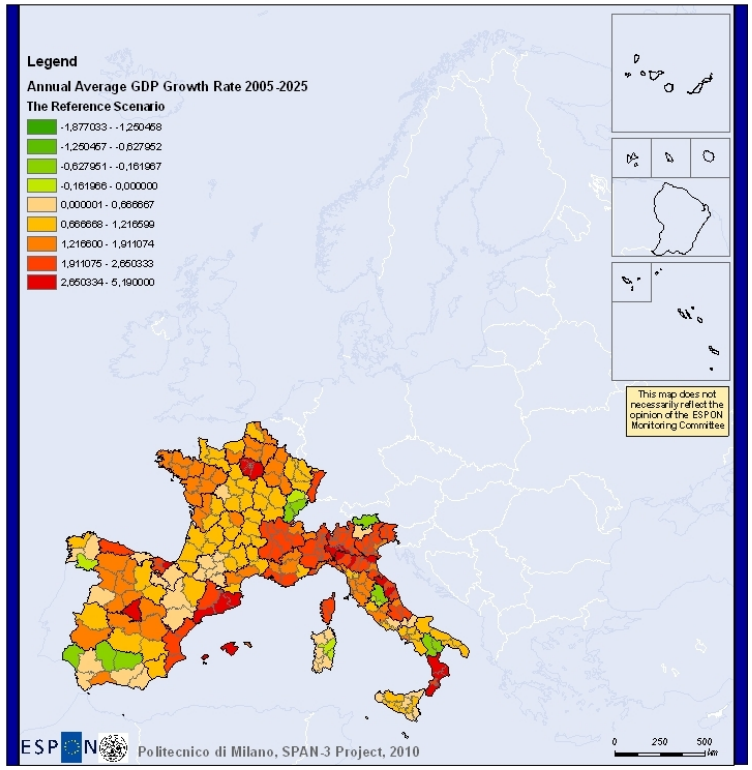
Barcelona shows a higher rate of growth than Hérault and Turin. However, Turin is the province that benefits more from the proactive in comparison with the reference scenario, and is also the province that is less affected by the defensive scenario. By contrast, Barcelona is the most affected by the defensive scenario.

Tab.4.5.1. – Average provincial growth rate

Average Provincial Growth Rate	***Reference***	***Proactive***	***Defensive***	***Diff Pro Ref***	***Diff Def Ref***
All countries					
- All provinces	1,96	2,94	0,98	0,98	-0,98
- Spanish provinces	2,06	3,02	1,02	0,96	-1,04
- French provinces	1,99	2,97	1,02	0,97	-0,97
- Italian provinces	1,83	2,83	0,89	1,00	-0,95
Latin Arc Provinces					
- All provinces	1,73	2,69	0,77	0,96	-0,96
- Urban provinces	1,70	2,51	0,69	0,81	-1,01
- Agglomerated provinces	1,88	2,98	0,96	1,10	-0,92
among which Megas provinces	2,03	3,17	1,12	1,14	-0,90
- Rural provinces	1,11	1,88	-0,01	0,77	-1,13
- Coastal provinces	1,84	2,89	0,90	1,05	-0,94
Barcelona	2,88	3,95	1,85	1,07	-1,03
Hérault	1,59	2,39	0,63	0,80	-0,97
Turin	2,23	3,32	1,42	1,10	-0,81

In the reference scenario (Map 4.5.1.), the growth rates of European provinces are highly differentiated. With regard to the typology of the provinces, agglomerated provinces benefit more than the others from the reference scenario, while rural provinces have the lowest growth rates.

Map. 4.5.1. Annual average GDP growth rate 2005-2025 in the reference scenario



By and large, peripheral rural and urban provinces, in particular those of the South and the North West of Spain, the South West of France, and the South of Italy are the worst performers. By contrast, provinces around MEGAs generally outperform the others.

Overall, provinces specialized in building and construction also have a lower than average growth rate. However, urban provinces benefit more than the others from this sector.

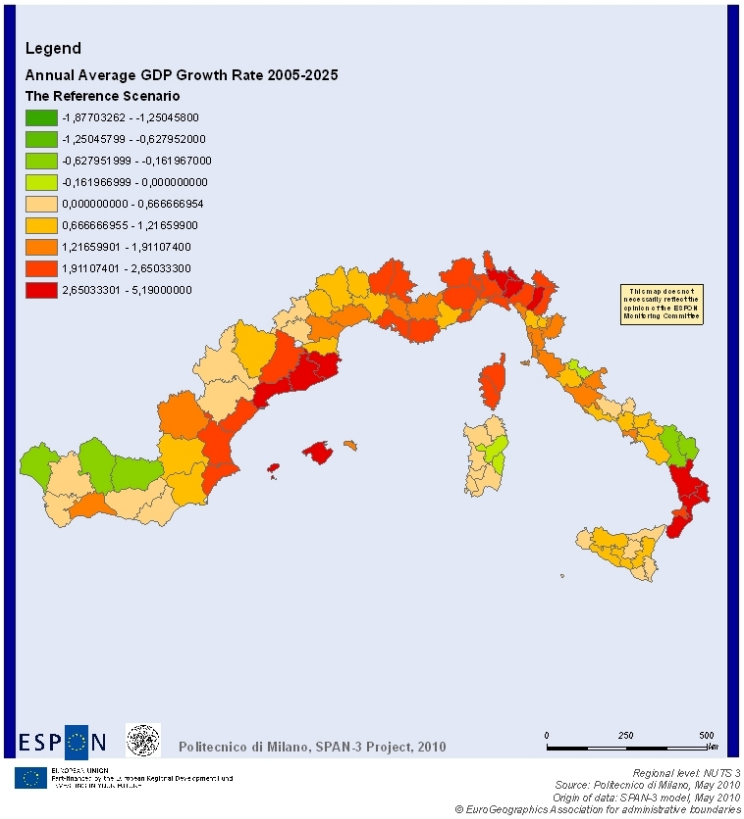
The growth rate of tourism provinces is higher than average. In this respect, it is interesting to underline that rural provinces specialized in tourism grow twice as fast as other rural provinces.

Although the agglomerated provinces show a positive trend, some interesting facts emerge from an in depth analysis. Growth rates are lower than 1.5% for all Italian agglomerated provinces and for Seville, Zaragoza, Malaga and Alpes – Maritimes. Moreover, growth rates are higher than 3% only in the French provinces of Ile de France, although Paris is an exception. Quite surprisingly, agglomerated provinces in France perform better than agglomerated provinces in other countries. With regard to other types of provinces, Spanish rural provinces have a higher growth rate than the other rural provinces and the Italian provinces are the best performers among urban provinces.

It is also interesting to note that development spreads outwards from Barcelona, Paris, and Milan to neighboring provinces which, in many cases, grow more rapidly. This is probably explained by congestion pushing activities towards second rank cities with similar services and generating a low cost housing market at the periphery of large cities. This is true only in part for Madrid and Rome, which grow more than their surrounding provinces.

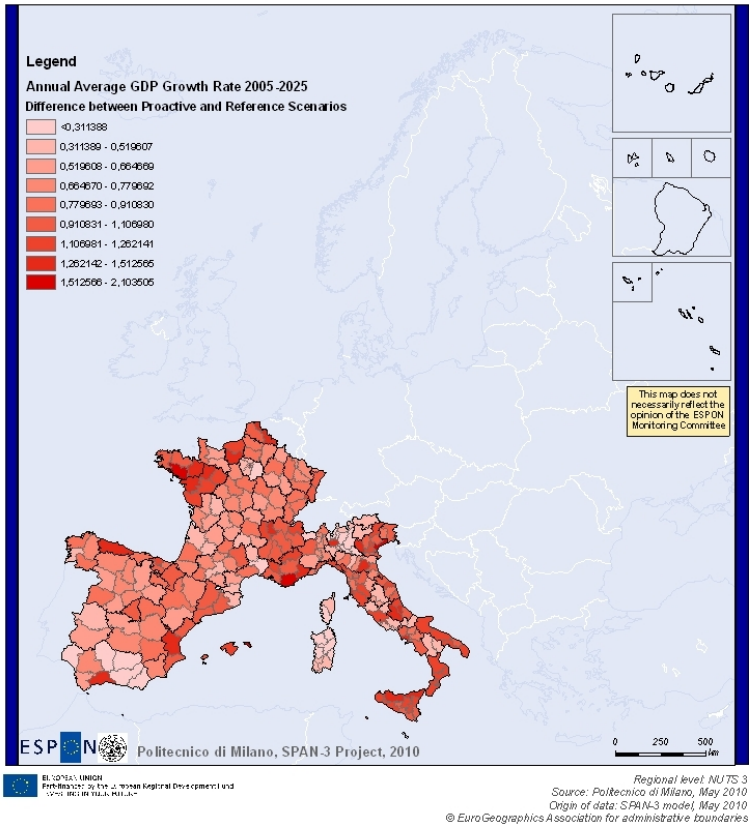
Many of the best performer provinces, excepting Madrid and the provinces of Ile de France, belong to the Latin Arc (see Map. 4.5.2.). Moreover, coastal provinces grow more than average. An interesting finding is that provinces in the Latin Arc specialized in building and construction grow more than average. In particular, the urban provinces outperform all the others in. This is due to the urban growth of the second rank cities which depends mainly on migrants. In fact, the Latin Arc has a strong potential to attract migrants (both nationals and foreigners), who may also be retired people. This is mainly related to the natural attractiveness of the Mediterranean coastal areas and of their hinterlands.

Map. 4.5.2.-Annual average GDP growth rate 2005-2025; the reference scenario in Latin Arc provinces



The pro-active scenario differs in many respects from the reference scenario and shows higher growth levels for all provinces. The differences between the pro-active and the reference scenario in terms of growth rates are shown in Map. 4.5.3.

Map. 4.5.3. -Annual average GDP growth rate 2005-2025; difference between proactive and reference scenarios



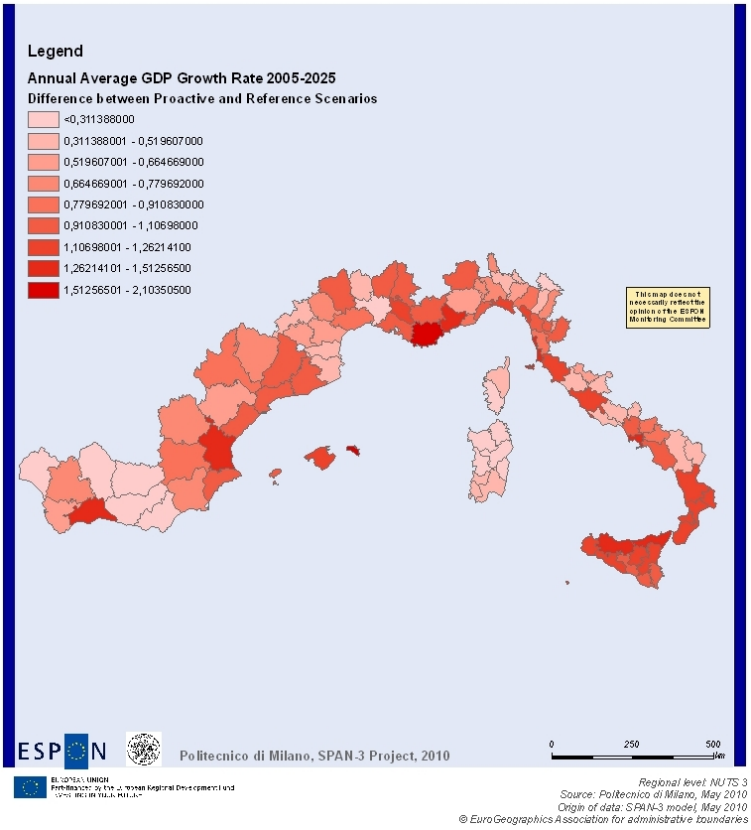
Provinces showing big differences between pro-active and reference scenarios include Rome, Madrid, and Paris, and other Megas such as Barcelona and Milan. Provinces with lower rates of growth also occur around Megas. This is the case of the provinces surrounding Paris, Milan and Rome, and also Bologna, Naples and Vizcaya. This happens because during the first phase (5 to 7 years) of the proactive scenario, growth is concentrated on metropolitan areas thanks to significant investments in advanced technologies. In a subsequent phase, "green economy" production activities spread towards second and third level cities and also towards the more peripheral provinces.

Interestingly, some provinces with a low rate of growth in the reference scenario benefit more from the pro-active scenario. This is the case, for example, of some Italian provinces in the Sicily region, the French provinces in the Franche-Comté region and Hautes-Pyrenees, Gers, Tarn-et-Garonne, Indre-et-Loire and the Spanish provinces Orense, Cantabria, La Rioja, Navarra, Huesca, Zaragoza and Salamanca. With the sole

exception of Zaragoza, all these provinces are rural or urban. This shows that as well as agglomerated provinces and capitals, the proactive scenario also favors rural provinces hosting the development of the residential and tourist economy and the "green economy", especially in the field of renewable energy sources (biomass, solar and geothermal energy etc) .

With regard to the Latin Arc, coastal provinces present bigger differences than other provinces between the proactive and the reference scenarios (see Map. 4.5.4.).

Map. 4.5.4. -Annual average GDP growth rate 2005-2025; difference between proactive and reference scenarios in Latin Arc provinces

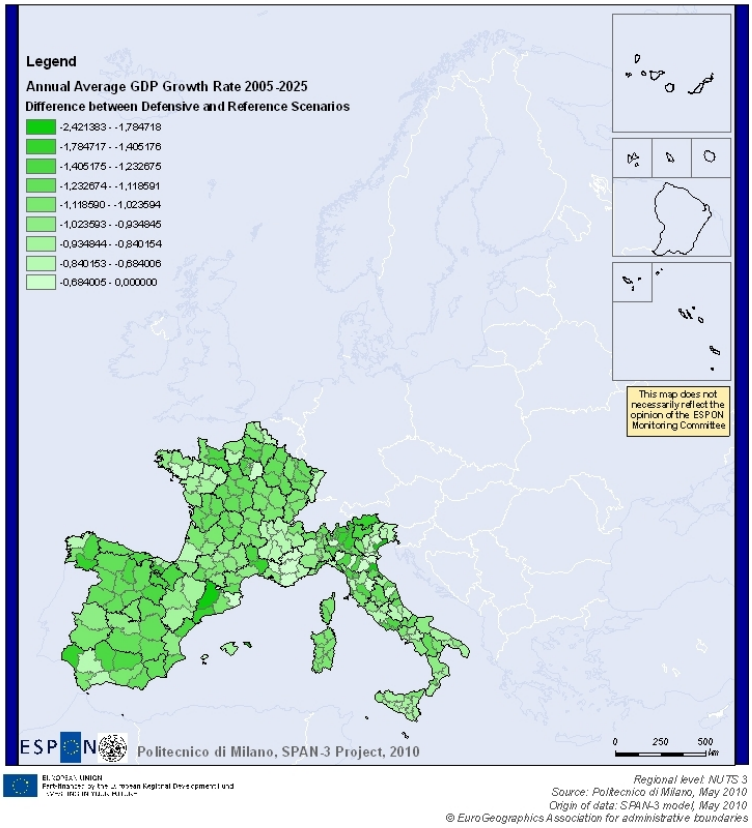


In the defensive scenario (Map. 4.5.5.) the most heavily penalized provinces are the rural ones which have an average rate of growth near to 0. In fact, in the defensive scenario, a significant number of rural regions are faced with serious problems of decline of yields in agriculture and job losses in small, no longer competitive manufacturing industries. Moreover, the "new paradigm" of the green economy sustaining the growth of rural provinces which emerges in the proactive does not emerge in the defensive scenario.

Nevertheless, some rural provinces with a smaller difference in growth rates between proactive and reference scenarios also show a smaller negative difference between

defensive and reference scenario. This indicates that they are not particularly penalized by the defensive scenario.

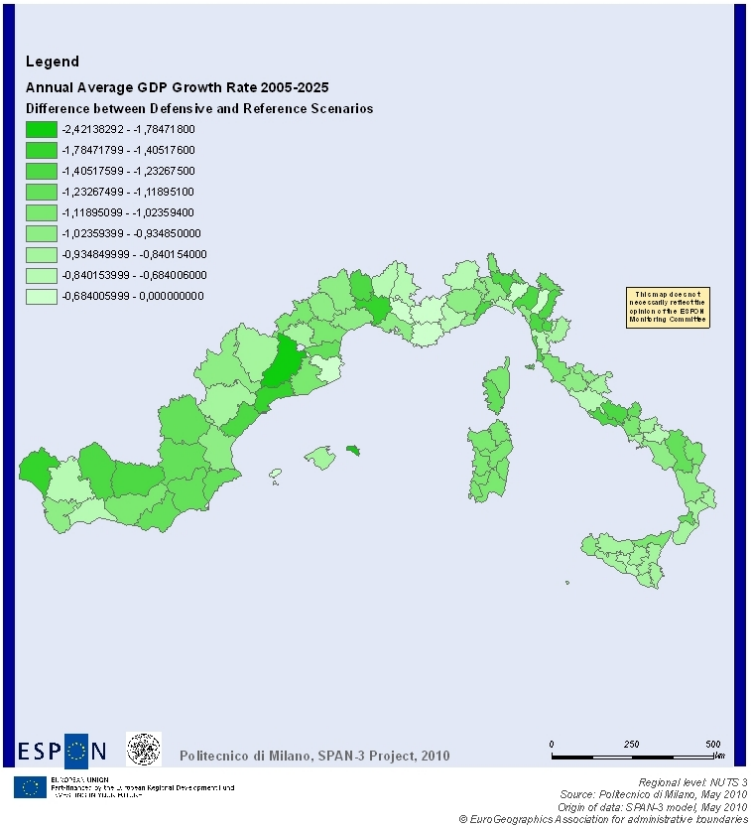
Map. 4.5.5.-Annual average GDP growth rate 2005-2025; difference between defensive and reference scenarios



Another interesting finding emerges from comparing the difference in growth in each scenario for each province with the average for all provinces. This reveals that some provinces showing a bigger difference in growth than average in the proactive scenario compared to the reference also have below average growth rate in the defensive scenario. This indicates that these provinces both benefit more from the proactive scenario and are more badly affected by the defensive scenario. This is the case of several provinces close to agglomerated provinces. It is due to the fact that in the proactive scenario they benefit from the growth of big cities that spread outwards, but in the defensive scenario, where the growth of big cities is more self-contained, they don't grow. These provinces include Lérida, Tarragona, Castellon de La Plana, Alicante, Oise, Loiret, Marne, Parma, Siena, Forlì-Cesena.

More generally, provinces showing a positive trend in the proactive tend not to lose out so heavily in the defensive scenario. This pattern is confirmed in the Latin Arc (see Map. 4.5.6.).

Map.4.5.6.-Annual average GDP growth rate 2005-2025; difference between defensive and reference scenarios in Latin Arc provinces



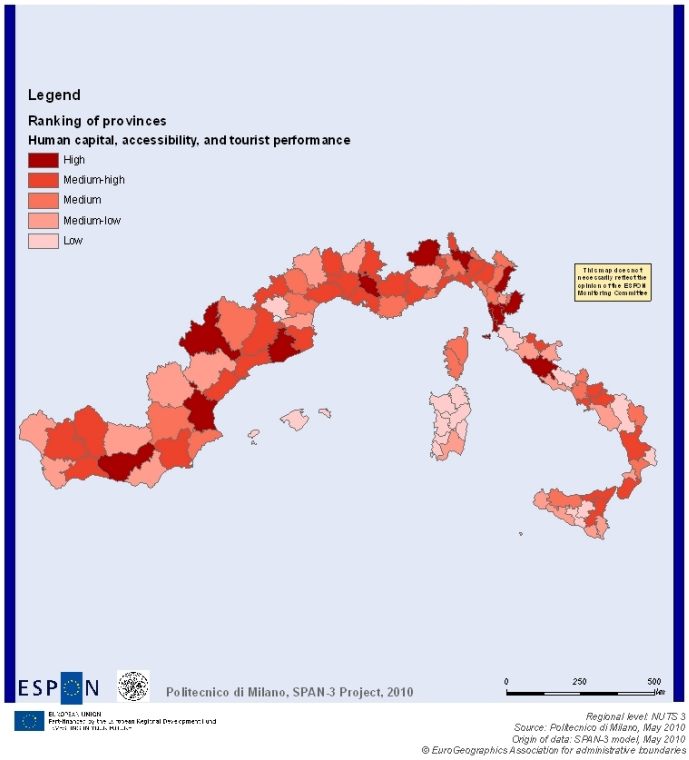
4.6. Fine Tuning on the Latin Arc provinces

Close collaboration with stakeholders allows us to fine-tune the econometric results. Making direct inquiries and gathering and interpreting indicators at local level enables us to identify elements which explain differential growth rates between provinces in the same region. Data on human capital, accessibility, and tourism performance are considered in this light. Provinces are ranked into five classes of endowment of these elements: High, High-medium, Medium, Low-medium, and Low.

In building the ranking we use seven indicators for accessibility, Length of road (km) per Km2, Length of railway (km) per km2, Time to the nearest motorway access by car from the capital or centroid representative of the NUTS3, potential accessibility air, potential accessibility rail, potential accessibility road, and potential accessibility multimodal (ESPON project 1.2.1). We use two indicators for Human Capital, percentage population of tertiary education (EUROSTAT-ISCED 5-6), and percentage population of professionals (EUROSTAT-ISCO 2), and one indicator of tourism performance, the growth rate of the total number of establishments, bedrooms and beds between 1997 and 2006 (EUROSTAT).

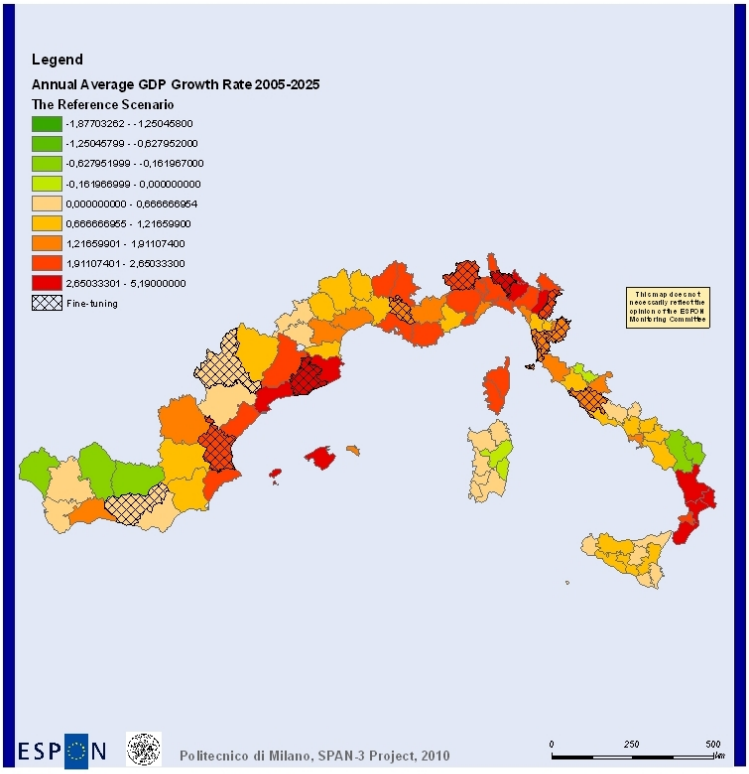
We ranked provinces for each indicator, then built a ranking for each of the three elements, human capital, accessibility, and tourist performance, and finally combined these three rankings into an overall one.
The results are interesting (see Map. 4.6.1.) and show that Barcelona and Turin are among provinces of the Latin Arc with the highest endowment of these three elements of territorial competitiveness. Hérault is endowed with a medium-high level of the three indicators.

Map. 4.6.1.-Ranking of provinces: human capital, accessibility, and tourist performance



On the basis of these results is possible to fine-tune the results of the MAN-3 model considering them as a staring point from which we increase the performance of provinces (see Map 4.6.2.).

Map. 4.6.2.-Annual average GDP growth rate 2005-2025; Fine-tuning of the reference scenario



5 BARCELONA STRUCTURE AND PERFORMANCE

5.1. Introduction: Barcelona, from industrial city to knowledge based metropolis

The Industrial Revolution in Spain starts in Barcelona in 1835 and until 1900 concentrated most of the manufacturing production of the Spanish economy. As a consequence of the Spanish protectionism, the economy of Barcelona experienced a technological and organizational slowdown with regard to the western European economies, especially during the isolation period (1939-1959) of the first stage of the Franco's dictatorial regime. Since the openness to the international economy in 1959, Barcelona developed a new productive manufacturing basis, with a central role for medium and small firms (PIMEs), and with an important presence of industrial multinational companies (French, German and Italian). The capacity of attracting population and activities led to an intense metropolitan dynamics. The crisis of the 1970's and the political transition meant for Barcelona the end of a development model based in a low capital intensive production, very intensive in low-qualified labour and basically oriented to a protected domestic market.

Since the entry of Spain in the European Economic Community (extension of markets and the attraction of external capitals) and the nomination of the city of Barcelona to host the Olympic Games, both in 1986, Barcelona has experienced one of the most intense processes of economic and urban transformation in Europe. Barcelona grows very significantly in population, economic activity and employment. The provision of transport and communication infrastructures expands extraordinarily (airport, expressways, university equipments). The metropolis of Barcelona experiences a great leap in scale to a polycentric metropolis of 4.8 million people when the expansion of the old industrial cities meets with the expansion of the city of Barcelona.

From 1997 on, a new municipal strategy centred in the notion of "Barcelona as a city of knowledge" began. This made possible that the city of Barcelona continue to lead the economic and urban transformation of the city. A new urban policy of transformation of land uses is deployed with the target of changing industrial uses into uses for knowledge-intensive activities: the project 22@barcelona, which pursues the transformation of the Poble Nou neighbourhood, the fisrt old industrial area where the industrial revolution took place. Furthermore the urban and infrastructural transformation continues: opening of Diagonal Avenue up to the sea, enlargement of the airport and the port, diversion of the river Llobregat, High speed train and new subway lines. This strategy is currently spreading out to the rest of the metropolitan area. Nowadays, Barcelona is considered one of the ten largest metropolises of the European Union and it shares with Lyon the territory on the eleventh Mega Region of the planet.

5.2. Macroeconomic performance until 2007

Barcelona has a productive basis oriented towards the foreign market (the rest of Spain, the UE and the rest of the world) which is supported on a business network in which the average dimension of production establishments is low. Regarding the foreign market as a whole, the exportation basis shows a surplus, since the large surplus with the rest of Spain balances the commercial deficit with the rest of Europe and the world.

Barcelona has a competitive economy that increases its quota of market in the external exchanges. Between 1986 and 2007 Barcelona's production and employment grew intensely, but the growth of the aggregated productivity was not very high. This low productivity growth reflects a production function not very high intense in capital and with a relatively low use of human capital. In the last ten years the low growth of aggregated productivity can be basically explained through the increase of the activities related to the building sector, which shows a low productivity growth (negative in some years). Conversely, the growth of the industrial productivity between 2004 and 2007 is very intense.

One of the explanatory factors of the competitive success of the economy of Barcelona relies on the existence of agglomeration economies. Their extension is a consequence of the growth of scale economies (partly due to the fast development of transport and communication infrastructures), urbanisation economies (enlargement of the metropolis and large productive diversity), localisation economies (especially those linked to activities of high- knowledge economy) and the existence of network economies (synergies and complementarities).

5.2.1. Population

The province of Barcelona is one of the largest NUTS 3 regarding its total population (5.416.000 inhabitants). The metropolitan region of Barcelona is the tenth largest metropolis in the UE (OECD 2009). The population has still steady during the 1990s in about 4.6 million inhabitants. However, between the years 2000 and 2008 the population has rose to 5.4 millions, with 16% accumulated growth rate. This rapid growth of the population from the year 2000 is due to the attractiveness of foreign born (non-Spanish) population. Foreign born population of the province rose from 150,000 in 2000 (3.2% of the population of the province) to 660,000 in 2008 (12.2% of the population of the province) with an accumulated growth rate of 440%. This attractiveness is due to the existence of a dynamic labour market. However, the labour market of the province of Barcelona is characterized by a dual structure: a core of workers with permanent contract and high costs of redundancy, and a rising periphery made of young people and new foreign-born residents with unstable and precarious contracts and low costs of redundancy.

5.2.2. Gross domestic product

The evolution of production (GDP) between 1986 and 2009 shows several differentiated stages: fast growth between 1986 and 1992, a severe recession between 1993 and 1994, recovery and intense growth between 1997 and 2007, and again a severe recession from the second trimester of 2008 until now.

EUROSTAT series allows to compare the production of the province of Barcelona with the rest of Spain from 1995 (first year available of the homogeneous series). Thus, in 1995 the GDP per capita of the province was 13,900 euro (95% of the UE-27, which was 14,700 euro). After 12 years (2006 is the last year available of the homogeneous series), the GDP per capita of the province rose to 26,300 euro, about 111% of the UE average. As a consequence, there was a process of convergence in GDP per capita of about 16.4%, this is, about 1% every year. In fact, when the data are expressed in PPA, the figure raises to 123% UE average.

Tab. 5.2.1. - Gross domestic product (GDP) at current market prices at NUTS level 3.

Euro per inhabitant

	1995	2000	2005	2006	Growth 1995-2006, units	Growth 1995-2006, %
eu27 European Union (27 countries)	14,700	19,100	22,500	23,600	8,900	60.5%
eu15 European Union (15 countries)	18,085	23,186	26,761	27,970	9,885	54.7%
es Spain	11,600	15,700	20,900	22,300	10,700	92.2%
es51 Catalunya	14,100	19,100	24,800	26,300	12,200	86.5%
es511 Barcelona	13,900	18,900	24,800	26,300	12,400	89.2%

Millions of euro (from 1.1.1999)/Millions of ECU (up to 31.12.1998)

	1995	2000	2005	2006	Growth 1995-2006, units	Growth 1995-2006, %
eu27 European Union (27 countries)	7,012,911	9,201,967	11,061,982	11,671,360	4,658,449	66,4%
eu15 European Union (15 countries)	6,740,683	8,763,924	10,396,375	10,924,332	4,183,649	62,1%
es Spain	456,495	630,263	908,792	982,303	525,808	115,2%
es51 Catalunya	86,084	119,225	170,109	184,035	97,951	113,8%
es511 Barcelona	64,994	89,838	127,021	136,880	71,886	110,6%
es511 Barcelona over eu27	0.93%	0.98%	1.15%	1.17%	0.25%	26.5%

Source: Elaborated from Eurostat.

5.2.3. Employment and sectoral structure of employment

The dynamism of employment between 1986 and 2007 is rather impressive in the province of Barcelona: from 1,852,000 to 2,775,000 jobs and 50% accumulated growth rate in 20 years. It could be said that is one of the most intense processes of growth of employment in the recent UE history. Employment growth has been continuous, with the exception of 1993-1994 and after 2007 (where the growth rate is negative about 10%).

Regarding the sectorial structure of employment between 1995 and 2006, two trends can be observed. Firstly, the relative growth has been positive in all the sectors (24% in manufacturing and energy, 29% in construction and 55% in services). Secondly, growth is particularly intense in the services sector. This means that, against the opinion of most of the analysts, the growth of the province was not based on the construction sector that created 129,000 new jobs, but by manufacturing (116,000 new jobs) and particularly by the tertiary sector (602,000 new jobs). Notice that in this province and metropolis initially based on industry, there is a distinct growth of employment in export-oriented sectors: manufacturing and (tourist) services.

Tab. 5.2.2. - Employment by sector, Barcelona prov. 1996-2008, thousands.

Per 1,000 employees

	1995	2000	2005 (P)	2006 (P)	Growth 1995-2006	Growth 1995-2006, 1995=100
Agriculture, hunting, forestry and fishing	23	29	31	34	11	148
Energy	12	12	13	14	2	119
Industry	486	620	612	602	116	124
Construction	126	194	228	255	129	203
Services	1,206	1,446	1,777	1,871	665	155
Total Employment	1,852	2,300	2,660	2,775	923	150

(P) Provisional
Source: CRE, INE

5.2.4. Productivity (low productivity growth)

Despite the impressive growth of production (GDP) and employment, productivity growth has been low. It was negative between 1997 and 2001, slightly positive from 2002 to 2005, and close to zero in 2006-2007. This is, almost all the growth of production has been explained by the growth of employment, particularly by the fast growth of sectors where productivity tend to rise slowly. Manufacturing is the sector more related to the growth of productivity in the economy of Barcelona (and in Spain as a whole). However, the growth of productivity in this sector was only important between 2004 and 2007, and it is expected to be again significant in the new period of crisis (2007-2009).

5.2.5. Small firm size

One of the distinctive features of the economy of Barcelona is the small average size of firms and establishments. In other researches it has been observed that this size is quite similar to some economies of industrial basis as Japan and some European Mediterranean European countries, whereas the rest of the UE and USA tend to show an average size two or three times higher. About 97% of firms have less than 50 employees, whereas medium-sized firms add up to 2.3% and large firms are only 0.41%. The province of Barcelona has only 806 large firms and 433 are concentrated in the city of Barcelona (the data is inflated by a headquarter-effect in the city of Barcelona). In Catalonia, about 80% of large firms tend to concentrate in the province of Barcelona, particularly in the metropolitan region of Barcelona and the city of Barcelona. Medium and large firms have showed an intense growth in recent times. Thus, medium firms increased from 2,786 in the year 1996 to 4.517 in 2008. Large firms rises from 526 to 806.

5.2.6. External and internal trade

The exports of the province have grown 458% between 1991 and 2008, rising from 7,100 to 39,800 million euro (nominal values). Exports from Barcelona to the rest of the world have increased faster than the growth of the UE or the whole world's exports so that Barcelona has increased its contribution to the UE-15 trade and to the world trade. Imports have grown 307% between 1995 and 2008, rising from 15,400 to 62,900 million euro. Despite the higher relative growth rate of exports, the total value of imports has increased more than the value of exports so that the negative balance rose from 8,300 to 23,100 million euro (178% growth rate). However, after 2007 the crisis has reduced in a significant way the imports (contraction of the demand) whereas exports have maintained better. As a result, the negative trade balance has reduced.

The export rate was 69% in 1995 and still above 70% until 2002. The growth of the internal demand fostered imports so that the export rate decreased to 62% between 2005 and 2007. In 2008, the contraction of the demand caused a reduction of imports whereas the value of exports still steady. As a consequence, the export rate has grown again.

Catalonia and Barcelona are very open economies. Exports account for 30% of GDP if the rest of Spain is not taken into account, and 68% if it does. Openness measured as exports plus imports on GDP is about 70% and if the rest of Spain is included as a foreign country the rate raises to 130%. The share of foreign trade (abroad of Spain) on production is still growing. The main origins and destination of trade flows have not suffered significant changes from 1995. Around 80% of exports and 65% of imports goes and comes from Europe. The most important destinations are France, Germany and Italy. The most important suppliers of the Catalan economy are Germany, Italy, and France. It is noticed that 20% of the imports comes from Asia, where the share of China on the total imports has growth.

Barcelona has succeeded to increase the value of its exports and enhance its share on the world's trade from 1995. Although successful, this model continues to show two main

drawbacks: first, an important share of trade still based on cost differentiation; this type of competition faces the emergence of other cheap producers (in the UE or abroad) as well as the higher differential inflation of the Catalan and Spanish economy. Second, in global terms, productivity has no increased from 1995 and an important share of the exports are concentrated on weak demand products.

Catalonia is the region with a largest share regarding interregional trade in Spain. When external trade is consolidated with interregional trade, the negative trade balance of Catalonia and the province of Barcelona becomes positive. This contrasts with the important interregional negative balance of other provinces as Madrid. Thus, there is an outstanding pattern of regional specialization in Spain: whereas Barcelona produces goods and services for internal and external markets, Madrid seems to focus on the production of services for the rest of the country and exports Spanish savings to the rest of the world.

5.2.7. Foreign direct investment

Catalonia has consolidated itself as one of the most dynamic regions in Europe in attracting multinationals: more than 3,000 foreign multinationals, where 600 are manufacturing firms and more than 2,000 are services firms. The province of Barcelona shares a large amount of this multinationals. The most important FDI investments are concentrated in Motor vehicles, Electric materials, Chemicals and Food and beverages.

Around 80% of flows have origin or destination in OECD countries where 50% belongs to the UE-27. Despite this figures, Catalonia does not play the same role on FDI that on external trade in Spain. In the period 2000-2008 Catalonia accounts for only 13.4% of Spanish inflows and 11.4% of Spanish outflows. This is due to the fact that Madrid Stock Market is much more important than the Barcelona's one and concentrates most of the Spanish FDI flows.

Tab. 5.2.3. - International and Interregional trade.

A) International trade. Barcelona Province–rest of the world. Milion euro. 1991-2008.

Year	Export	Import	Balance (X-M)
1991	7.137	15.448	-8.311
2001	30.478	42.885	-12.407
2008	39.807	62.943	-23.136
2009	32.262	48.520	-16.257

Source: Elobarated from AEAT.

B) Interregional trade. Exports from Catalonia to the rest of Spain and Imports to Catalonia from the rest of Spain (milion euro), 2003-2007.

Year	Exports	Imports	Balance (X-M)
2003	43.560	25.725	17.835
2007	53.207	31.278	21.930

Source: Elaborated from C-Intereg.

5.2.8. Knowledge economy

Since 1990, Barcelona has experienced an intense change towards the knowledge economy. Employment growth in knowledge-based industries has been faster than in non-knowledge industries. Knowledge-based jobs double between 1991 and 2008 (from 398,000 to 796,000 jobs). This growth has been especially intense in services. Furthermore, Knowledge-intensive jobs have better resisted the effect of the crisis: in 2007 knowledge-intensive industries have lost 14,000 employees whereas non-knowledge-intensive industries have lost 84,000 employees.

On the other hand, the share of R&D on GDP of Catalonia and the province of Barcelona has rose from 0.79% in 1995 to 1.49%. The total growth of this ratio has been 0.59, slightly higher than the Spanish (0.48) and much more than the UE average (0.05). Despite this fact, R&D/GDP still lower than the UE average (1.85). About 63% of the expenditures in R&D belong to firms, which is more than the Spanish average (56%). Since 2004, there is a significant rise of government expenditures in R&D so that its contribution rises from 9.3% to 13.7%.

5.3. Effects of the crisis: 2007-2009

The analysis of the effect of the crisis on the province of Barcelona exceeds the scope of this report. Some basic facts can be, however, pointed out:

1. The economic crisis starts in USA at September 2007. Since the third trimester of 2007, the Spanish economy (including the province of Barcelona) declines, giving pass to a recession in the second semester of 2008.
2. Between the first quadrimester of 2007 and the third quadrimester of 2009, Barcelona's growth becomes negative (-4.7%) when until 2007 was growing at an annual growth rate of 3.6%,
3. This decline of the productive activity shows its consequences on unemployment rate (rises from 7.2% to 16%) and on employment (the city of Barcelona loss 4.15% of its jobs, the province loss 10.2%, Catalonia loss 9.91% and Spain 9.7%). This means that the effects of the crisis on the city of Barcelona are lower than on the rest of the province. Furthermore, the unemployment growth rate is higher than the destruction of employment. The labour market is quite flexible (external flexibility) and with an important cyclical sensibility.
4. The price of housing decreases 4.2% in the province.

5.4. An introduction to the territorial structure of the province of Barcelona

5.4.1. Basic facts

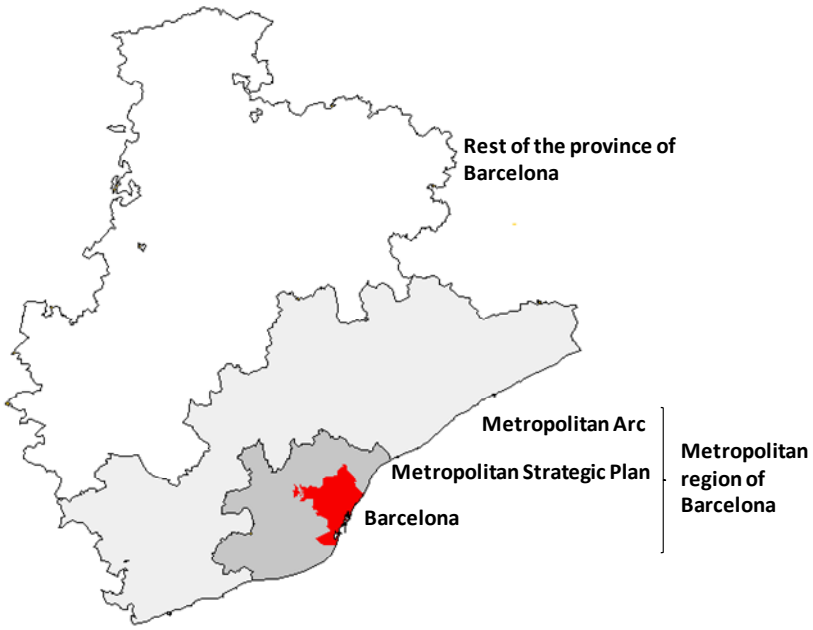
The province of Barcelona has an area of 7.700 Km2, with a population of 5.416.000 inhabitants and a density of 700 inhabitants/Km2. The most important city is Barcelona (1,615,000 inhabitants) and other four cities have more than 200,000 inhabitants: L'Hospitalet de Llobregat (254,000 inhabitants) and Badalona (215,000 inhabitants) are contiguous to Barcelona, whereas Terrassa (206,000 inhabitants) and Sabadell (204,000 inhabitants) are 25 kilometres far from Barcelona. Other important cities in the neighbourhood of Barcelona are Santa Coloma de Gramanet (117,000 inhabitants), Cornellà de Llobregat (85,000 inhabitants), Sant Boi de Llobregat (81,000 inhabitants) and El Prat de Llobregat (63,000 inhabitants). Other medium cities in the metropolitan agglomeration of Barcelona are Mataró (120,000 inhabitants), Sant Cugat del Vallès 76,000 inhabitants), Rubí (72,000 inhabitants), Vilanova i la Geltrú (65,000 inhabitants), Viladecans (62.573 inhabitants), Castelldefels (60.572 inhabitants), Granollers (60.122 inhabitants), Cerdanyola del Vallès (58.493 inhabitants) and Mollet del Vallès (51.912 inhabitants). The only city of more than 50,000 inhabitants located away from the metropolitan agglomeration is Manresa (75.000 inhabitants).

Inside the province there are at least three administrative levels: vegueries (Barcelona Metropolitan Ambit; Central Counties), *comarcas* or counties (Alt Penedès, Baix Llobregat, Barcelonès, Garraf, Maresme, Vallès Oriental, Vallès Occidental, Anoia, Bages, Berguedà, Osona and Solsonès) and municipalities (314 municipalities). Although recognised by the legal system and updated their boundaries, comarcas and veguerias are

a reminiscence of the ancient organization of Catalonia. Both are inappropriate for most of the current necessities of the XXI Century and, have only few tasks and reduced budget. In the case of veguerias, continuous territorial disputes and disagreements, as well as the fact that their use only is functional under the improbable case of dissolution of the provinces, makes it real use unlikely enough.

The real socioeconomic structure of the province is however quite different from the administrative proposals. Several points of view better serve to this propose in the concrete case of the province of Barcelona: metropolitan areas and local labour markets provides a good picture of the socioeconomic areal divisions of the province whereas the design of the networks of cities presents the structure of relations between the municipalities, which are the basic nodes in the province.

Map. 5.4.1.- Operative divisions of the province of Barcelona



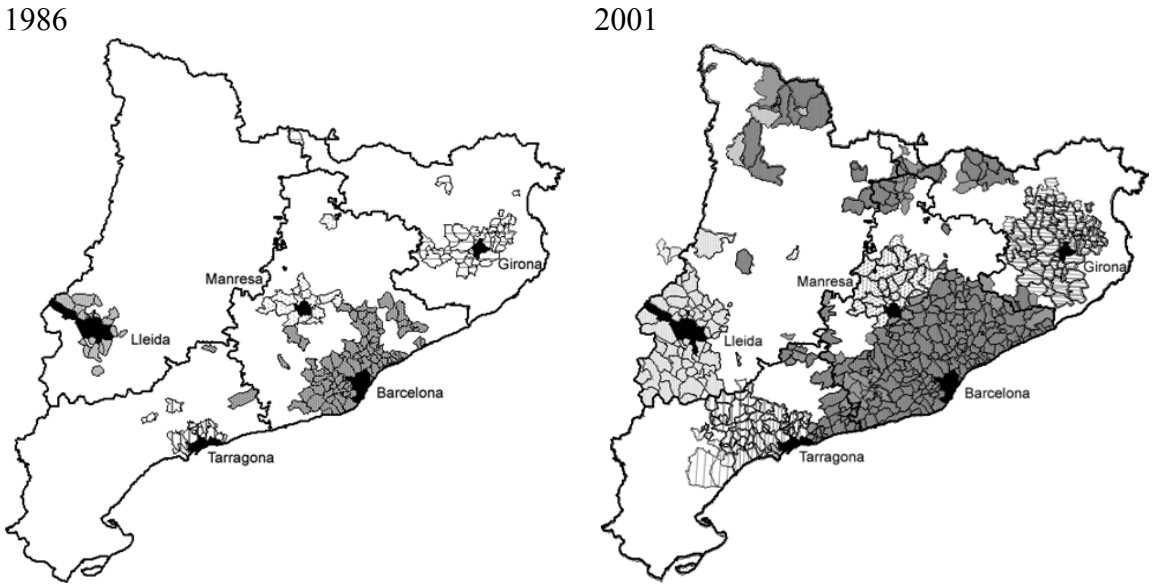
5.4.2. Metropolitan areas

The most outstanding division of the province of Barcelona is the differentiation between the metropolitan region of Barcelona and the rest of the province and the expansion of this metropolitan territory. In 1986 the Metropolitan Region of Barcelona began a process of economic and territorial expansion that led to it becoming one of the ten largest urban agglomerations in Europe, with a size similar to the 10th largest North American agglomeration (Washington) and ranked as one of the thirty largest metropolises in the OECD. The territorial expansion has arisen not from a process of hierarchical decentralization but rather as the effect of the increasing interaction between the urban continuum of Barcelona and a group of medium-sized cities that were old industrial centres (Mataró, Granollers, Sabadell, Terrassa, etc.).

The expansion takes place in several ways. Regarding its spatial dimension, the metropolitan region of Barcelona increased from 90 municipalities in 1986 to about 220 in 2006 and multiplied by three its spatial area. However, the spatial expansion basically stopped in 1996 because the boundaries of the metropolitan region of Barcelona achieved the boundaries of other metropolitan areas (also in expansion). As a result of the spatial expansion and a procedure of endogenous growth, the population of the metropolitan region of Barcelona increased from 3.56 million inhabitants in 1986 to 4.54 in 2001, and from 1.04 million jobs in 1986 to 1.85 in 2001. It is necessary to remark that after 1996 all the growth of population and jobs respond to endogenous factors since the number of municipalities does not increase.

Although the boundaries of the metropolitan region have been expanding until 2001, the most used definition for planning, proposed by the *Pla Territorial Metropolità* is quite similar to the 1991 real metropolitan region and covers 164 municipalities. The metropolitan region has currently 5.4 million inhabitants (91% of the province), 195,000 companies (91% of the province) and more than 2.4 million jobs (92.5% of the province). This area for planning is usually divided in two parts: the core or inner part of the metropolitan area, which mainly matches up with the area for the Barcelona Metropolitan Strategic Plan (Barcelona and other 35 surrounding municipalities) and the so called "metropolitan arc" or outer part (the other 128 municipalities).

Map. 5.4.2. - The process of territorial expansion of metropolitan areas in Catalonia. Iterative methodology. 1986-2001.



Source: Elaborated from Trullén and Boix (2000), Boix and Galletto (2004), and Boix and Veneri (2008).

The inner part of the metropolitan region is sometimes referred by some organisms as "the metropolitan area" so that we should be careful about the nomenclature. Most of this area forms an urban continuum and has currently 3,150,000 inhabitants (59% of the

province), 120,000 companies (29% of the companies in the province) and more than 1.6 million jobs (67% of the province). The largest cities of the province are located in the central part of this inner area (Barcelona, L'Hospitalet de Llobregat and Badalona). The city of Barcelona is the true economic engine of the province as well as of the economy of Catalonia. Barcelona has 1.6 million inhabitants (30% of the province), 77,000 firms (39% of the province), and around 1,050,000 jobs (43% of the province)[5].

The outer part of the metropolitan (metropolitan arc) has 1,700,000 inhabitants (32% of the province), 57,000 companies (29% of the companies in the province) and 620,000 jobs (26% of the province). In many aspects, the economic size of this area is similar to the third Spanish metropolitan area (Valencia). Other important medium cities are located in this area, mainly old industrial subcenters in the XIX Century (Mataró, Granollers, Sabadell, Terrassa, and Vilanova i la Geltrú).

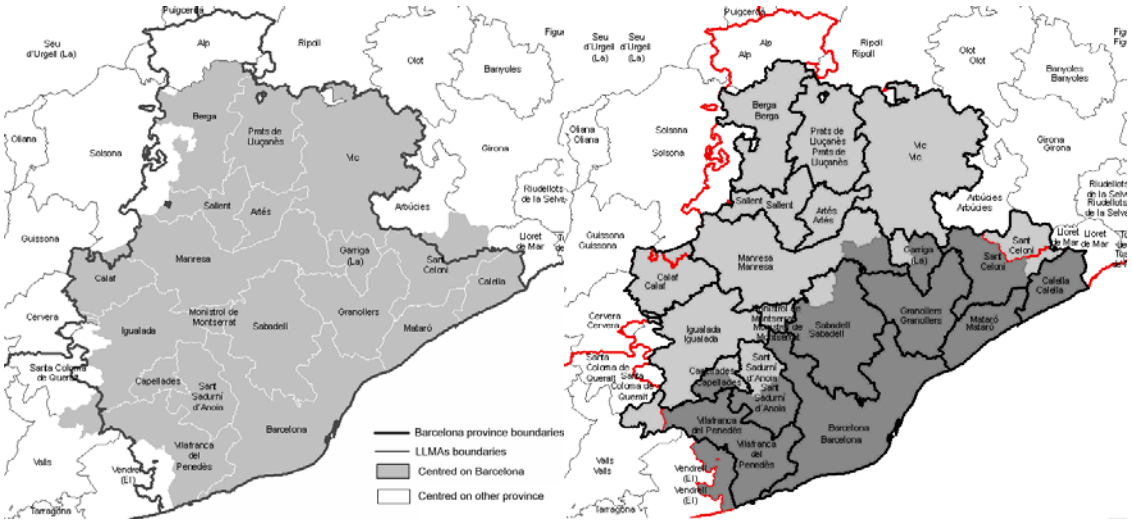
There are other three small-medium cities in the province of Barcelona with capacity to structure the territory: Igualada (38,000 inhabitants), Manresa (75,000 inhabitants) and Vic (39,000 inhabitants). Manresa forms an small area independent from the metropolitan region of Barcelona having 29 municipalities and about 148,000 inhabitants and 60,000 jobs. At this moment the population and jobs of the area have increased to 170,000 inhabitants, more than 6,000 firms and about 70,000 jobs. The Functional Urban Region procedure suggests that also Vic could form another small area (Boix and Veneri 2009).

5.4.3. Local labour markets

The province of Barcelona can be also divided in local labour markets. This division is not administrative or "official" but provides valuable information about the internal organization of the socioeconomic dynamics. There are 19 LLMAs centred in the province of Barcelona: Artés, Barcelona, Berga, Calaf, Calella, Capellades, La Garriga, Granollers, Igualada, Manresa, Mataró, Monistrol de Montserrat, Prats de Lluçanès, Sabadell, Sallent, Sant Celoni, Sant Sadurní d´Anoia, Vic, Vilafranca del Penedès.

[5] Data about firms and jobs could be slightly inflated due to the existence of a "headquarter effect" in the city of Barcelona.

Map. 5.4.3. - Local labour market areas in the province of Barcelona and comparison with the metropolitan region for planning



Source: Elaborated from Boix and Galletto (2006) and Boix and Trullén (2009).

5.4.4. Polycentric networks of cities

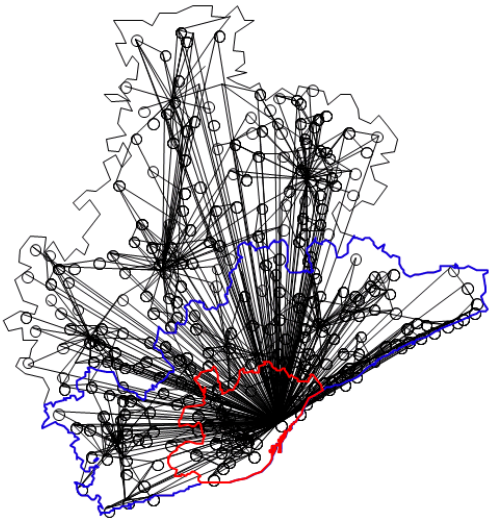
The metropolitan region of Barcelona is a polycentric network of cities well-weaved around some of the old industrial subcentres and other newer industrial cities. This space cannot be simply understood as a "belt" as the subcentres are not satellites of Barcelona and the complexity of the network is high. Despite this fact, the several parts of the metropolitan arc appear as poorly connected. This design shows not only the location of the subcentres that articulates the metropolitan territory but also the deficiencies in the infrastructures between several parts of the technological arc, that at this moment are being improved. The city of Barcelona serves as a common nexus connecting these spaces as the system of infrastructures continues to be highly radial. Furthermore, there is not a true differentiation between the centre of the metropolitan region and the rest of the arc.

The differentiation between the metropolitan network and the rest of the province is more evident as the flows of the metropolitan cities are more intense with Barcelona and the same metropolitan cities. The rest of the province is articulated around four cities: Igualada, Manresa, Vic and Berga. Other small cities articulates the spaces between this medium cities, forming small networks even if self-contained enough to explain the formation of small labour markets. The largest cities form quite compact networks which are intensely connected with the city of Barcelona although few connected between them as well as with the cities of the metropolitan arc. The urban structure tends to be stable in short and medium periods of time, although the network becomes denser in 2001. The ambit of influence of the city of Barcelona becomes more important in the province. At the same time, the metropolitan network becomes more connected. In the rest of the

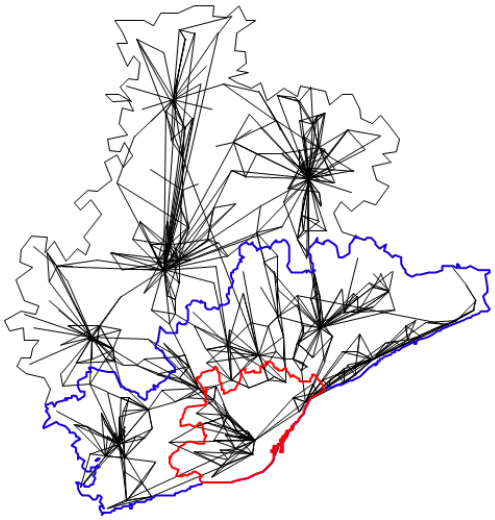
province, the most outstanding fact is a light trend to connect the networks of the largest cities thanks to some small cities that revolve around more than one network.

Map. 5.4.4. - Networks of cities in the province of Barcelona

A) Four director flows. 2001



B) Four director flows without Barcelona. 2001



Source: Elaborated from Trullén and Boix (2000, 2008).

5.4.5. Urban/rural characteristics

The province of Barcelona is classified by the OECD as predominantly urban (OECD 2009) since the average density of the province is 700 inhabitants/Km2, 99.4% of the population live at least of 45 minutes by road of a city of more than 50,000 inhabitants. However, not all the municipalities of the province are considered as urban. In fact, there is a clear differentiation between the metropolitan region of Barcelona and the rest of the province. The metropolitan region concentrates the municipalities with the highest density of the province, and only some concrete parts of the Penedès and the Vallès Oriental could be classified as rural. In the other part of the province, density is lower so that, with the exception of the medium cities (Igualada, Manresa, Vic, Berga) and some surrounding municipalities, most of this other part of the province has rural characteristics regarding density. This in part explains why the networks of cities were very hierarchical in this non-metropolitan part of the province.

Regarding the local labour markets, most of them are classified as urban following the OECD criteria as the "urbanity" of medium cities and their contribution to the population of their labour markets counterbalance the rurality of the small municipalities. Only three small local labour markets (Sallent, Prats de Lluçanès and Monistrol de Montserrat) could be classified as rural. The total population of these small labour markets is less than 30,000 inhabitants.

5.5. Three scenarios for Barcelona/NUTS3: a qualitative approach

Based on the qualitative and quantitative scenarios presented in the interim report, and on the basis of contributions made at the seminar held in Barcelona and at IERMB on 4 and 5 March 2005, a qualitative approach is presented for the three proposed scenarios focusing on spatial variables.

Regarding the territorial areas of study, the aim is to distinguish four areas within the NUTS-3 area of Barcelona: the municipality of Barcelona, the municipalities of the Metropolitan Area of Barcelona, the municipalities of the Metropolitan Region of Barcelona and the rest of the province of Barcelona.

As noted in the Interim Report of January 2010 these scenarios must be considered - on the horizon of 2025 – in a economic and territorial dynamic for the metropolis of Barcelona dominated by the consolidation of Barcelona as a global metropolis, with an enlargement of the radius of the Barcelona's labour market that will involve the incorporation into the economic and territorial reference area of cities that exceed the territorial scope of the Diputació of Barcelona: Girona and Reus-Tarragona-Valls.

From an economic point of view the fundamental change that will affect the urban agglomeration of Barcelona is the substitution of a model of growth based on low productivity growth and high employment growth for an alternative model based on a productivity growth which is higher than employment growth.

For each scenario it will be identified the four most significant territorial and economic changes that this change of model of growth will entail. It is important to stress that in each case it will be requested the implementation of active policies of local development. In the case of the Reference Scenario active policies will be less intense and targeted than in the Pro-Active scenario, but more and better targeted than in Defensive scenario. In all the scenarios, the monitoring of active local development policies is a necessary condition to achieve high levels of productivity and employment growth.

We propose to identify four major strategic economic and territorial factors for the four regional areas of study:

1) Those that affect the nature of production, its sectoral composition, its composition in terms of knowledge intensity and technological level, the origin of its territorial demand.
2) Those that affect the dynamics of local labour markets, especially those related to the interaction with the central metropolitan labour market.
3) Those that affect the provision of infrastructure, especially those related to transport and communications infrastructure.
4) Those that affect supply factors, both in the labour market (education) and technology (R & D).

5.5.1. The Reference Scenario

The reference scenario – where aggregate productivity growth is 50% higher than the growth in employment - requires major changes in the four strategic factors identified:

a) The production, both of goods and services, will be increasingly directed towards foreign markets. The core of the metropolis will act as a central provider of services not only for the whole territory of the Barcelona province but also for the rest of Catalonia, the Spanish domestic market, the European Union markets and Mediterranean markets and the rest of the world, especially Asia.

The weight of tertiary export activities will tend to grow, as well as tertiary activities related to the industry. Industrial production, which will move progressively towards the rest of m region (Metropolitan Arc) and the rest of the province, will be increasingly oriented towards exports markets in two directions: towards the rest of the European Union and to the Mediterranean and the rest of the world.

The growth of industrial production of medium-high technological intensity will be higher than the growth of high technology activities and that of low technology activities, exploiting comparative advantages.

b) With respect to the local labour market areas which are included in the whole territory of study, there will be a struggle between two forces of opposite signs. On the one hand, the gradual extension of central metropolitan market, led not only by the municipality of Barcelona but by all municipalities within the Barcelona Metropolitan Area; this force will tend to push wages upward in the, still important, labour markets nucleated around certain major cities of the rest of the Metropolitan Region and the rest of the province. On the other side, the existence of an excess of supply of labour with lower wages and higher specialization in activities of low technological intensity in these areas of the rest of the Metropolitan Region and the rest of the province, will result in a resistance pushing in the opposite direction. In the Reference scenario will prevail the first trend over the second, which is consistent with the important levels of productivity growth in the whole economy of Barcelona.

c) In this scenario it is assumed an improvement in the provision of transport and communications infrastructure that will affect both the connection to the rest of the world (high speed train, European rail gauge from the Port of Barcelona to the French border). It also assumes that the full road and rail infrastructure will be completed so that it will connect the network of cities with the major rail nodes (La Sagrera Station). The increase in the supply of infrastructure that connects to all major nodes of the network of cities, both in the Metropolitan Area as well as in the rest of the Metropolitan Region and in the rest of the province, is a key requirement to explain the increase in the efficiency of the whole economy of Barcelona.

d) Finally, among the supply side factors that explain the important growth of the aggregate productivity in the Reference scenario, there are those related to the

enhancement of total factor productivity, stemming from training and research and development, and innovation. The transition to a knowledge-based economy will require increased efforts in education and in providing conditions for the expansion of the innovation capabilities from research and development. Here the basic idea is to articulate in a network the provision of research and education infrastructure, linking these infrastructures with the technological trajectory of the different cities and with the needs of the environment.

5.5.2. The Proactive Scenario

In this scenario, the forces that may hamper the transition towards a more knowledge-intensive model with higher productivity levels not only are feeble but are subject to specific policies of correction. In particular, the fragmentation of labour markets is fought with infrastructure and endogenous development policies which seek consciously the adoption, both in the rest of the Metropolitan Region as elsewhere in the province, of a new pattern of growth based on high value added activities and in segments of sectors of medium or high technological intensity. The substitution of unskilled labour intensive activities to high value added activities will require the implementation of active policies that guide the transition of industry, agriculture and services, exploiting the existence of a large metropolitan market and also directing the production towards exports.

In this Proactive scenario, the implementation of active industrial policies as the support of primary and tertiary industries and activities addressed at new eco-innovators markets is one of the fundamental master lines. The preservation of the environment with the deepening of the objectives envisaged in the new land use planning of Catalonia is the new strategic challenge for these spaces.

Accordingly, we postulate the implementation of an integrated economic and territorial strategy to strengthen the network of cities as a whole (and particularly its main cores) and to preserve the territory from predation (fight against urban sprawl). In this sense, the integration of the labour markets of the whole province of Barcelona must be accompanied by policies of transport infrastructure endowment, mainly railways, which go beyond connecting these cities with the main high-speed rail (Sants-La Sagrera), port and airport hubs. To devise a network of cities, with infrastructure policies and economic policies of local development is the best guarantee to achieve the economies of agglomeration associated with a global metropolis and at the same time strengthen the economies of localization of a wide range of cities of the Metropolitan Area, the Metropolitan Region as well as the rest of the province.

In this sense, the Pro-Active scenario must include as a priority the construction of the new orbital (rail) line linking Mataró with Vilanova i la Geltrú, linking nuclei as important as Granollers, Sabadell, Terrassa, Martorell and Vilafranca del Penedès. Similarly, of great importance is the widening of the transversal (road) axis and the rail link between Girona and Lleida, articulating the axis of Vic, Manresa and Igualada.

5.5.3. The Defensive Scenario

In this case, not only there is no implementation of infrastructure policies nor local development policies as those described in the Pro-active scenario, but instead policies that protect small and poorly communicated self-contained local labour market are promoted, with the deepening of development models based on the exploitation of cost advantages.

If the existence of an excess of supply in the labour markets, which increases with the distance from the municipality of Barcelona, has as a corollary the implementation of policies that, instead of promoting the transition towards processes and products of higher value added, are aimed at exploiting cost advantages (low wages, predator land consumption, low technological intensity, low innovation), then the overall growth of productivity will be lower and, given the growth of foreign competition, the share of foreign trade will be lower and, finally, the employment rate will be reduced.

It should be noted that the process of relocation of activities (mainly industrial but also logistic services and other) from Barcelona and the Metropolitan Area to the rest of the Metropolitan Region and the rest of the province, could lead to an interesting change in the economic base. The exploitation of advantages in terms of land prices in these areas can lead to changes in the sectoral composition, increasing its technological level, and attracting new activities, including tertiary activities. The whole metropolitan market may also be attractive for the establishment of new manufacturing plants of multinationals aimed at the integration of products made in Asian markets that would benefit from the existence of first-level suppliers, thereby following a pattern of localization based on flexible production which requires proximity to major seaports. In these two cases the existence of favourable conditions in labour markets and in the land market would be accompanied by productivity gains. They represent alternatives to the Defensive scenario which simply intends to exploit differences in productivity compared to the Metropolitan Area.

As a whole, the Defensive scenario presupposes maintaining the nature of the production and not act deeply on transport infrastructure and on the conditions of supply (education and R & D), which involves preserving or protecting small and poorly communicated labour markets, both in the rest of the Metropolitan Region and in the rest of the province.

5.6. A translation of the province scenarios to infra-province scenarios based on a shift-share method.

There are several possibilities to translate the province scenarios to infra-province scenarios. The proposed method is based on a shift-share division.

5.6.1. The shift-share method

The shift-share analysis is a method frequently used in regional economics that divides the causes of growth in a territory and activity in three components: regional (or, in this case the province), sectoral, and local.

Thus, the growth rate since 0 to *t* of an economic variable *y* (GDP, GVA, employment) in a locality *j* in an industry *i*, named y_{ij} , is expressed as:

$y_{ij} = y + (y_i - y) + (y_{ij} - y_i)$ [1]

or

y_{ij} = *Province Effect +Industry Mix +Local Competitive Effect*

where

$$y_{ij} = \frac{Y_{ij}^t - Y_{ij}^0}{Y_{ij}^0} \quad [2] \qquad y = \frac{\sum_{i=1}^{I}\sum_{j=1}^{J}\left(Y_{ij}^t - Y_{ij}^0\right)}{\sum_{i=1}^{I}\sum_{j=1}^{J} Y_{ij}^0} \quad [3] \qquad y_i = \frac{\sum_{j=1}^{J}\left(Y_{ij}^t - Y_{ij}^0\right)}{\sum_{j=1}^{J} Y_{ij}^0} \quad [4]$$

The Province Effect explains the share of growth in a locality and industry due to the growth of the region as a whole or, in other words, the part of the growth that is similar to the regional growth.

The Industry Mix explains the share of growth due to the particular mix of industries in a place. It reflects the fact that different industries show different growth rates so that a place with a larger share of fast growing industries must growth faster.

The Local Competitive Effect is the part of the local growth that is not explained by the regional and industrial components, and is supposed to be due to local idiosyncratic components as agglomeration economies, institutions, etc.

5.6.2. Application of the shift-share to the generation of infra-local scenarios in the province of Barcelona

We take advantage of the properties of the shift-share in order to approach the performance of the several parts of the province of Barcelona under the proposed

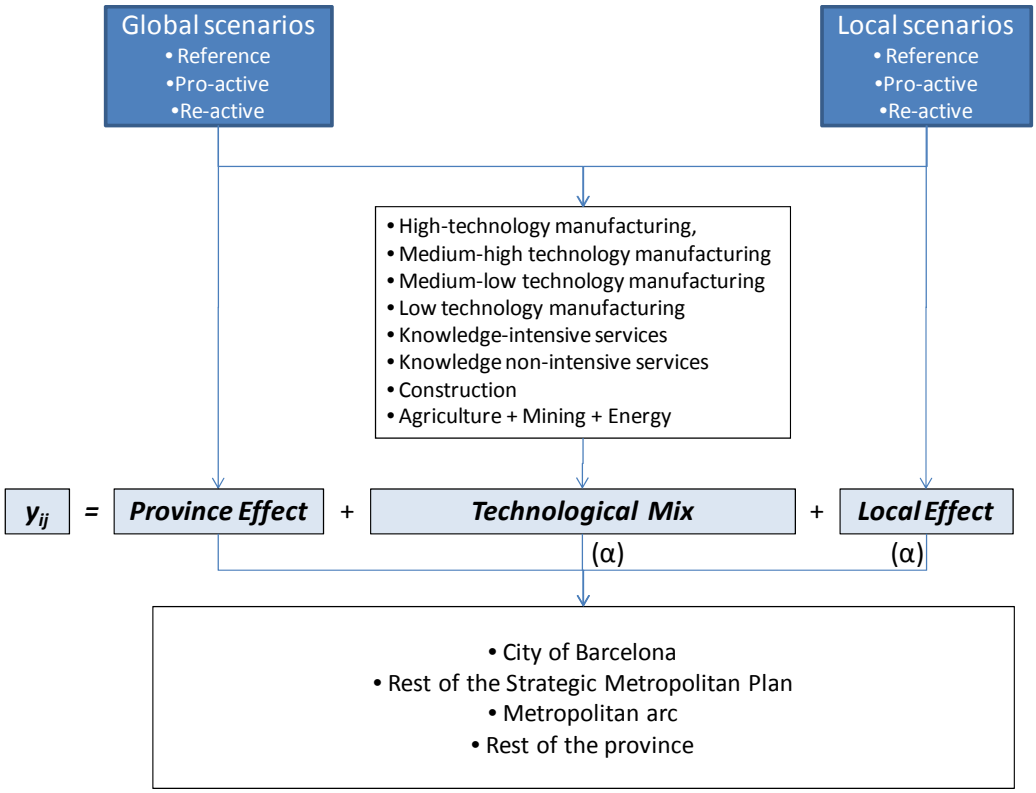
scenarios of future. This procedure also allows the international and local scenarios to be introduced into the analysis by weighting the performance of each infra-province territory by means of the Industry Mix and the Local Competitive Effect.
GDP or GVA data are not available at infra-province level with the necessary sectoral detail. For this raison the analysis and subsequent projections are carried out using employment data. The procedure is composed of three stages:

1. First, the GDP growth rate of the province in each scenario is converted to employment growth rate using the apparent labour productivity.

2. The Industry Mix and Local Competitive Effect are calculated departing from their share and composition in the previous period and adjusted by means of the international and local scenarios.

3. The sum of the three effects for each infra-province territory produces the expected employment growth rate for each scenario.

Fig. 5.6.1. - Shift-share modified by scenarios



5.6.2.1. Division of the province of Barcelona

The province of Barcelona is divided in four exclusive sub-areas:

1. The city of Barcelona: one municipality and 1.07 million jobs (43% of the province)

2. The area defined by the strategic metropolitan plan: 35 municipalities surrounding Barcelona that have 580,000 jobs (23% of the province)

3. The metropolitan arc: 128 municipalities forming an arc surrounding the strategic plan. This area has 660,000 jobs (26% of the province).

The union of Barcelona, the rest of the metropolitan strategic plan, and the metropolitan arc forms the metropolitan region of Barcelona: 164 municipalities that have 2.3 million jobs (93% of the province).

4. The rest of the municipalities of the province: 150 municipalities and 190,000 jobs (7% of the province).

5.6.2.2. Province Effect

The regional effect comes from the estimates of the province growth. Regarding GDP, the annual growth rates are 2.89 for the reference scenario, 3.96 for the pro-active scenario, and 1.88 for the defensive scenario. As the shift-share analysis is carried out by using employment data, these figure are translated to employment growth rates using the contributions of the employment and productivity growth to the GDP growth rate of Catalonia[6]. The employment growth rate is 0.90 for the reference scenario, 1.56 for the pro-active scenario, and 0.88 for the defensive scenario.

Tab. 5.6.1. - Catalonia: GDP growth rate and contribution of productivity and employment..

Catalonia	Reference	Pro-Active	Defensive
Productivity growth rate	2.09	2.41	1.09
Employment growth rate	0.95	1.60	0.97
GDP growth rate	3.06	4.05	2.07

[6] The GDP growth rate is equivalent to the sum of the growth rate of the employment and the growth rate of productivity. For each scenario, the three figures (GDP growth rate, employment growth rate, and productivity growth rate) are provided by the leader team. The assumption that regional (Catalonia) and province (Barcelona) contributions of employment and productivity growth rates similar is feasible due to the large contribution of the province of Barcelona to the Catalonia growth. However, the Barcelona local team express some reservation about a so large contribution of productivity in the counterfactual division of the GDP growth rate.

Tab. 5.6.2. - The province of Barcelona: GDP growth rate and contribution of productivity and employment.

Barcelona	Reference	Pro-Active	Defensive
Productivity growth rate[1]	1.97	2.36	0.99
Employment growth rate[1]	0.90	1.56	0.88
GDP growth rate	2.89	3.96	1.88

[1] Relative contributions of productivity and employment to the GDP growth rate come from the estimated contributions for Catalonia (Tab. 5.6.1).

5.6.2.3. Industry-Mix and technological-mix

The industry-mix, which takes into account the effect of the different sectoral composition, has been transformed into a "technological-mix" (Tech-Mix). The 3 digit sectors have been grouped together using the OECD classification of activities by intensity of technology and knowledge: High-technology manufacturing, Medium-high technology manufacturing, Medium-low technology manufacturing, Low technology manufacturing, Knowledge-intensive services, Knowledge non-intensive services, and rest of activities (divided in two groups: (1) construction; and (2) Agriculture + extractives + energy)[7]. As a certain technological proximity is assumed inside each group and the scenarios reflect changes in technology regimes more than in specific sectors, this reflects a more appropriated form to translate the scenarios to the analysis.

The global scenarios (international, UE, Arc Latin) are translated to the Tech-Mix by a simple system of weights. Each event remarked in the scenario has assigned a value -1% (if the impact considered negative), 0% (neutral) or 1% (positive impact) so that the Tech-Mix could be increased or decreased in a maximum of 14%. As the assignation of weights depends on the perception of the agents, weights have been assigned using as input two panels of local experts, the first one formed by the components of the Barcelona local team, and the second by the assistants to a local ESPON workshop in the IERMB (also completed other local experts who could not attend the workshop and send the answers by email). Since events can be positive or negative and counterbalance, in practice the variation has never exceeded 10%. The impact of local scenarios is also considered when the weights are assigned.

5.6.2.4. Local Competitive Effect

The procedure followed to obtain the modified Local Competitive Effect (LCE) is quite similar to those used for the Tech-Mix. The original weights of the LCE have been modified by the local scenarios by taking into account the influence of six events by adding -1%, 0% or 1% to the original value. The values have been decided in this case by the local team who elaborated the local scenarios even if the process leading the elaboration of the scenarios has been in part participative.

[7] The detail of the classification is in OECD (2003) and OECD (2005).

In the case of the Tech-Mix and the LCE, it should be taken into account that the modification of the values could produce a deviation from the total growth of the employment predicted for the province in each scenario. For this reason, both must be weighted by a factor α which assures that the sum of the territories and technologies (activities) equals the total growth and satisfies the Loveridge and Selting's property (zero national deviation).

Tab. 5.6.3. - Local scenarios for the territories of the province of Barcelona. Summary.

A) Baseline (reference) scenario	*B) Proactive scenario*	*C) Defensive Scenario*
• Production increasingly directed towards foreign markets • Growing share of tertiary activities on the productive structure • Growth of manufacturing production knowledge intensive • Extension of the local labour market areas • Improvement in infrastructures • Education; R&D&i	• Transition towards more knowledge-intensive activities • Improvement in infrastructures • Education; R&D&i • Ecology, preserve land, econ-innovation • Strenhght of the network of cities • Strenght of agglomeration economies	• Infrastructures addressed to self-containment of labour markets • Excess o supply in the labour markets • Explotation of cost avantages in production more than knowledge • Relocation of activities based on cheaper land prices • Attraction of manufacturing plants of multinationals

5.6.3. Results

The three reference scenarios suggest a positive growth rate of the employment for every infra-province territory. However, the growth rates vary across territories and remark a clear division between the pro-active scenario and the other two.

In the reference scenario, the annual employment growth rate varies from 0.76% in Barcelona to 1.04% in the metropolitan arc and 1% in the rest of the province. In fact, these growth rates do not differ very much from the defensive scenario due to two factors: the Province Effect is very similar in both cases and the LCE is not unfavourable in excess. Thus, although the technological regimes impose a certain penalty, the total effect is low. As explained in the local scenarios, under the conditions explained by these scenarios, the province of Barcelona is still able to take advantage from the agglomeration economies, labour force supply and exports, even if there is not a transformation of its productive model. More visible should be, however, the consequences on productivity.

On the other hand, the pro-active scenario suggests a growth rate of the employment between 60 and 80% higher than the reference scenario. The city of Barcelona could be growing at an annual growth rate of 1.4% whereas the growth rates of the metropolitan arc (1.73%), the rest of the province (1.7%) and the Strategic Plan without Barcelona (1.65%) are quite similar.

Comparing with the trend 2001-2007, the growth rates of employment are significantly slower, as in the period 2001-2007 Barcelona grew at 2.2%, the rest of the Strategic Plan at 2.6%, the Metropolitan Arc at 2.8%, and the rest of the province at 2.8%. This means that in the reference and defensive scenarios the growth of employment is expected to be a third of the trend 2001-2007 whereas in the pro-active scenario the growth of employment is expected to be two thirds with regard to the original trend. The slower growth of employment in the forecasts 2010-2025 is due to the forecasted contributions of employment and productivity to the GDP growth[8].

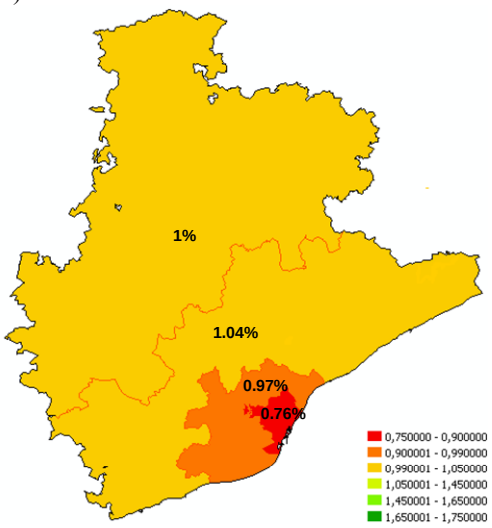
Tab. 5.6.4. - Employment growth rates 2025 and differences from the reference scenario.

	2001-2007	Forecast anual growth rates 2010-2025			Differences	
	Trend	Reference	Pro-active	Defensive	Pro-Ref	Def-Ref
Barcelona (1)	2.2%	0.76%	1.38%	0.75%	0.63%	0.00%
Strategic plan without Barcelona (2)	2.6%	0.97%	1.65%	0.94%	0.68%	-0.04%
Metropolitan arc (3)	2.8%	1.04%	1.73%	1.00%	0.69%	-0.04%
Metropolitan region of Barcelona (1+2+3)	2.4%	0.89%	1.55%	0.87%	0.66%	-0.02%
Rest of the province (4)	2.8%	1.00%	1.70%	1.02%	0.70%	0.02%
Total province (1+2+3+4)	2.5%	0.90%	1.56%	0.88%	0.66%	-0.02%

[8] We refer to the previous footnote.

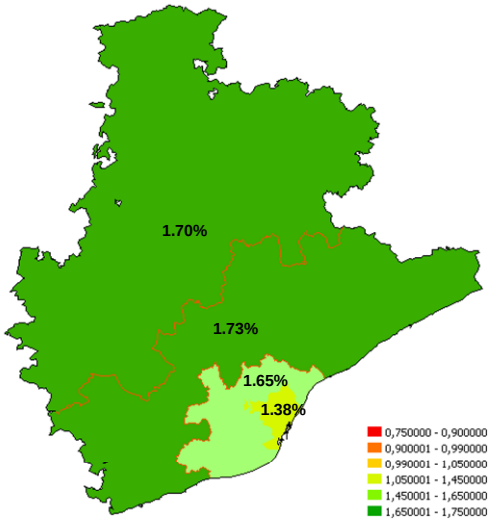
Map. 5.6.1. - Employment growth rates 2025 for the four infra-province territories

A) Reference scenario



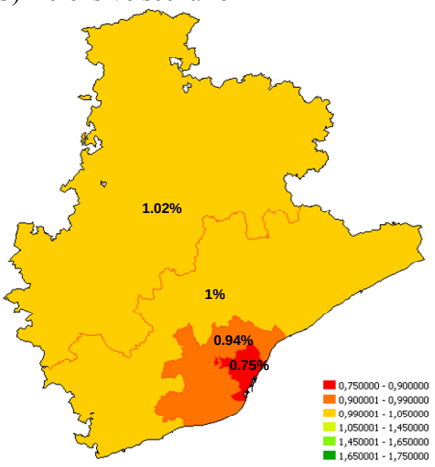
Annual employment growth rate	%
Barcelona (1)	0.76%
Strategic plan without Barcelona (2)	0.97%
Metropolitan arc (3)	1.04%
Metropolitan region of Barcelona (1+2+3)	0.89%
Rest of the province (4)	1.00%
Total province (1+2+3+4)	0.90%

B) Pro-active scenario



Annual employment growth rate	%
Barcelona (1)	1.38%
Strategic plan without Barcelona (2)	1.65%
Metropolitan arc (3)	1.73%
Metropolitan region of Barcelona (1+2+3)	1.55%
Rest of the province (4)	1.70%
Total province (1+2+3+4)	1.56%

C) Defensive scenario



Annual employment growth rate	%
Barcelona (1)	0.75%
Strategic plan without Barcelona (2)	0.94%
Metropolitan arc (3)	1.00%
Metropolitan region of Barcelona (1+2+3)	0.87%
Rest of the province (4)	1.02%
Total province (1+2+3+4)	0.88%

6. OPTIONS FOR POLICY DEVELOPMENT

6.1. Policy options for the Latin Arc

6.1.1. General considerations and national policy tasks

The present post-crisis context of advanced economies is deeply characterized by a re-launch of public intervention in the economic field, in the form of:
- rescue policies, especially in the financial field,
- short-term, anti-cyclical policies, addressed towards the boosting of internal demand and mainly involving the building, construction and infrastructure sectors,
- drafting new rules and regulations mainly concerning the control on financial risks and most speculative financial products,
- long-term, structural policies addressed towards the strengthening of production sectors and their orientation towards new technologies and new production paradigms.

One of the most relevant efforts in economic policy making for the years to come concerns – according also to EU suggestions – the strengthening of the link between short and long-term interventions, to be achieved through what are increasingly called "smart investments". The general aim should be to revitalize internal demand while at the same time boosting local and national competitiveness of the production fabric.

On a scenario time span reaching 2025, the necessary structural policies become central, and in fact they represent a constituent and consistent part of the scenarios that are presented and elaborated in the present study. Even in the "reference" scenario, they are present in the form of support to the emergence of a new production paradigm, namely the "green economy" one, orienting in a consistent and synergic direction both public and private investments. But of course the centrality of long-sighted, visionary and intentional policies is most visible in the "pro-active" scenario, where a full perception and even anticipation of structural change underway is hypothesized by policy makers, and a deep involvement in new policy goals and styles is considered.

But linking short and long-term goals and tools is not the only request for effective economic and structural policies. A similar consistency is requested among the actions of different government levels, from Community to national, regional and local. This goal can be achieved through explicit coordination efforts ("multi-level governance") or implicit synergetic behaviour, each policy layer operating with its own instruments and inside its own competences with a full complementary attitude. This requested cooperative behaviour implies, in operational terms, two main elements:
- a strong permeability between policy layers, in particular linking together top-down processes of policy design, programming and financial support with bottom-up processes of project design and operational implementation; and
- the relevance of local policies, acting on the different aspects of territorial capital and implemented through inclusionary processes of vision building and project elaboration.

The main areas of policy design and implementation refer to two main fields: (aggregate but also local) demand policies and (regionalized) supply policies.

Demand policies.

a. The most urgent part of demand policies concerns the design of an exit strategy from the present deficit of Member States budgets, reducing reliance on public expenditure. Direct public intervention through public demand should be substituted by less expensive, indirect public expenditure - e.g. in the form of incentives to private demand - or by appropriate regulatory policies. This could be achieved in the fields of building and construction, through incentives and cautious de-regulation policies; in the case of those sectors in which still monopoly positions persist, like in telecommunications and many private, trade and professional services; in the support to new demand fields, like cultural and education services, more than simply trying to force an anticipation of private expenditure in durable goods, like cars and electrical appliances.
b. The creation of new sources of aggregate demand, like the opening up of new international markets in developing countries. This strategy implies trade agreements with these countries, concerning both their internal markets and the EU market, e.g. in the agricultural products field; support to their development policies, through multiple forms of cooperation; in case of emerging countries with huge surplus in trade balance, joint international effort towards an agreement on a re-evaluation of their currencies.
c. The full support to the launching of new production paradigms, implying multiple technological advances, multiple applications in a wide array of sectors, multiple possibilities of product innovations. The case of the green economy paradigm is the perfect example nowadays: its emergence could be supported by appropriate environmental regulations and some public financial support; it encompasses a wide spectrum of innovations, touching sectors like energy production, building and construction, advanced R&D and manufacturing activities, transport and agriculture. In the last case, an interesting example concerns the recent spread of the "zero-km agriculture" model, which implies only a change in public perception and preference and allows achieving important reductions in transport emissions and costs, new agricultural organization and local markets, easier defence of peri-urban agricultural land against urbanisation and real estate speculation.
d. The conquest of new internal and international markets through enhanced competitiveness of local production. Appropriate strategies at the macro-economic level concern cautious wage increases, (facilitated) private investments in technology, organization and management culture, focalization on advanced and excellence production. This strategy, though, can be widely supported by supply actions, implemented mainly at the regional and local level.
e. A smart utilization of existing public procurement of goods and services, although due to shrink, for the creation of an initial market for advanced, environment friendly products, in the building and construction field, in advanced

telecommunication networks and services, in the provision of many e-services like health, social assistance, e-governance in general.

Supply policies

Supply policies mainly concern the efficiency and innovativeness of the production fabric, which, on its turn, depends widely upon national context elements but also, and particularly, upon local context elements.

National policy actions concern the general cultural and educational context of countries, the main internal infrastructure networks, the general regulatory framework in the field of anti-trust and land-use controls, the structure of industrial incentives and regional policies. All these elements are particularly relevant in the achievement of the general goal, already mentioned, of driving a fast rescue from the crisis reorienting production towards more advanced and more innovative sectors, products and firms. Selective fiscal policies, allowing a de-taxing of firms investments but also far-looking regulatory policies in the fields of environmental characteristics of production processes, products and living standards (heating, mobility, energy production) may widely help the necessary inter-sectoral reallocation of resources.

The second task assigned to these national, supply-side policies concern wide investments with an inter-regional interest. Cooperation among regional governments (or among states in federal systems) looks particularly difficult to achieve: in the provision of large infrastructure networks, in the management of large river and hydro-geological basins, in the design of integrated, network strategies for tourism.

In this field, the role of national governments is still crucial, coupled by a relevant lobbying role of leading regional governments. An important case was found during this research work: the transport integration of the Latin Arc regions. In fact, the western Mediterranean macro-region, in spite of the many common characteristics and the sharing of the sea resource, still shows a striking fragmentation in terms of mobility infrastructure (and consequently, in terms of economic integration). This fragmentation is even more striking if compared with the clear inter-regional and also inter-national integration strategy pursued and implemented in the northern part of the EU, in the area of the large, leading capital city-regions (London-Paris-Bruxelles-Randstad Holland-Frankfurt), and with the historical territorial integration of the large central European axis running along the Rhine, the so-called “blue banana”. In particular, the condition of the rail infrastructure is not satisfactory at all: for a long time, technical problems between the French and Spanish rail systems, difficulties in the Liguria and southern Italian regions, lack of priority in the French southern east-west axis, clear priorities given, in almost all countries to north-south connections, linking the large Mediterranean ports with their continental hinterlands; all this has prevented the realization of an efficient Mediterranean network, reinforcing the historical lack of cooperation among the European southern regions.

For a long time, similarities among these regions were felt as more important than potential complementarities, and this led to explicit competition: in the field of tourism, maritime transport, agriculture. Nowadays, an increasing differentiation is emerging – among regions and among cities – potentially leading towards a deeper inter-regional specialization and consequent integration of the respective markets. The case is also present for exploring deeper inter-regional co-operation, in the form of the creation of "synergy networks" (Camagni, 1993; Camagni, Salone, 1993; Camagni Capello, 2004): between ports, with a commodity and branch specialization; in the spheres of tourism, building – and selling in the global market – integrated "itineraries" in both maritime cruise and city/cultural tourism; among knowledge centres, for cooperation in R&D and advanced education.

But another relevant case for supply-side policies implies important responsibilities for regional and local governments. Here the focus of actions refers to the accumulation and best utilisation of "territorial capital", as indicated by an important statement of DG Regio of the EU Commission, still not sufficiently elaborated both by the scientific and the operative policy milieu: "Each Region has a specific 'territorial capital' that is distinct from that of other areas and generates a higher return for specific kinds of investments than for others, since these are better suited to the area and use its assets and potential more effectively. Territorial development policies (policies with a territorial approach to development) should first and foremost help areas to develop their territorial capital" (European Commission, 2005, p. 1).

6.1.2. The concept of territorial capital and its relevance for regional policy strategies.

The concept of territorial capital was first proposed in a regional policy context by the OECD in its *Territorial Outlook* (OECD, 2001). It proposed a well-structured list of factors acting as determinants of territorial capital, which range from traditional material assets to more recent immaterial ones. "These factors may include the area's geographical location, size, factor of production endowment, climate, traditions, natural resources, quality of life or the agglomeration economies provided by its cities, but may also include its business incubators and industrial districts or other business networks that reduce transaction costs. Other factors may be 'untraded interdependencies' such as understandings, customs and informal rules that enable economic actors to work together under conditions of uncertainty, or the solidarity, mutual assistance and co-opting of ideas that often develop in clusters of small and medium-sized enterprises working in the same sector (social capital). Lastly, according to Marshall, there is an intangible factor, 'something in the air', called the 'environment' and which is the outcome of a combination of institutions, rules, practices, producers, researchers and policy makers that make a certain creativity and innovation possible" (OECD, 2001, p. 15).

Although it is clear that some items in the above list belong to the same abstract factor class and differ only in terms of the theoretical approach of their proponents, and some others are lacking, the concept appears sound and fruitful. A full and possibly complete

taxonomy of elements of territorial capital was presented elsewhere (Camagni, 2008), underlining the relevant dichotomies encompassed by the concept:

- material and immaterial elements: social overhead capital, infrastructure, public goods and private fixed capital on the one side, and human capital, entrepreneurship and social capital on the other. Agglomeration and urbanization economies present a mix of both elements;
- private and public goods, but also an intermediate category of impure public goods and club goods, for which new governance styles are requested. In fact, in order to avoid opportunistic behaviour by some actors and excessive exploitation of "commons" and public goods, new policy styles are needed, addressed towards the creation of wide consent, reciprocal trust, synergies and cooperation;
- functional and relational elements, the latter constituting the novelty and the most interesting development factors nowadays. Relational assets, in the form of inter-personal and inter-institutional linkages, represent a "capital" as they are costly to build and maintain but they facilitate innovation, creativity, enhancement of economic competitiveness.

Acting on territorial capital in policy making means acknowledging the integrated nature of any policy strategy, the added value on intervening on different but linked assets at the same time, promoting network relations and cooperative agreements and supporting innovative projects emerging thanks to these agreements instead of the single partners.

For the sake of simplicity, we may mention four large classes of territorial capital elements on which attention should be given in a policy context:

- *infrastructure capital and settlement structure*, encompassing also the characteristics of the urban system and the quality of the environment;
- *cognitive capital*, in the form of knowledge, competence, capabilities, educational and research structure, embedded in both productive capital and human capital;
- *cultural and identitarian capital,* encompassing cultural heritage, landscape and natural capital;
- *social and relational capital,* in the form of both civicness and associative capabilities.

6.1.3. Local and regional policies: acting through "territorial platforms".

As mentioned, regional supply-side policy strategies should address explicitly the conservation, best use, completion and improvement of the different forms of territorial capital. The main messages in this case reside in the necessity to better integrate the traditional spatial development policies into each territory, through an harmonious merging of material and immaterial elements, functional and relational assets, economic, social and environmental aspects; to create new cooperation networks among local actors and between them, policy makers and external bodies, acting on the creation of willing and cohesive local communities; to focalize on excellence assets in the spheres of knowledge, culture, natural and cultural heritage, and support innovation through synergetic behaviour (Camagni, 2008; Camagni, Maillat, 2006).

This integration strategy could be properly synthesized through the concept of "territorial platforms", a concept used in recent times by the Italian Government in order to depict its territorialisation strategy of main infrastructure and development actions. Intervening through territorial platforms means exactly to aim at a full integration – in physical, economic, social and aesthetic terms – of new development projects into the local realm, engaging at the same time multiple local resources in supporting public action with all possible synergies.

In parallel with the four large categories of territorial capital already mentioned, we could speak about three main forms of "platforms": *infrastructure platforms, knowledge platforms and identity platforms* (the fourth category of territorial capital, namely relational capital, providing at the same time a sort of precondition for success and a policy implementation method. The different possible actions pertaining to the three forms of platforms are symbolized in Map. 6.1.1.

6.1.3.1. Infrastructure platforms

New infrastructure platforms will allow the achievement of some basic priorities for the Latin Arc, namely: improving the internal integration of the entire area; boosting external accessibility of each region with respect to the Latin Arc and external territories, in order to achieve enhanced competitiveness and attractiveness; reaching a higher internal efficiency of large metropolitan areas through a polynuclear urban structure.

New infrastructure platforms encompass (Map. 6.1.1):

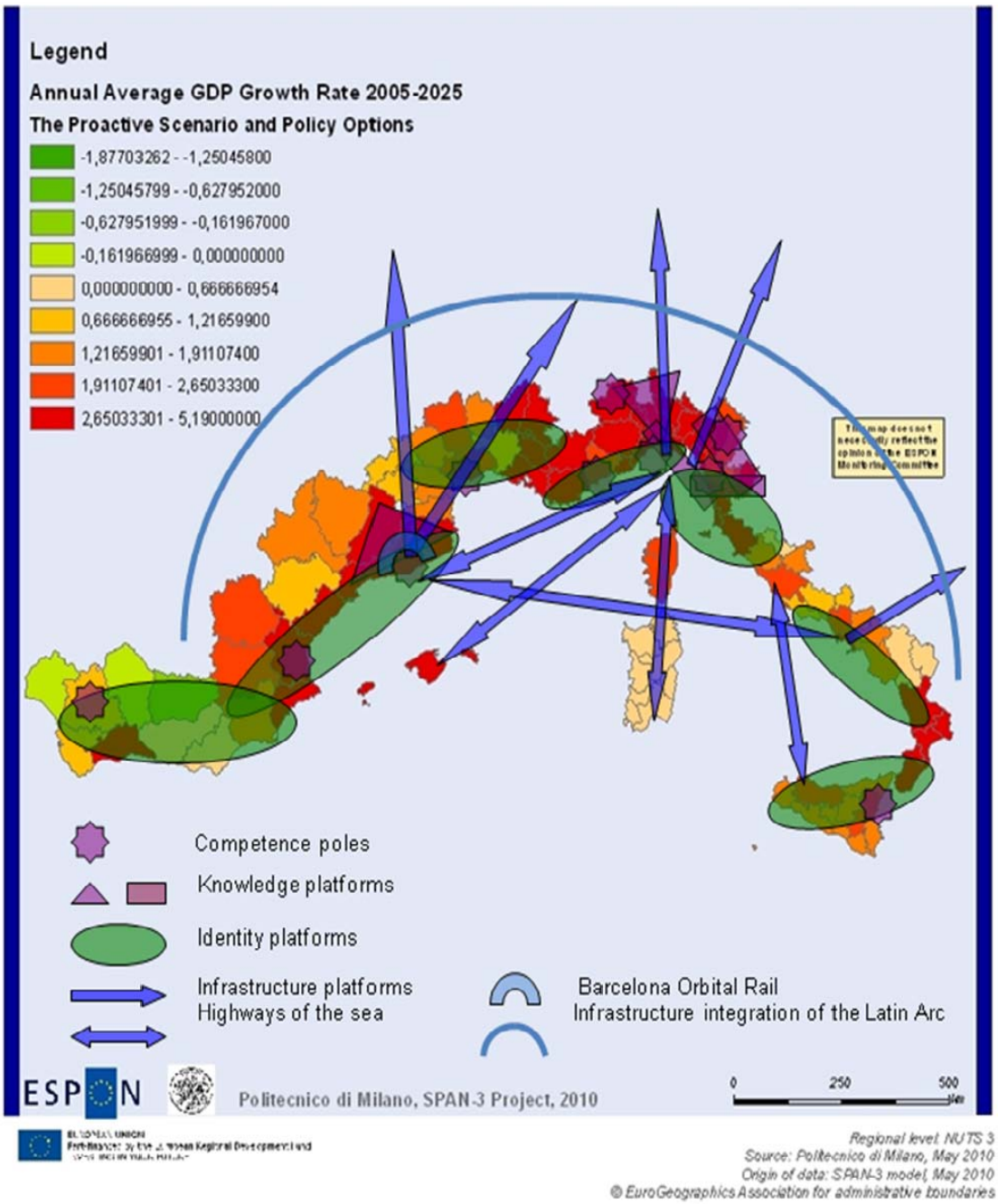
- a better and integrated rail network along the entire Latin Arc, as already stated;
- the use of new "highways of the see" in order to achieve the same goal;
- improved linkages of large metropolitan areas with the main European corridors: the Corridor of the Two Seas (Genoa-Rotterdam); links with Corridor 1 (through the new rail and road axis TI-Bre, Tirreno-Brenner from La Spezia to Parma, Mantua and the Brenner); Corridor 8 (Naples-Bari-Patras); improved infrastructure linking Barcelona with Marseille, Lyon, Turin and the Po Valley, Strasburg and Central Europe;
- an Orbital railway system internal to the Barcelona metropolitan area, allowing the structuring of a strong ring of subcenters.

6.1.3.2. Knowledge platforms

Knowledge platforms represent systems of cooperation networks between the main actors of the knowledge society: advanced research institutions, high education institutions, advanced and dynamic firms. Local firms are not only the recipients of the output of the specialised knowledge plexus (institutions working on scientific and applied research), but the carriers of long standing local production competence and know how, and therefore they represent a crucial partner in any innovation and technological advancement strategy. Particular attention should be paid by policy makers not just to achieve fruitful cooperation between these three local actors (in line with the up-to-now successful experience of the French "*poles de compétitivité*"), but also to monitor the

persistence of local production knowledge which could be jeopardised by the selective delocalisation of parts of the production *filières*.

Map. 6.1.1. – Policy actions and territorial platforms



Knowledge platforms may be structures through (Map. 6.1.1.):

- the synergy and cooperation between the above-mentioned main actors of the knowledge society into what may be called the local "competence poles". Examples of such existing or developing poles may be found in Sevilla (bio-technologies and links with the agri-food filière), Valencia (mechanical engineering for light sectors), Barcelona (wide array of sectors), Montpellier (bio-technologies and green technologies), Nice (ICTs), Genoa (ICTs and medical appliances), Turin (industrial automation), Pisa (advanced physical applications), Florence and Bologna (mechanical engineering, bio-medical appliances), Catania (ICTs);
- the enlargement of cooperation in the applied scientific field between local competence poles and similar but complementary realities in the wider urban region or even outside it. This strategy could be realised engaging the entire Catalonian territory or the triangle Genoa-Turin-Milan;
- the inclusion of innovative firms in these cooperation agreements, working on the industrial "vocations" and the specificities of territories. Examples range from marine technologies, very advanced and incorporated by the local shipbuilding industry in the arc Genoa-La Spezia-Viareggio-Livorno, to mechanical engineering and industrial automation competences on the axis Bologna-Florence;
- the development of other filières, linking excellence local natural and productive assets with knowledge and competence poles. The agri-food-tourism filière supplies huge potential benefits in the Latin Arc area. Similar virtuous circles, building on local "vocations" and supplying wide potential synergies refer to the health and wellness filière, linking local know-how in medical technologies with the increasing specialisation in wellness services and accommodation facilities for an increasing population of European retirees. A last example concerns a possible increasing engagement in the green economy paradigm, particularly in the supply of bio-mass and solar energy production possibilities, linked with the production and servicing for new energy technologies.

6.1.3.3. Identity platforms

Identity platforms exploit natural wealth and local cultural heritage for the development of new economic and employment opportunities. Local identities may become effective "brands" for new, selective and sustainable forms of tourism, but also for the advertising of ancient local competences embedded in food and wine productions and in local handicraft products. An integrated strategy for linking up all the preceding elements with new physical accessibilities, careful site information, worldwide marketing and enhanced logistic receptivity may prove extremely effective.

Local identities have to be re-discovered and interpreted on a wide area level; single pieces of cultural heritage have to be linked with each other in larger and consistent "itineraries", integrated in both information and logistic terms, in order to reach appropriate critical mass and new visibility on the international tourist market.

In the definition of identity platforms the role of citizens and local population is crucial, as they bring in their sense of belonging and place pride, their values and expectations, adding real culture and life to what could easily end up in a trivial commodification of the local atmosphere. Beyond that, they are the natural beneficiaries not just of the new employment potential, but of the improvements that a wise development strategy could bring in terms of accessibility and services.

As it is shown in Map. 6.1.1., the possibility of devising identity platforms along the Latin Arc in wide and extremely rich: diversities are widespread, but also the commonalities brought in by history and geography are clear.

6.2. Scenarios for the province of Barcelona: policies and ideas for the future

6.2.1. General framework

In order to obtain information about the territorial vision of local experts on the future changes in the province of Barcelona, a series of contributions were collected, which have been incorporated in the development of the scenarios. Here are in summary some of the most important points:

1. The province of Barcelona has two great opportunities if it is able to develop: (1) the Metropolitan Arc, as en articulator middle ground between the central area of Barcelona and the cities of central Catalonia, and (2) a kind of Network of Municipalities as a tool to reach consensus by agents located in the territory.

2. Focusing in the economic future, several experts consider that a relevant question is how to transform the economy from low value added activities to a high value added economy. Another key question is the management of the attractiveness of the Barcelona city: Barcelona is attractive, there is no doubt about it, but the challenge is to move from mass tourism to higher quality tourism.

3. The third policy priority is to enhance the communications between Catalan cities, because it is true that much has been invested in central cities and in the high speed train, but very little in the communication system between smaller cities and between industrial areas.

4. Finally, a major problem was put forward for the future of the region: the high levels of youth unemployment. During the last 10 years young people had the chance to quit studying and start working immediately in the building sector, without any training. Now they are unemployed and uneducated with the peril to become a lost generation. This is a very important problem because it is essential to have a good human capital to succeed in the knowledge economy. Key to this transformation is the role of public administration: The proactive scenario is more likely if the government is efficient.

6.2.2. Policy Indications for each scenario

6.2.2.1. Reference Scenario

In this scenario it is assumed an improvement in the provision of transport and communications infrastructure that will affect the both the connection to all major nodes of the Catalan network of cities and the connection to the rest of the world. It also assumes that the full road and rail infrastructure will be completed (La Sagrera Station). This increase in the supply of infrastructure is a key requirement to explain the increase in the efficiency of the whole economy of Barcelona.

The enhancement of total factor productivity, stemming from training and research and development, and innovation, will be another key area of policy intervention. The basic idea is to articulate in a network the provision of research and education infrastructure, linking these infrastructures with the technological trajectory of the different cities and with the needs of the environment

6.2.2.2. Pro-Active Scenario

In this scenario, specific policies to ease the transition towards a more knowledge-intensive model with higher productivity levels will be implemented.

The implementation of active industrial policies as the support of primary and tertiary industries and activities addressed at new eco-innovators markets is one of the fundamental master lines.

In particular, the fragmentation of labour markets will be tackled with infrastructure and endogenous development policies with the aim of developing a new pattern of growth based on high value added activities and in segments of sectors of medium or high technological intensity.

Accordingly, we postulate the implementation of an integrated economic and territorial strategy to strengthen the network of cities as a whole. In this sense, the integration of the labour markets of the whole province of Barcelona must be accompanied by policies of transport infrastructure endowment, mainly railways, which go beyond connecting these cities with the main high-speed rail (Sants-La Sagrera), port and airport hubs.

Policies in this scenario must include as a priority the construction of the new orbital (rail) line linking Mataró with Vilanova i la Geltrú, linking nuclei as important as Granollers, Sabadell, Terrassa, Martorell and Vilafranca del Penedès. Similarly, of great importance is the widening of the transversal (road) axis and the rail link between Girona and Lleida, articulating the axis of Vic, Manresa and Igualada.

6.2.2.3. Defensive Scenario

As a whole, the Defensive scenario presupposes maintaining the nature of the production and not act deeply on transport infrastructure and on the conditions of supply (education

and R & D), which involves preserving or protecting small and poorly communicated labour markets, both in the rest of the Metropolitan Region and in the rest of the province.

6.3. Policy Indications for the Intra-Province Territories

Infrastructural policies will determine the new strategy for the whole territory of the province of Barcelona. In particular, the transport infrastructure and technological and training infrastructure.

Regarding the transport infrastructure, policies for the Rail become fundamental. Especially, the ones affecting the heart of the metropolis, and specifically to La Sagrera Station, which will became the core of the entire network, integrating the high-speed rail in the metropolitan and regional rail transport. Similarly, the new orbital rail connection, linking Mataró and Vilanova i la Geltrú, through Granollers, Sabadell, Terrassa, Martorell and Vilafranca del Penedés, is intended to weave the network of cities in the whole Metropolitan Arch. Finally, the transversal axis linking Girona to Lleida, becomes crucial in the articulation of the whole territory of the rest of the province of Barcelona, first splits the existing highway and then building the new high speed railway line.

Along with the rail infrastructure policies, a prominent role is occupied by policies intended to integrate the whole network of cities of the province of Barcelona, with the aim of integrating its labour markets. Here the strategy is to help connect this network of cities based on the promotion of knowledge-intensive activities, both strategically locating new technological infrastructures, and encouraging specialization in advanced training. Here the objective is to promote the benefits of specialization of each node while promoting productive diversity of the whole system of cities.

In any case, both the strategy of provision of transport infrastructure (particularly rail) as the strategy for provision of technological infrastructure or training tend to feed each other, and encourage a dynamic that favours the strengthening of regional economies of urbanization and localization without falling into the problem of accentuation of the trend towards the sprawl nor of urban congestion of the centre.

In short, a strategy that enhances the competitiveness of all the territories and especially of the nodes of the network which are more distant from the core cities of the metropolitan area.

Version 01/05/2010

The ESPON 2013 Programme

SPAN-3

Spatial Perspectives at Nuts-3 Level

Project 2013/2/6

Annexes to the Scientific Report

EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

This report presents the draft final results of a “Scientific Platform and Tools” Project conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

Information on the ESPON Programme and projects can be found on www.espon.eu

The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This basic report exists only in an electronic version.

List of authors

Politecnico di Milano

Prof. Roberto Camagni
Prof. Roberta Capello
Dr. Antonio Affuso
Dr. Ugo Fratesi

Universitat Autònoma de Barcelona

Prof. Joan Trullen
Dr. Rafael Boix
Dr. Vittorio Galletto

TERSYN

Dr. Jacques Robert

Table of contents

ANNEXES

Annex 1. Thematic perspectives and scenarios

A.1.1. Demography

1. **Main drivers and patterns of demographic development during the past decade**[1]

- The European population is increasing slowly (average annual growth rate below 0.5% since 2000). In a context of low fertility rates, migration has been the main source of population growth, while the contribution of natural growth has become very small.

- Considerable differences can however be observed between countries and regions. On the background of the European trend of slow demographic growth, population decrease between 2000 and 2008 was reported in seven EU member States: the three Baltic States, Bulgaria, Romania, Hungary and Poland. In Germany, population size increased between 2000 and 2002, but has decreased since. On the opposite, average population growth has been above 1.5% per year in only three EU member States: Ireland, Cyprus and Spain.

- Considering the regional level, population has been declining in north-eastern and eastern European regions as well as in central parts of Europe and some scattered regions in western parts. Population growth has been relatively high in several northern and southern regions. In the north- western parts, population growth has been high in Ireland and in the northern regions of Scotland. In the southern parts of Europe, population growth has been relatively high in south-eastern regions of Spain, several southern regions in France, northern regions of Italy and Cyprus. In addition, there are some scattered regions with high population growth in Switzerland, the Netherlands, Norway and Luxemburg.

- Since 2000, fertility rates have increased slightly (partly caused by the postponement of childbirth). The percentage of European regions with very low total fertility rates has decreased from 21% in the 1990s to 12% since 2000. The percentage of regions with relatively high total fertility rates has increased from 17% to 25%. However, the rise has not been enough to change the direction of the trends. The percentage of EU regions experiencing population decline has increased further, from 27% in the 1990s to 30% in the years 2000-2006. The percentage of EU regions with a high share (15% or more) of people aged 65 or over has increased from 60% in the 1990s to 70% since 2000.

- Since 2000, natural population growth has been negligible or negative in more than one half of EU countries. In the 1990s, natural increase was positive in 59% of European regions. Since 2000, the percentage has declined to 47%.

[1] Account has been taken of the ESPON Project DEMIFER « Demographic and migratory flows affecting European regions and cities ». Interim Report. April 2009.

a) Since the 1990s, net migration has been the main source of population growth. In 72% of the regions, net migration has been positive. Since 2000, net migration has been high in several southern regions, especially in south-eastern regions in Spain and northern regions in Italy. Moreover, Ireland had also high positive net migration. About one quarter of European regions experienced negative net migration: many regions in Eastern Europe, several French regions, southern regions in Italy and northern regions in Norway, Sweden and Finland.

- As far as international migration is concerned, large flows were observed during the period 2000-2006 from Poland to the UK and Germany and from Bulgaria and Rumania to Spain. There are also significant migration flows between neighbouring countries (for example between Denmark, Norway and Sweden, between the Slovak and the Czech Republic and from the UK to France and Spain).

1. Although several migrant groups have higher fertility than the native population, the impact of migrants' fertility on the national fertility level tends to be rather small. In addition, migrants' fertility is diverse and fertility rates of many migrant groups are declining.

- The combination of low fertility rates and increasing life expectancy has caused important population ageing in a large number of European regions. In the 1990s, in one quarter of all European regions, the percentage of people aged 65 or over exceeded 17.5%. Since 2000, it is the case in 43% of European regions. The percentage of the oldest old has increased even more strongly. In the 1990s, the percentage of regions where the share of people aged 75 and over exceeded 7.5% amounted to 31%. Since 2000, this percentage has increased to 57%. In eastern parts of Europe, there are many regions with a high rate of growth of the "oldest old" combined with negative population growth. Other regions with high growth rates of the "oldest old" and low population growth can be found in Greece and southern parts of Italy.

- In Europe, the number of people aged 65 and over equal about one quarter of the working age population. Two decades ago, this was only one fifth. Since 2000, the increase of the old age dependency ratio (ratio of the number of people aged 65 and over and the number of people aged between 15 and 65) has been particularly strong in Germany, Greece, Italy, Estonia, Latvia and Slovenia.

- During the last two decades, life expectancy at birth in Europe has increased by 0.2 year per year on average (increase of one year every five years). There are however wide differences among countries. In many East European countries, the life expectancy of men is below 70 years whereas in most western countries it exceeds 75 years. In the Baltic States, women live in the average seven years longer than men, while in many Western and North-European countries, the difference is below five years.

- In more than one half of European regions, the growth rate of the working age population since 2000 has not contributed much to economic growth. It has been declining in most regions of Germany, especially in the eastern Länder, in the northern regions of Norway and Sweden, in eastern Finland, in the Baltic States, in several Slovak, Rumanian and Bulgarian regions. Only 16% of European regions experienced annual growth rates of the working age population higher

than 1%. This was the case in eastern parts of Spain, in several southern regions of France as well as in several regions of Ireland and the UK. In most Polish regions, there has been a moderate growth of the working age population.

A.1.1.2. Demographic perspectives and critical factors for the coming decade

A significant part of future demographic change, especially related to a period not exceeding 15 years, is largely conditioned by the present situation and by the trends of the past decades. In this respect, it is likely that:

- European total population change will remain slightly positive in the medium term and will probably become negative later on (roughly after 2025). The presentation of European regions experiencing population decline will further increase.

- fertility rates will remain below replacement level in most European countries, despite some increase since 2000. Changes in fertility rates have only long-term impacts on the population structure.

- population ageing and dependency rates will accelerate in most European regions. Mortality rates will also increase because of population ageing.

- the number of people aged 75 and over ("oldest old") will be growing, generating an increasing demand of health care. In the coming decade, informal care to the "oldest old" supplied by the young elderly is likely to increase. In the long run, the gap between supply and demand for care will increase sharply.

- the size of population of working age will further diminish in most regions.

- migration will remain the main source of population growth in numerous regions. Regional attractiveness for households will become more and more important. The extent to which European regions will succeed in attracting skilled migrants will be a critical factor for their further development.

There is a mutual interdependence between demographic and economic changes at regional level. Some aspects of this relationship are significant mainly in the longer term, such as fertility and mortality rates which depend upon the economic context, but do not affect significantly the population structure in the short term. Other aspects of the relationship have more immediate impacts: the differentials of economic progress between regions affect the direction of migration flows. Inversely, changes in population growth and ageing affect both the supply and demand side of the economy of regions. While in the long run, technological progress may reduce the need of internal migration, the supply of healthcare will remain labour-intensive in the long-term. Specific challenges will emerge in regions that show a strong increase in the number of "oldest old" and a decline in the working age population[2].
Against this background, it is likely that the economic crisis has had a significant impact on the flows of migrants, especially from Central and Eastern Europe to Western Europe. A significant number of migrant workers returned back to their home regions. Future migration flows will very much depend upon the way Europe will recover from the crisis.

[2] See DEMIFER

A.1.1.3. Territorial perspectives of demographic issues in the Arc Latin under different economic assumptions.

a) Recent demographic trends in the Arc Latin

The Arc Latin has rather heterogeneous demographic characteristics[3]:

- fertility rates are rather high in the French territorial entities (Départements), while they are much lower in the Spanish and Italian Provinces.

- average life expectancy at birth is in the highest category (above 80) in all territorial entities, except those of the region Languedoc-Roussillon, where it is slightly lower (78-80).

- during the period 2000-2006, annual net migration per 1000 inhabitants was high (above eight), except in the territorial entities of Provence-Alpes-Côte d'Azur and Piemonte, where it was lower (between four and eight).

- the annual population growth rates over the period 2000-2007 vary significantly among areas, with a strong East-West gradient. The territorial entities of Catalonia and Languedoc-Roussillon had stronger growth rates than those of Provence-Alpes-Côte d'Azur, which were themselves significantly higher than those of Liguria and Piemonte. In all cases, all were however positive.

- population ageing shows also a territorial gradient, but exactly in the opposite direction (which is of course logical). The share of population aged 65 and over is significantly higher in the eastern territorial entities of the Arc Latin than in the western ones.

- surprisingly, the growth rates of the population aged 75 and over during the period 2000-2007 show a different pattern, with relatively high values (between 3% and 4.5% per year) in the territorial entities of Catalonia and Piemonte and intermediate values (between 1.5% and 3% per year) in the others.

- the changes of working age population during the period 2000-2007 show a very strong East-West gradient, with high values (growth above 1% per year) in the territorial entities of Catalonia and Languedoc-Roussillon, intermediate positive values (between 0.5% and 1% per year) in the territorial entities of Provence-Alpes-Côte d'Azur and negative values (between 0 and -0.5% per year) in the territorial entities of Piemonte and Liguria.

b) Perspectives

A number of demographic characteristics of the Arc Latin are rather independent from the general economic context:

- the Arc Latin shows are rather dynamic evolution of its population and is not threatened by population decline in the medium term. The Italian territorial entities of Liguria and Piemonte are however in a less robust situation in this respect.

[3] See ESPON Project DEMIFER. Interim report. Draft Maps.

- the very high levels of life expectancy in the Arc Latin, combined with relatively low levels of fertility rates in the Italian and Spanish parts are likely to generate in the coming decade a quite strong trend of population ageing in these regions.

- the combination of declining population of working age and strongly growing population aged 75 and above is likely to generate problems of availability of human resources in the health care sector in the territorial entities of Liguria and Piemonte.

The Arc Latin has a strong potential to attract migrants (both nationals and foreigners), who may also be retired people. This is mainly related to the natural attractiveness of the Mediterranean coastal areas and of their hinterlands. The economic situation plays an important part in the nature and direction of migrants flows:

- in a very favourable global economic context, the flows of migrants above working age (retirees etc) are likely to continue and even to increase, while those of working age (especially foreigners from Central and Eastern Europe and from North Africa) are assumed to stabilize or to decline, because of better employment opportunities in their home countries (in particular if the Union pour la Méditerranée becomes a tangible reality).

- if the global economic situation is depressed, migrants flows can be expected to move in the opposite direction, with stronger flows of (partly illegal) economic migrants and weaker flows of non-working migrants into the Arc Latin.

A.1.2. Economy

A.1.2.1. European economic challenges before the crisis

The European economy is now emerging from the most severe crisis of the post-war period. During the decade before 2008, Europe was however confronted with a series of challenges in a context of accelerating globalization. Its average per capita income was more than three times higher than the world average, but it was only 70% of the US level and lower than that of Japan. The process of convergence in which Europe had been previously involved, based on the assimilation of existing technology, organizational practices and increasing activity rates, had come to an end at the beginning of the 1980s. Although productivity increased more dynamically in Europe, it was counteracted by weak employment performance and falling working hours. While in 1970 all of the difference in GDP/capita between Europe and the USA could be attributed to lower labour productivity, this represented only 1/3 of the difference by 2000, 1/3 being accountable to fewer working hours and 1/3 to lower employment rates. By and large, Europe had not sufficiently adopted the new economic paradigm based on new organizational forms, less vertically integrated firms, greater mobility both intra- and inter-firm, greater flexibility of labour markets, a greater reliance on market finance and a higher demand for both R&D and higher education. Although the catching up process of the economies of central and eastern Europe has been encouraging, with the 2004 and 2007 enlargements the EU has inherited the largest levels of territorial inequality in its history. The Lisbon Strategy, adopted in 2000, addressing the issue of European technological competitiveness has been challenged by disappointing achievements. At the same time, the expansion of international trade and international investments far outpaced the growth of output and income. In this process, the emerging

economies (BRIC) have been playing a major part, using mainly their comparative advantages of lower labour costs and growing domestic markets.

A.1.2.2. Nature and impacts of the economic crisis

The origin of the crisis was a combination of factors including growing social disparities and indebtedness of households in the western economies, weaknesses in the banking system with growing unreliable loan securities and the liberalization of financial services act world scale. The rapid widespreading of " rotten" capital assets and stocks throughout the global banking system has severely affected the world economy, especially the western economies, generating the strongest recession since World War II. The most immediate consequences have been the plunging of world trade, hitting particularly the leading exporting countries as well as the strong reduction of FDIs. In Europe, sharply growing unemployment has affected primarily the manufacturing regions, but also the regional economies which relied largely on construction and building activities as well as on tourism. The crisis has put into trouble the global integration of the movements of goods, capital and jobs and has generated some forms of de-globalisation. In the western world (Europe, USA), the governments have taken action to counteract the crisis by injecting money into sectors considered as strategic, such as the motor car industry and in speeding up the implementation of infrastructure projects in order to save jobs and enterprises. Public debt has dramatically increased in most European countries, so that public initiatives will be more limited in the years to come. After one year of recession in the western economies and in Japan, the growth rates of the emerging economies, especially in Asia, are still substantial, a situation which may point out lasting disparities in economic changes at world scale. Also within Europe, the impacts of the crisis are not homogeneous among countries and even less among regions.

A.1.2.3. Critical factors for the next 15 years

The future of globalisation

Although the economic crisis has generated some kind of de-globalisation, other factors point out to new forms of globalisation, differing from those which have characterised the decade before the crisis.

b) It is likely that wages will increase and technology will significantly progress in the emerging economies. Their comparative advantage of low labour costs will progressively be replaced by a competitive advantage, challenging the European economies on world markets in segments of significantly higher added value;

c) Integration will most probably progress more within the various world regions than between them. This may have significant consequences for the orientation of FDIs. It is also not unprobable that Asian countries create a common currency in order to better protect their interests;

d) The future of the dollar as reserve currency is more questioned than ever. Its further worldwide use in the trade of energy and raw materials is also uncertain. A weak dollar may, however, mean that significant production activities will be relocated into the dollar zone in order to better access markets and also to export under better conditions;

e) The accumulation of capital outside Europe (BRIC, energy producing countries, sovereign funds) will facilitate the taking over of European businesses by non-European groups looking for good investment opportunities, advanced technologies and short-term profits. This may endanger the long-term prosperity of increasing segments of the European economy;

f) After a period of easy access to capital, the financial crisis has generated more strict control in credit attribution. The likely increase of wages and related production costs in emerging economies (especially Asian countries) may induce inflation likely to spread throughout the world economy. The emergence of higher interest rates and progressing inflation is not unprobable during the recovery from the economic crisis and also for a longer period;

g) The energy sector is largely globalised because of the concentration of large fossil energy resources in a small number of countries. The external dependency of Europe in terms of energy supply will remain high in the 15 years to come and therefore subject to the unelastic relation between global supply and demand.

Europe-based challenges

Recovery from the economic crisis

Economic crises generate generally structural transformations. The European economy emerging from the economic crisis will certainly be different from what it was before. The impact of the crisis varies strongly between countries. Considering two countries which had significant growth rates before the crisis (Ireland and Poland), one can observe that Ireland has been hit by a very deep recession, causing a very sharp increase of the unemployment rate, while Poland's economy still has a positive development. IMF's economic forecasts for the coming years point out very low rates of economic development in Europe if compared with the expected growth rates of other continents. It is likely that major growth differences between European countries and regions with develop. The basic question is if the catching up process of the countries of Central and Eastern Europe will continue, considering that not all countries concerned are achieving similar economic performances to Poland.

FDIs originating from Europe

During the past 15 years, FDIs from Western Europe benefited largely to the countries of Central and Eastern Europe, mainly because of cheap labour costs. It is not unlikely that this type of investments favours in future an outer ring of countries outside the EU (except Bulgaria and Romania), such as Ukraine, Moldova, Croatia, Serbia, Turkey, Egypt and North Africa. This would create major difficulties in the countries of Central and Eastern Europe which are not yet at the edge of technological development and are progressively losing their comparative advantage of low labour costs.

Economic impact of demographic change , especially of population ageing

The economic impact of demographic change, in terms of reduction of the available workforce due to the retirement of a growing number of people, will be accelerating

during the decades to come. Shortage of manpower, especially of skilled human resources, will be a growing handicap for numerous European regions. The situation is however rather heterogeneous throughout Europe, some regions being considerably more affected than others by population ageing. The issue is likely to be particularly serious in numerous regions of central and eastern Europe as well as in some West European regions, such as north-west Spain or northern Italy.

Development and diffusion of new technologies

Europe's capacity to be at the edge of technological development, as advocated by the Lisbon Strategy, will be more crucial after the crisis than it was before, as numerous jobs in activities based on low or medium-level technologies have disappeared during the crisis. External competition, in particular from emerging economies such as China and India, will however intensify. Various technological sectors have a strategic importance for the next 15 years, for which Europe should not be less competitive than other continents. These are especially the biotechnologies, the nanotechnologies, the technologies of robotisation, the technologies of new materials as well as new technologies in the energy sector. Not only strengthened innovation is important in the sectors concerned, but also the capacity to transform innovations into products and processes and to involve as many regions as possible in the dynamics of technological upgrading. This is a real challenge for Europe, considering the modest results of the implementation of the Lisbon Strategy up to now. Concentrating more on the delopement of new technologies may also generate stronger territorial imbalances within Europe.

The "green economy" as a significant opportunity for growth

The emergence of the "green economy" results from the convergence between sharply increasing energy prices before the crisis and a growing concern about climate change. While the economic crisis has provisionally attenuated the energy issues, it had no real impact on the need to depart from the carbon-based economy and energy production. A consensus has progressively crystallised both within political circles and within the European civil society to drastically reduce the greenhouse gas emissions, considered as responsible for climate change and the related nature of hazards. The "green economy" is not a sector in itself. It is more horizontal in nature and crosses a variety of sectors, such as energy, transport, manufacturing, agriculture, tourism, building and construction etc. It should be largely based on technological innovations, their diffusion and rapid adoption in European regions and cities.

The "green economy" can become a significant factor of growth in Europe, because it could boost domestic demand in a period where this is particularly low and also promote new export activities. The revival of endogenous growth in Europe is a key factor for the economic recovery. In addition to environmental improvement and reduction of greenhouse gas emissions, it could also contribute significantly to the recovery from the economic crisis, to the creation of new jobs and to the reduction of dependency on fossil energy sources. A number of European enterprises (motor car industry, solar energy etc) are already on the move towards the "green economy". In order to reach a true "size effect" and to involve the various economic sectors as well as a large number of European regions into the process, public support will prove necessary. Constraints will however be the scarcity of public resources due to high

public debts and the growing external competition (China is for example already very competitive in the sector of solar energy).

A.1.2.4. Possible hypotheses for scenarios on "Economy"

The economic crisis has revealed the extent of the globalisation process and has confirmed that the future of Europe cannot be envisaged in an autonomous way. This is the reason why the scenarios will pay significant attention to the global context, in a situation where the resources available for public policies are more constrained than before the crisis by the high level of public debts.

Because of the structural changes generated by the economic crisis, the elaboration of a "trend" (baseline) scenario for the economy does not seem meaningful. A "reference scenario" taking into account a number of recent structural changes in addition to more long-term evolutions seems more appropriate. On this background, the capacity (or incapacity) of the European economy to take advantage of the new global situation and of its internal potentialities can be anticipated in the form of contrasting scenarios.

A.1.2.4.1. Reference scenario

The regionalisation of the globalisation process will reduce the amount of external FDIs into Europe, with the exception of those (sovereign funds etc) aiming at taking over European businesses of strategic character (technology, brands etc). European investments will be less substantial but more concentrated on Europe and on its external periphery and neighbourhoods (including Ukraine, Moldova, Turkey, Egypt, North Africa).

The integration of currencies will take place at the scale of large world regions (North America, Europe, Asia, Gulf States), but will fluctuate more between themselves at that scale. The US dollar will lose its importance as reserve currency.

The deflationist effect of Asia (mainly of China) on the world economy will be strongly attenuated and will progressively disappear. Inflation will increase as well as real interest rates. The growth of real income in Europe will be more modest than before. The purchase power of specific groups (retirees, civil servants, low income groups) will be particularly affected. The new generations will maintain their standards of living in selling their heritage and properties.

Growing oil and gas prices will favour investments in oil and gas exploration and discovery. The Arctic region will become a strongly targeted region in this respect. Regional tensions and possible conflicts are not excluded. The expansion of nuclear energy will be constrained by the progressive depletion of uranium resources. The profitability of renewable energy will increase.

The regionalization of globalisation will enable the recovery of manufacturing activities in Europe

Disparities in the productivity of the main economic sectors will increase, especially between advanced economic functions (financed by capital) and basic services (paid by incomes, including social transfers). Such disparities will be projected also on territorial development

A number of new technologies will emerge during the coming 15 years which will have significant impacts on the economy, especially in the fields of energy production and use, including the processing of biomass, the nanotechnologies, biotechnologies and transport systems.

A.1.2.4.1.1. Territorial aspects of the reference scenario

Regional disparities are likely to increase within the EU. The two-speed Europe will be accentuated, with advanced economic functions concentrating more and more in metropolitan regions. New manufacturing activities, benefiting from significant technological progress and from related productivity growth, will also concentrate in well-developed regions. In addition to main metropolitan regions, second-rank cities and metropolitan areas will also be beneficiary, but the process will be weaker in the case of a number of second-rank cities in Central and Eastern Europe which are handicapped by their low accessibility.

The regions most affected by the crisis and where development perspectives are not easy to identify, are mainly manufacturing regions with low or intermediate technologies and a relatively high intensity of manpower, both in Western and Eastern Europe. While low level manufacturing activities will largely be transferred to the neighbouring countries outside the EU, a number of regions of central and eastern Europe, which had so far benefited from such activities, will be particularly affected by this evolution. They will be confronted to problems similar to those which the east-German regions had to face during the past 15 years, with technological and skill levels lower than in the West European regions and production and labour costs higher than in the regions farther in the east. Romanian and Bulgarian regions will be less affected. Other regions affected by the crisis and where recovery will prove difficult are those which had, up to the crisis, booming activities in the sector of building and construction, largely based on speculation in the real estate sector, as for instance in Spain.

Lasting difficulties may also affect regions where economic growth before the crisis was largely based on financial speculation and related financial services or on specific fiscal niches as in Ireland and in the UK. Numerous tourist regions have also been affected by the crisis, but tourism is very volatile and the recovery of these regions depends upon the general level of the European economy. In the hypothesis of moderate economic growth in the medium range, a number of tourist regions will have a satisfactory recovery, a fact which does not exclude that others, especially those based on mass tourism with low added value, may face a less favourable evolution.

The evolution for rural areas will be contrasting and heterogeneous, with a number of rural regions being affected by the deregulation of the CAP and trade liberalization in the context of the WTO, others benefiting from the opportunities of biomass and renewable energy production. In addition, other factors will influence the future of rural areas, such as their attractiveness for retirees, their potential for rural tourism and also the impacts of climate change.

The regions where demographic factors may act as a constraint on the regional labour markets are those where the economic recovery is substantial in a context of rapid population ageing. This may be the case for metropolitan regions with low immigration in the past decades as well as for a number of rural areas subject to economic revival.

Immigration will further concentrate on large cities, generating a low cost housing market at their periphery. It will also be substantial in tourist areas and in areas attractive for the retirees. In these regions, it will favour the increase of fertility rates.

The financial support of European policies to the EU regions of central and eastern Europe will be more modest than it was during the past years. On the opposite, EU support to neighbour countries outside the EU borders will increase in order to stabilise the region and to accompany the flows of private investments. In the reform of EU policies and especially of structural policies after 2013, it is not excluded that increasing support be also attributed to well-developed EU regions in order to support metropolitan areas and global competitiveness.

Territorial impacts for the "Arc Latin"

The "Arc Latin" has a rather heterogeneous economic structure, so that developments will contrast between regions. In general terms, metropolitan areas with advanced economic functions and technological poles will be more favoured than cities with an economy depending upon intermediate or low technologies. After recovery, tourist functions will progress moderately. The residential economy will progress more because of accelerating population ageing in Europe. Rural areas will be affected, up to a certain extent, by the deregulation of the CAP, especially the wine producing regions. A number of rural areas will benefit from the production of renewable energy, but only a modest part of the available potential will be exploited. Immigration will concentrate in metropolitan and tourist areas.

A.1.2.4.2. Pro-active scenario

The pro-active scenario differs in many respects from the reference scenario, both with regard to the global context, to the attitude of European economic actors and to European support policies.

The recovery from the crisis will generate significant structural changes at global scale, with a more aggressive attitude of economic actors. The western economies wish to rapidly re-conquest growth and are ready to let their economies realise a substantial qualitative leap, moving towards more technology oriented activities and implementing resolutely the "green economy" strategies. Asian countries become aware that the context of their growth has changed. They also move towards more technology-intensive activities requiring better paid and better skilled human resources.

A consensus will crystallise between Europe, the main Asian countries and the largest exporters of oil, gas and raw materials to abandon the dollar as a transaction currency for these commodities. They also rapidly diversify their currency reserves, reducing significantly the share of the dollar. A more stable international financial order results from these initiatives.

In Europe, the strategy consists of increasing significantly technological investments boosting productivity, but generating in a first stage higher unemployment rates. Only after a period of 5 to 7 years, employment is growing again. Higher skills and qualifications are required, which doesn't mean that Europe's employment is mainly composed of managers. The race for stronger tertiarisation is being attenuated thanks to

a rapid development of the "green economy" which creates jobs both in R&D and in manufacturing activities. Services move towards higher added value segments. In the context of a more regional globalisation, higher financial services are being re-centred on Europe. Through higher competitiveness and stronger public support, European enterprises are less in danger of being taken over by non-European groups or sovereign funds.

Economic growth is stronger and recovery more rapid than in the reference scenario. It is not limited to Europe, but includes also the USA and Asia. The more developed economies and also the BRIC invest in the less-developed countries, especially in Africa, Latin America and Southeast Asia, in order to develop the local markets and to create demand, which is just the opposite of a protectionist attitude.

A.1.2.4.2.1 Territorial aspects of the pro-active scenario

The territorial impacts of the pro-active scenario will change somewhat over time. During the first phase (5 to 7 years) growth will be concentrated on metropolitan areas, especially in Western Europe, because of significant investments in advanced technologies. In a second stage, production activities related to the "green economy" will diffuse towards cities of second and third level and also towards regions of central and eastern Europe as well as towards the more peripheral regions of Western Europe.

The scenario will favour, in the second stage, a higher degree of polycentricity of settlement systems than the reference scenario, especially with regard to international and regional cities, showing that specific contexts favour more polycentricity than others.

A significant number of rural areas will benefit from the "green economy", especially in the field of renewable energy sources (biomass, solar and geothermal energy etc).

Territorial impacts on the "Arc Latin"

The scenario is favourable to the development of technological poles situated along the "Arc Latin". The strengthening of R&D activities will also generate spin-off effects in the production sectors. In the context of the "green economy", the development of solar energy will be booming along the "Arc Latin", from R&D activities down to the general implementation of related technologies in rural areas and cities.

The realisation of the "Union pour la Méditerranée" (UPM) will only be possible if economic growth in Europe is significant. The scenario provides good conditions for its implementation, especially for the development of complementarities and partnerships between the European Mediterranean regions and countries of the southern and eastern parts of the Mediterranean Basin. The metropolitan areas of the "Arc Latin" should benefit significantly from this multilateral initiative.

The "Arc Latin" will be less subject to foreign immigration because of stronger economic development in North Africa and central and eastern Europe. A larger part of the immigrants of working age will be integrated into the regional labour markets of the "Arc Latin" because of more favourable economic conditions.

The “Arc Latin” will also benefit from a better development of tourist functions and of the residential economy, both being directly linked to the prosperity of other European regions.

A.1.2.4.3. Defensive scenario

The scenario assumes a slow recovery from the crisis in Europe, resulting from a weak reactivity to the changing context and also from less favourable global conditions. In the USA, domestic demand remains low because households put a higher priority on savings than on consuming. The BRIC maintain their comparative advantages in low-cost production, a factor which also constrains the development of their domestic demand. They however progress also in more technology-intensive sectors, competing more intensely with Europe. Few investments are made in the least developed countries, so that markets and domestic demand remain weak there.

Europe does not invent a new technological paradigm and maintains its traditional activities. The “green economy” cannot make a breakthrough. Cost competitive policies are maintained in Central and Eastern Europe in order to attract FDIs. Their impact is however rather limited.

The Euro does not become a reserve currency. Inflation is lower than in the reference scenario, mainly because the deflationist impact of low-wage policies in Asia is maintained. Interest rates are also lower than in the reference scenario.

In a first stage (5 to 7 years), Europe exports more than in the reference scenario, but exports comprise a large share of products with low added value. The progress of productivity is much lower. Employment is being artificially protected.

More European businesses are taken over by non-European groups, which means, in the first stage, more inward capital flows. Such investments look, however, mainly for short-term profits and for the appropriation of technology. When the profits of such businesses are declining in the medium-range, because of the lack of investments in technology and productivity improvement, they are left out by the new owners. A number of them are then threatened in their existence.

The service sector is less qualified than in the reference scenario. Only functions with modest added value will increase somewhat. Low-profile tertiary activities, such as call centres, are dominating.

While employment remains relatively protected during the first phase (5 to 7 years), the situation worsens afterwards because of insufficient competitiveness in the global context. Exports will slow down as well as FDIs from outside. The economic situation in Europe by 2025 will not be better than it was at the end of the recession in 2010. Opportunities for recovery will even be worse, with long-lasting weaknesses and fewer resources for modernising the economic structure.

A.1.2.4.3.1 Territorial impacts of the defensive scenario

The territorial evolution of Europe, according to this scenario, has to be considered in two stages. During the first phase, economic growth will be quite low and changes in

the regional patterns will be modest, compared with the situation in 2010. The settlement pattern will not be significantly modified.

Important changes will however take place during the second phase, when the manufacturing industries will lose their competitiveness and rapidly decline. This will be very detrimental to numerous regions of central and eastern Europe, as well as to a number of regions of Western Europe, outside metropolitan regions. Unemployment will significantly increase in these regions.

The development of activities will then concentrate mainly in and around metropolitan areas, especially in Western Europe, in order to minimise risks. There will not be sufficient economic potential and flexibility for a more polycentric development of the settlement system. Medium-sized and smaller cities with an economic base strongly dependent upon manufacturing industries will be particularly affected.

Rural areas will be much less prosperous than in the reference scenario. They will benefit modestly from their potential in the field of renewable energy because of insufficient resources and support. They will also be affected, during the second phase, by the decline of manufacturing industries in numerous small and medium-sized cities. Rural tourism will not be flourishing because of the depressed economy situation in Europe.

Territorial impacts on the "Arc Latin"

Under this scenario, the perspectives of development of the "Arc Latin" are less favourable than under the reference scenario. The lower level of public efforts in the field of research and technological development will not enable the technological poles of the "Arc Latin" to generate spin-off effects and to efficiently contribute to the modernisation of the regional economies. Manufacturing industries in the "Arc Latin" based on low and intermediate technologies will be affected during the second phase, while the potential existing in the field of solar and other renewable energy sources will only be modestly exploited. This will also be detrimental for rural areas, which will be confronted, in addition, to a decline of agricultural activities and to depopulation trends.

The stagnating European economy will handicap the development of tourist functions and of the residential economy along the "Arc Latin".

The implementation of the UPM strategy will hardly be possible because of insufficient economic growth in the European context and of weak public support. The low level of European investments in the southern countries of the Mediterranean Basin will accelerate out-migration from North Africa. A significant number of (largely illegal) migrants will settle in the regions of the "Arc Latin", especially in metropolitan areas and will remain largely unemployed.

A.1.3. Energy

The crisis has overshadowed the energy issue which remains however one of the most serious factors for the economic development of Europe.

A.1.3.1. Lessons from the past 10 years

The past 10 years have been characterised by strong fluctuations in oil price and by the price increase of other energy sources (natural gas, electricity).

The strong fluctuations of oil price between 2003 and 2009 were driven by both supply and demand variations:

- strong increase of oil price after 2003 caused by:

2. supply variations (Iraq war)
3. demand variations (increasing oil demand from emerging economies)
4. role of OPEC and speculative traders

- strong decrease of oil price during the second half of 2008 caused by sharp fall in demand related to the financial/economic crisis and the attenuation of speculation;

- increase of oil price during the first half of 2009 driven by a modest recovery from the crisis.

The strongest price fluctuations concern crude oil and reflects very closely the relationship between supply and demand (no elasticity). The price evolution of other energy sources after 2003 shows an upward trend with smaller fluctuations, driven by the average change of oil price.

The liberalisation of electricity markets in Europe has, so far, not resulted in a decrease of electricity prices. On the contrary, electricity producers increase domestic prices in the context of emerging competition in order to be able to invest for catching new markets abroad.

A.1.3.2. Critical factors for the next 15 years

h) Global economic growth at world scale: it will largely determine the level of oil price which interacts with other energy sources. In this respect, the speed of recovery from the crisis as well as the further development of emerging economies (BRIC) are essential factors.

i) Date of depletion (oil peaking) of large oil fields in the Middle East in relation to new oil discoveries. The probability of disruption of oil supply in the medium term, caused by the oil depletion of large oil fields is probably higher than that of significant new oil discoveries. The volume of investments as well as the political stability in oil-producing regions, in the coming years, are critical factors.

j) Possible scarcity and depletion of uranium resources in the context of growing demand related to the construction of numerous nuclear power plants at world scale.

k) Development speed of renewable energy sources. Political decisions related to the curbing down of climate change will have an accelerated impact on the

development of renewable energy sources. Their share in total energy supply in Europe by 2025 will however remain modest.

A.1.3.4. Possible hypotheses for scenarios on "Energy"

For a time horizon of 15 years, low energy prices as they were before 2003, seem hardly possible. Relevant hypotheses will be related to more or less significant growth rates of energy price, according to various situations in the global context:

- in a context of rapid recovery from the crisis, global energy demand, and especially oil demand, will grow significantly. If the new "green economy" is a significant factor of economic recovery, at least in the more developed countries, the share of renewable energy sources will also increase substantially, attenuating somewhat the impact of oil price increase.

- In a context of slow recovery from the crisis, global energy demand, and especially global oil demand, will be more moderate. However, fewer resources will be available for promoting the "green economy".

The occurrence of depletion of oil and/or nuclear energy resources during the next 15 years cannot, however, be excluded. This would generate a completely new scenario, which would be substituted to the two former ones, because it would certainly generate a new, lasting economic recession with very important territorial impacts.

A.1.3.4.1. Territorial aspects of energy scenarios

- *Rapid recovery from the crisis and sustained development of the new green economy without depletion of major energy sources (oil, gas, uranium)*

As far as Europe is concerned, this scenario concentrates mainly on the transformation of energy systems in the context of the new "green economy". Significant investments are made for the development of new technologies departing from the usual carbon-based fossil energy sources and for the curbing down of energy consumption in general. Oil and gas demand are diminishing, but electricity demand is increasing (electric cars, public transport systems etc). Economic actors and households are influenced, in their behavior, not only by incentives related to energy savings and the production/use of renewable energy sources, but also by the new carbon- related taxes.

As far as energy production is concerned, a very large number of decentral production units of very different sizes are being developed, both in the countryside and in cities. Solar energy and biomass are the most favourite sources, but wind and geothermal energy are also being significantly exploited. Numerous rural areas benefit from the production of biomass. The new energy paradigm favours compact settlement systems, although the generalisation of electric cars maintains a certain level of urban sprawl. Impacts are significant at the scale of buildings and neighbourhood units, with new low energy consumption architectural and urbanistic concepts. Long-distance transport of goods and people is more and more ensured by railways, at the expense of motorways and air transport. Significant investments are made in high-speed railway networks. Air quality in cities improves significantly.

- *Slow recovery from the crisis; no real emergence of the "green economy"; no depletion of major fossil energy sources*

The European economy is lastingly affected by the crisis and by the growing external competition from emerging economies (BRIC). The transformation of energy systems in Europe is slow. European demand for conventional energy sources does not change significantly and increases moderately. Europe remains vulnerable in terms of external energy supply. The high level of public debt in the various European countries, combined with low economic development, does not make possible the emergence of a true "green economy". The production of renewable energy remains marginal. There is no significant revival of the rural economy based on the production of biomass. The low level of economic development results in a modest expansion of settlement systems.

- *Depletion of oil and uranium resources*

The scenario assumes that significant energy shortage in Europe will occur in the medium term (before 2020), caused by the combination of oil peaking in a number of major oil fields in the Middle East and of the scarcity and depletion of uranium resources. The price of energy will continuously increase and finally cause a deep, long lasting global recession.

The increase of transport costs affects primarily the regions strongly dependent upon transport functions, which are both European peripheral regions and manufacturing regions. A number of regions of eastern Europe, being both peripheral and industrial, are particularly affected. The emphasis is put on the development of renewable energy sources, which prove however to be insufficient to match the energy needs in Europe. It becomes difficult to avoid unsustainable practices in rural areas caused by the intensive production of biomass. Competition between energy and food production is increasing. Settlements become more compact in order to reduce transport costs. When energy prices have reached substantial levels (higher than five times the level of 2010), production and consumption systems are being re-organised at meso-scale in order to minimise transport costs. Regional specialization at European scale is losing its importance and heterogeneous production systems develop at meso-scale. Larger urban concentrations become again more dependent upon their surrounding rural areas, where poly-cultural and more labour-intensive agriculture develops.

The economic recession caused by the sharp increase of energy prices generates significant unemployment rates. Numerous unemployed urban citizens move to rural areas, hoping to develop a more self-sufficient way of life. All regions with favourable climate conditions are particularly targeted. European regions with still exploitable fossil resources (coal, brown coal, peat etc) are again put to contribution. The environmental situation worsens in a number of fields (intensive use of coal and brown coal, proliferation of wind mills, more intensive agriculture etc), but it improves in other fields (less intense traffic flows, increased use of public transportation, development of solar energy).

A.1.3.4.2. Possible territorial evolution in the "Arc Latin"

The Mediterranean regions of the "Arc Latin" have specific characteristics with regard to energy issues. They benefit from a warm climate and have huge potentialities in the

field of solar energy. On the other hand, dependence on motor cars and trucks for the transportation of people and goods is higher than in numerous other European regions, because of less-developed public transport systems and more dispersed settlements. Potential in the field of biomass is rather low because of dry climate conditions.

The first scenario (rapid recovery from the crisis) will be very beneficial to the "Arc Latin" in boosting the "green economy" in terms of strong development of the solar energy resources and in improving significantly the environment of cities which are generally quite polluted by car traffic. New architectural and urbanistic solutions will have to be developed to reduce energy consumption related to air conditioning in cities.

The second scenario (slow recovery from the crisis) is more or less freezing the existing situation, with high dependency of the "Arc Latin" upon external energy sources and therefore stronger vulnerability to changes in the global context. At the same time, the economy of the "Arc Latin" will not benefit from the enormous potential of solar energy available in the region and will remain stagnating.

The third scenario (depletion of major fossil energy resources) will be rather catastrophic for the "Arc Latin", as it would also be for the rest of Europe. The availability of a significant potential in solar energy will not be sufficient to solve all problems. It is however likely that the production of solar energy will be enormously boosted and may have detrimental environmental impacts (destruction of landscapes etc). The natural vegetation (forests) will also be under pressure for the accelerated production of biomass in a difficult and unsustainable context (drought).

A.1.4. Rural Development

A.1.4.1. Main drivers of rural development during the past decade[4]

- Increasing differentiation of rural areas in Europe, due to:

    5. the declining importance of agriculture in rural employment as well as in the outputs of rural regions

    6. slow transition from "productivism" in agriculture to a variety of:

        7. para-productivist orientations (businesses and areas which opt to compete on the basis of specialisation, technology and strong links with the agribusiness)

        8. peri-productivist orientations (increasing importance of on-farm diversification and off-farm jobs for farm household members; survival strategy for specific farm types and categories of rural areas)

    - Increasing contrast between large "commercially-oriented" holdings and smaller pluri- active and diversified units, especially in rural regions where agriculture continues to play a major role. Large-scale commercialised holdings tend to be tied into supply chains which are often controlled by multinational companies and supermarkets retailers. Small-scale producers

[4] Account has been taken of the ESPON Project EDORA (European Development Opportunities for Rural Areas). Interim Report. April 2009

tend to be attached to shorter, locally embedded supply chains, often competing primarily on quality rather than solely on price.

- Increasing urban influence on accessible rural areas. Demographic and economic impacts: larger functional labour markets which blur the urban/rural boundary; stabilization or increase of population; stronger development of secondary and private services employment. Increasing dominance of the New Rural Economy in intermediate rural areas (clusters; post-fordism; innovation; learning regions etc). Development of urban-rural cooperation; increased demand for rural housing; counter-urbanisation.

- More peripheral regions entering into a vicious circle characterised by strong population ageing and depopulation, declining attractiveness for businesses and households caused by lower supply of services; land and farm abandonment. Rural out-migration of transnational character from rural regions of Central and Eastern Europe. In various peripheral rural regions: emergence of a sustainable development model based on local food production through "re-embedded local food supply chains".

- Changes in consumption trends: growing niche markets for agricultural and food products;

- Increasing value placed by society upon rural environment, culture and heritage; increasing ability of the urban population to access recreational amenities;

- Introduction by the new CAP of environmental and safety norms, but significant impact of liberalization on agriculture.

A.1.4.2. Critical factors for the development of rural areas in the next 15 years.

- Rural demography: a larger number of rural regions will be subject to population ageing and decline, especially if the rural outmigration continues. These are mainly located in the eastern territories of Central and Eastern Europe as well as in the landlocked areas of southern Europe (Greece, Italy, Spain, Portugal)

- Access to services of general interest. This will be the most critical factor for numerous rural areas in relation to their capacity to maintain and attract population and to break the rural deprivation vicious circle. The further privatisation of services and the reduction of public budgets are strategic aspects;

- Progress of the New Rural Economy[5], especially in intermediate rural regions where the influence of cities and metropolitan areas is substantial;

- Recovery from the economic crisis, especially for fordist and neo-fordist rural regions as well as for regions in Central and Eastern Europe which were dependent upon the remittances of migrant workers;

- Energy challenge and production of renewable energy. The emergence of a "Green New Deal" can be particularly challenging for numerous rural areas. It

[5] Diversified economy largely based on manufacturing activities and private services

may generate significant new income opportunities for rural areas, but also threaten the environment and generate competition with food production;

- Climate change. The further acceleration of climate change is likely to affect the fertility of numerous rural areas in Southern Europe and will put forests at higher risk of fires. Drought may also have impacts on the production of hydro-electricity in these regions. Climate change will also affect the tourist potential of mountain regions (winter sport) and have impacts on the types of agricultural production in the more central and northern regions;

- Further changes in the CAP after 2013. Further liberalisation of agriculture and reduction of supports to farms might have significant impacts on a number of rural regions, including Mediterranean ones.

- Evolution of the global demand for food products at world scale. Demographic growth and increasing purchase power in a number of large emerging countries are likely to boost the global demand for food products (especially cereals, dairy products and meat);

- Evolution of technologies related to the exploitation of renewable energy sources, especially biomass.

- **Thematic scenarios for rural development**

- **Rapid recovery from the crisis and adoption of a "Green New Deal"**

Hypotheses and general aspects

l) On the background of general recovery from the economic crisis, driven by sustained growth rates in the emerging countries, a Green New Deal is adopted by the EU and a number of other large economies, with the aim to depart from the carbon-related economy in relation to climate change. EU and national policies are adopted to support investments in new technologies (energy, transport, manufacturing, living in housing, agriculture etc). New technological solutions have also to be rapidly implemented and widespread throughout Europe.

m) Rural areas are put to contribution for increased production of renewable energy. The introduction of new technologies for the exploitation of biomass make possible to limit the competition between energy and food production. Nevertheless, not only the most fertile rural areas are being intensively used, but also a number of areas previously set aside. Concentration trends in the productivist agricultural segments will continue because of growing capital needs to implement new technologies. Maintaining sustainable forms of agricultural practices in a context where demand for outputs is growing requires specific efforts and control mechanisms.

n) Rural areas attractive for tourism and residential functions, especially those with a significant cultural and natural heritage, benefit from the general recovery of the economy and gain additional income.

o) A number of rural areas hit by the economic crisis (especially the fordist and neo-fordist regions with labour-intensive manufacturing activities) can compensate for their loss of employment by the development of activities in

renewable energy production. Capital penetration will increase in various peripheral rural regions.

p) Rural regions affected by the CAP reform and by further liberalisation of exchanges of agricultural commodities will be in a position to reconvert their production into segments with growing demand (niche and "terroir" products).

q) Outmigration from rural regions will slow down.

r) Urban-rural relations and partnerships will intensify. A number of medium-sized towns in accessible rural areas will benefit from the spin-off effects generated by metropolitan areas.

Territorial impacts on the Arc Latin

2. The potential of Mediterranean rural regions for biomass production is much more limited than that of less dry European regions, especially in the context of global warming. Mediterranean regions have however is significant potential in the field of solar energy, the exploitation of which will be speeded up by increased public support and by the development of new technologies. A significant difference with biomass production is that solar energy production does not require fertile rural areas. On the contrary, dry and hilly areas are particularly well suited, provided that typical Mediterranean landscapes can be protected. Coastal and hilly regions will also be subject to the development of wind energy, the environmental impacts of which will have to be seriously monitored and mitigated.

3. The positive evolution of the European economy favours the development of rural tourism and of the patrimonial and residential economy in the Mediterranean rural regions of the Arc Latin.

4. The CAP reform (liberalisation in the wine, fruit and vegetable sectors implying growing external competition) will affect a number of Mediterranean rural regions. The resulting loss of income will partly be compensated by alternative activities and income sources (solar energy, tourism and residential economy, intensification of urban-rural interactions).

5. A large part of the rural areas of the Arc Latin are under the influence of the New Rural Economy[6] and will therefore benefit from the favourable economic climate which will facilitate adjustments were necessary.

6. Land abandonment and rural outmigration in the mountainous and hilly hinterlands will slow down, but population ageing and decline in a number of these areas will threaten the stability of settlements and the provision of services. The extent of additional rural deprivation will however be limited.

- **Slow economic recovery and no emergence of a Green New Deal**

Hypotheses and general aspects

c) In this scenario, the economic recovery is assumed to be slow and irregular in time. Further economic shocks will take place, caused by speculative bubbles based on cheap access to capital (very low interest rates).On this background,

[6] See EDORA

trust of economic actors will not be sufficient to generate sustained economic growth. The lack of resources and of political willingness will prevent the emergence of a Green New Deal at European level, in cooperation with other advanced and emerging economies. Initiatives in this field will remain isolated and un-coordinated. In such a context, it will be difficult to make profitable investments in new technologies related to energy, transport, construction etc. The competition of traditional, less environmentally-friendly systems will remain strong. Protective attitudes will generalise in order to maintain employment.

d) External competition will however continue to progress and will, in a second stage, hit particularly the rural regions with fordist or post-fordist economic activities. Further liberalisation of the CAP will affect a significant number of rural regions.

e) Rural areas will face significant difficulties in compensating the loss of jobs by the development of alternative activities. The exploitation of renewal renewable energy sources will progress rather slowly because of insufficient public support. The generally depressed economic situation in Europe will not favour the development of the patrimonial economy and of rural tourism.

f) Urban-rural relationships will modestly intensify. Suburbanisation around metropolitan areas will however further progress because new activities and jobs will concentrate in large cities in order to benefit from external economies.

g) In the more peripheral and landlocked rural areas, vicious circles of deprivation will further progress, caused by population ageing, outmigration, suppression of services of general interest and decline of farms and other businesses.

h) Capital penetration will be rather weak in rural areas. A number of unprofitable or abandoned small farms will be taken over by the larger ones. In the less favoured areas, land abandonment will be significant.

Territorial impacts for the Arc Latin

- As large parts of the rural areas of the Arc Latin are under the influence of the New Rural Economy[7], combining private services and manufacturing activities, the general weakness of the European economy and the growing external competition will be rather detrimental to them. The loss of jobs in these sectors will not be compensated by sufficient new jobs in alternative activities. Medium-sized towns in the countryside will not benefit from spillovers from technological poles and metropolitan areas because of insufficient research and development outputs and of the concentration of activities in large cities. The potential of Mediterranean regions in renewable energy, especially solar energy, will be only weakly exploited. Various segments of agricultural production will be affected by the further liberalisation (wind, fruits, vegetables) and by further progressing globalisation.

- The weakness of the patrimonial economy and rural tourism will be detrimental to the mountainous and hilly rural areas for which these activities bring necessary complements to the income from agriculture. Rural deprivation areas

[7] See EDORA

in the hinterlands will therefore widen, with services of general interest declining significantly and outmigration going on.

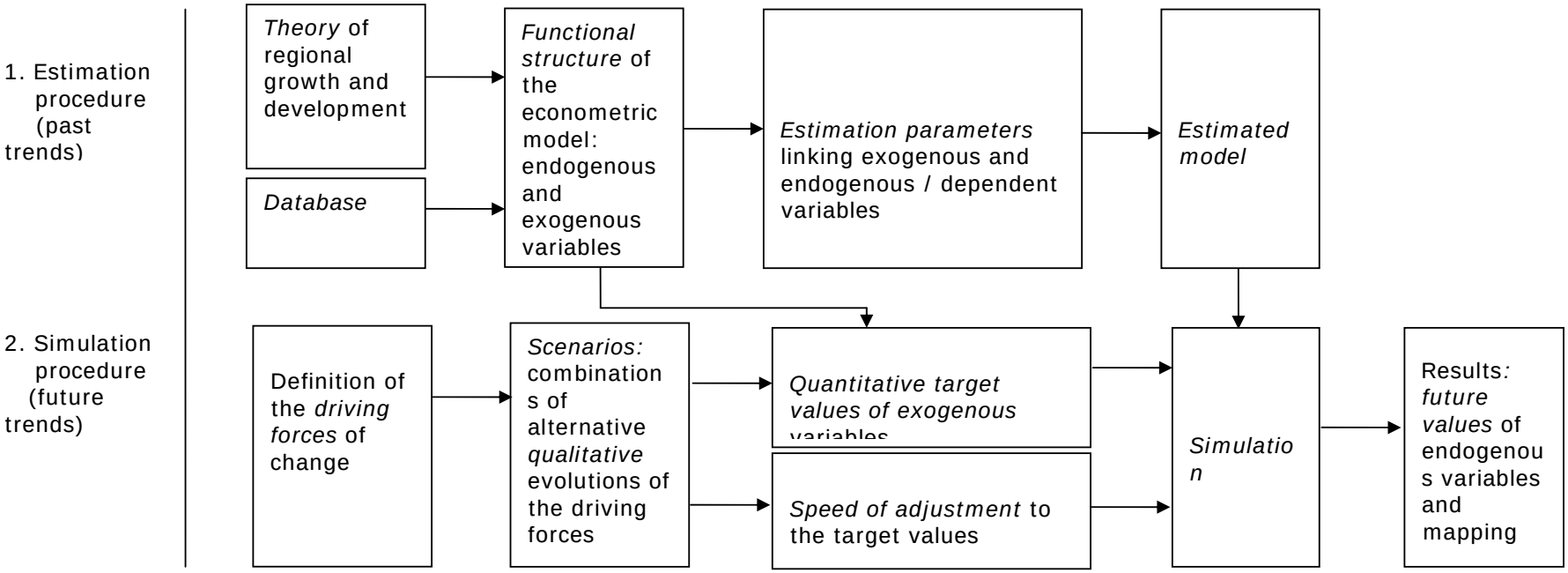
Annex 2. Methodology for scenarios at Nuts-2 level and the MASST model

A.2.1. Methodology for scenarios at Nuts-2 level

The scenario-building methodology is based on identification of the institutional, socio-demographic and economic driving forces of change, and their possible alternative trajectories, that derive from different globalisation patterns and which give rise to different opportunities for growth and patterns of territorial distribution. The qualitative characteristics of these scenarios are translated into quantitative assumptions about the model's exogenous target variables in the final year of the simulation procedure. Consequently, growth rates of GDP and population as well as their levels for each year up to 2025 are simulated. The logic behind the methodology is summarised in Figure A.2.1.

As Figure A.2.1 shows, the first step of the simulation procedure is to highlight the driving forces of change, and especially their possible combinations. Among all possible choices, we build our scenarios on the basis of the behaviours of blocks of countries: the EU countries, the block of emerging countries in the world economy (the BRICs: Brazil, Russia, India and China), the other advanced countries (mainly USA and Japan) and the alternative policy strategies by the European Commission.
This approach allows to place in the forefront of the reflections globalisation trends and EU country strategies in an endeavour to define, through utilisation of the MASST simulation model, their likely impact on territorial trends, regional convergence, and general economic performance.

Fig. A.2.1. Structure of the scenario methodology



Source: Capello R., Camagni R., Chizzolini B. and Fratesi U. (2008), "Modelling Regional Scenarios for an Enlarged Europe", Springer Verlag, Berlin.

A.2.2. The MASST Model

This section of the annex provides an in-depth description of the MASST (MAcroeconomic, Sectoral, Social and Territorial) model – a combination of an econometric model of regional-national economic growth with a simulation algorithm – whose foremost purpose is to forecast medium-term trends in economic growth and demography for the new Europe (the enlarged EU plus the two new member countries, Bulgaria and Romania[8]). Future economic and demographic tendencies are obtained under different scenarios: systems of consistent conjectures about how the trends affecting growth and the associated policies will manifest themselves in a fifteen-year perspective.

The model is built in order to predict future levels of regional per capita income in EU 27 countries, and therefore future levels of territorial disparities, under different conditional hypotheses. The aim of the exercise is *not* to provide precise estimates of future GDP levels in fifteen years' time; it is rather an attempt to underline future territorial tendencies that will result under different assumptions on how the forces driving the economy will develop. It should therefore be regarded as an exercise to raise awarenessse on the territorial effects that different, and extreme, normative as well as macroeconomic, technological and demographic trends will have in shaping the future European territory.

MASST is an *economic* model, and therefore its outcome is mainly GDP growth rates and their spatial distribution. However, the model is also able to interpret future socio-demographic tendencies identified under some specific macroeconomic trends or normative interventions at both the regional and national (supranational) level. Moreover, because it is a model 'territorial' in nature, it highlights inter-regional spillover effects, namely the effects on regional growth due to the performance of neighbouring regions. Geographical position matters.

The MASST model is a combination of two different and interactive parts: a pure macroeconomic regional growth model estimated on past-growth; and a simulation algorithm for inspection of the future. Both parts will be thoroughly explained as regards their conceptual and theoretical aspects.

In MASST, linkage between national factors and regional ones concerning growth is assured by the structure of the model, which interprets regional growth as resulting from a national growth component and a differential regional growth component:[9]

$$\Delta Y_r = \Delta Y_N + s; r \in N \qquad (1)$$

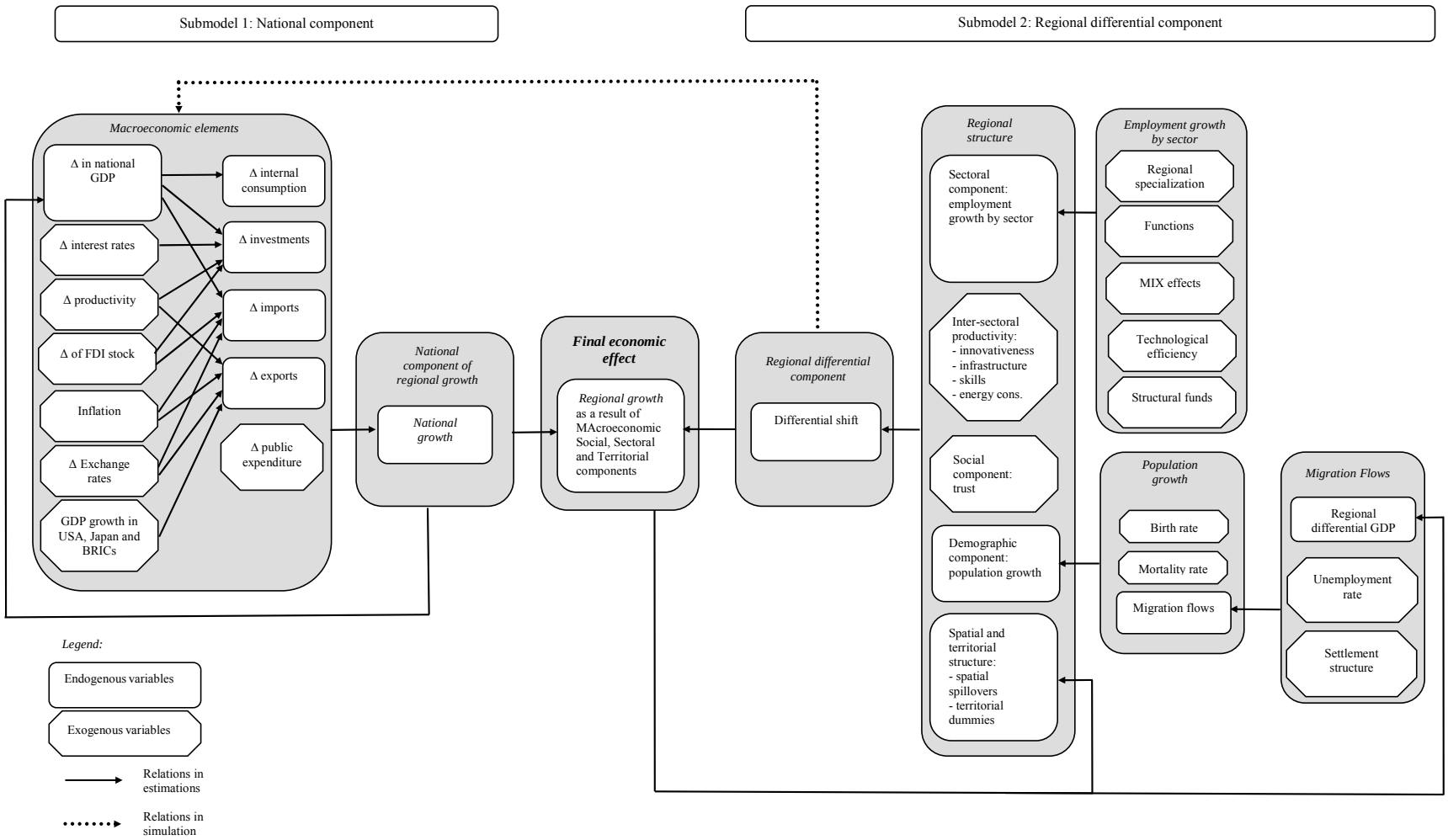
where ΔY_r and ΔY_N denote the GDP growth rate respectively of the region and the nation, and s represents the regional differential growth with respect to the nation.

Figure A.2.2 presents the internal logic of the model, in which it is clear that the econometric model consists of two intertwined blocks of equations, a national block and a regional one, giving to both the regional and national component a role in local economic trajectories.

[8] Bulgaria and Romania joined the EU on 1 January 2007.

[9] See Capello R. (2007a), "A Forecasting Territorial Model of Regional Growth: The MASST Model", Annals of Regional Science, Vol. 41, n. 4 and Capello R., Camagni R., Chizzolini B. and Fratesi U. (2008), Modelling Regional Scenarios in an Enlarged Europe: European Competitiveness and Global Strategies, Springer Verlag, Berlin.

Fig. A.2.2. The structure of the new MASST model



National growth depends on the dynamics of the macroeconomic national elements: private consumption growth, private investment growth, public expenditure growth and export and import growth. This part of the model is able to capture macroeconomic (national) effects on regional growth generated by interest rates and public expenditure policies, trends in inflation rates and wages. These policies and trends differ radically among European countries (especially between the Eastern and Western ones).

In its turn, the *regional differential component* (the shift component, i.e. the relative regional growth) depends on the competitiveness of the local system, this being based on the efficiency of local resources: the increase in the quality and quantity of production factors (like human capital and population) in infrastructure endowment, in energy resources, as well as the sectoral and territorial structure of the regions and the interregional spatial linkages.

As a consequence of this double structure, MASST differs substantially from existing regional growth econometric models. These conduct direct interpretation of absolute regional growth either by replicating national macroeconomic models or by using complex systems of equations for each region that are linked to both the national aggregate economy and the other regional economies through input-output technical coefficients determining intra- and inter-regional trade and output.

The first sub-model is a macroeconomic model applied to each of the 27 European countries in our sample which is very similar to the standard macro-econometric models used by national governments and central banks as programming and policy support tools. MASST differs from these macroeconomic models in that only goods and service markets are specified within it, while the monetary market, the labour market, and the public sector budget receive no endogenous treatment. The national sub-model of MASST is therefore a partial equilibrium model in which prices, wages, interest and exchange rates, public spending are taken to be exogenous variables. If these characteristics of MASST can be regarded as a shortcoming, they nevertheless allow fairly simplified explanation of real growth as a function of policy tools (interest rates, exchange rate, government expenditure) or policy targets (inflation, unemployment) influenced by national or international macroeconomic trends.

The specification of the national sub-model consists of five equations. The first specifies the *growth rate of private consumption* on a traditional Keynesian approach, depending directly on the growth of income (Tab. A.2.1).

The *private investment growth* equation also has a traditional structure whereby the investment growth rate depends directly on the growth rate of output (as the accelerator model suggests), positively on interest rates,[10] negatively on a measure of the country's competitiveness (in our case, growth rate of unit labour costs, the inverse of productivity growth), and on the share of FDI on domestic investments made in a country, given the domino effect that a flow of FDI may generate on domestic investment growth (Tab. A.2.1).

The *import growth* equation is made positively dependent on changes in domestic demand, directly on the nominal exchange rate; on the internal inflation rate, and on the share of FDI flows on domestic investments (see Tab. A.2.1).

[10] The nominal effective exchange rate (or, equivalently, the 'trade-weighted currency index') describes changes in the average value of a currency with reference to a given base period and a given group of reference countries. It is calculated by Eurostat as a weighted geometric average of the bilateral exchange rates against the currencies of competing countries. Given the way in which it is built, a rise in the index means *a strengthening of the currency (a re-valuation) and a loss of competitiveness*. The link between the effective exchange rate index and export growth is therefore expected to be negative.

Lastly, the *export growth* equation is expected to depend on the nominal exchange rate and on changes in the unit labour cost: for both explanatory variables, the relationship is expected to be negative (Tab. A.2.1). The export growth equation also depends on changes in world demand, which are not explicitly mentioned as a control variable but are captured by the constant term of the equation.

The *government expenditure growth rate* is an exogenous independent variable of the model.

The national growth rate is determined by a *'pseudo' identity equation* derived from the national accounts identity: aggregate income plus imports ($Y+M$) must equal the sum of consumption, investments, public expenditures and exports, ($C+I+G+X$). By applying the total differential formula to the identity and by doing some simple algebraic manipulations we obtain:

$$
\begin{aligned}
&Y = C + I + G + X - M \rightarrow \Delta Y = \frac{\partial Y}{\partial C}\Delta C + \frac{\partial Y}{\partial I}\Delta I + \frac{\partial Y}{\partial G}\Delta G + \frac{\partial Y}{\partial X}\Delta X - \frac{\partial Y}{\partial M}\Delta M \\
&\frac{\Delta Y}{Y} = \frac{\partial Y}{\partial C}\frac{C}{Y}\frac{\Delta C}{C} + \frac{\partial Y}{\partial I}\frac{I}{Y}\frac{\Delta I}{I} + \frac{\partial Y}{\partial G}\frac{G}{Y}\frac{\Delta G}{G} + \frac{\partial Y}{\partial X}\frac{X}{Y}\frac{\Delta X}{X} - \frac{\partial Y}{\partial M}\frac{M}{Y}\frac{\Delta M}{M} \qquad (2) \\
&\frac{\Delta Y}{Y} = \eta_{YC}\frac{\Delta C}{C} + \eta_{YI}\frac{\Delta I}{I} + \eta_{YG}\frac{\Delta G}{G} + \eta_{YX}\frac{\Delta X}{X} - \eta_{YM}\frac{\Delta M}{M}
\end{aligned}
$$

The result in equation (2) states that the income growth rate is equal to the weighted sum of the aggregate demand components where the weights are the elasticities of income with respect to each component, (η_{Yj} , $j = C, I, G, X, M$) (Tab. A.2.1).

Tab. A.2.1. Outline of the MASST sub-national blocks of equations

Explanatory variables		*Change in domestic output ($\Delta\%Y_N$)*	*Interest rates*	*Internal Inflation*	*Nominal effective exchange rates index*	*Change in unit labor costs*	*Share of FDI flows on internal investments*
Estimated equations							
1	*Consumption growth rate ($\Delta\%C$)*	+					
2	*Investment growth rate ($\Delta\%I$)*	+	-			-	+
3	*Imports growth rate ($\Delta\%M$)*	+		+	+		+
4	*Exports growth rate ($\Delta\%X$)*				-	-	
5	(Pseudo) identity	Output ($\Delta\%Y_N$)=$a_1 \Delta\%C + a_2 \Delta\%I + a_3 \Delta\%G + a_4 \Delta\%X - a_5 \Delta\%M$					

$\Delta\%G$ = Government expenditure growth rate

The regional part of the MASST model aims to explain relative regional growth with respect to national growth. It represents the novel feature with respect to the traditional regional econometric models of the 1970s and 1980s.

According to the logic of MASST, the higher/lower relative capacity of a region to grow depends on its structural elements: its productive structure, its relative position, its accessibility, its settlement structure, its degree of economic and social integration - all elements that identify a particular economic trajectory of a local economy which may differ from the national one.
Tab. A.2.2 shows the blocks of equations that characterise the regional sub-model.

Tab. A.2.2. Outline of the MASST sub-regional blocks of equations

1)	Dependent variable: *regional differential shift*	
	Industrial sector dynamics	Average increase of industrial employment (lagged with respect to the dependent variable)*
	Service sector dynamics	Average increase of service employment (lagged with respect to the dependent variable)*
	Intersectoral productivity:	-infrastructure endowment - share of self-employment • quality of human capital • population growth* • energy resources • human capital • rural vs. agglomerated vs. urban regions; mega regions • spatial spillovers* • EU funds (strcutural funds)
2)	Dependent variable: *Average increase of industrial employment* Independent variable: industrial specialisation of the regions	
3)	Dependent variable: *Average increase of tertiary employment* Independent variable: past industrial structure; settlement structure of the region	
4)	Dependent variable: *population growth* Independent variables:	
	Birth rates	Death rates Net in-migration*
5)	Dependent variable: *net immigration* Independent variables:	
	Regional differential growth	Unemployment rate Regions' settlement structure

*Variables with * are endogenous variables in the model.*

The first equation is the regional shift equation represented as a quasi-production function in a reduced form. It presents the factors thought to determine regional production capacity. These factors, which stem from both modern and traditional theories of regional growth, are the following:

- *industry and tertiary dynamics*, i.e. the increase in employment growth in the industry and in the tertiary sectors, capturing a sort of mix effect of the regional dynamics, demographic changes;
- *an intersectoral productivity*, stemming from structural features of the regions, like infrastructure endowment, accessibility, share of self-employment, quantity and quality of human capital, availability of energy resources, and the settlement structure of regions, measuring the advantages stemming from the physical organisation of the territory (agglomerated vs. dispersed regions).

Not all the explanatory variables are exogenous to the model; three of them are endogenous and allow for cumulative processes, namely (Tab. A.2.2):

- the *dynamics of the industrial employment*, made dependent on the industrial specialisation of the region;
- the *dynamics of the tertiary employment*, made be dependent on the industrial and settlement structure of the region;
- *demographic changes* (population growth rate) are dependent on birth and death rates and on in-migration;
- In its turn, *in-migration* is dependent on regional income differentials, unemployment rate, and on the different settlement structures of regions;
- the part of regional growth dependent on the other regions' dynamics (*spatial spillovers*) is dependent on the regional growth of neighbouring regions in the previous year;

The way in which the recursive mechanism works over time in a forecasting model is of great importance for full understanding of the logic lying behind the simulation procedure.

In the case of the MASST model, the simulation algorithm has the specific role of creating a 'generative' process of regional growth. In other words, our intention was to create a model in which regional dynamics play an active part in explaining national growth and do not derive only from distributive mechanisms of allocation of national growth.

A conceptual distinction between *ex-post* and *ex-ante* national growth is useful, and it receives operational treatment in MASST. *Ex-post* national growth rates cannot be anything other than the weighted sum of regional growth rates. If an *ex-post*, competitive, approach to growth is chosen, the regional blocks of equations only distribute national growth among the regions of the country. By contrast, if an *ex-ante*, generative, approach is chosen, national growth can be obtained thanks to the performance of the single regions; in this case, regional growth plays an active role in defining national growth.

Our conceptual and operational approach follows the second definition: in MASST, the regional sub-model partly explains the national performance. Operationally, MASST treats *ex-ante* and *ex-post* growth rates as follows:

- *ex-post* national (and regional) growth rates are obtained through the national sub-model and distributed to the regions through the results of the regional differential sub-model, rescaled in order to match the aggregate result (point C in Tab. A.2.3); these results are considered to be the actual outcome of the model at time t;
- *ex-ante* regional growth rates are obtained when the regional differential growth is not rescaled; they are interpreted as 'potential' growth rates (point D) from which potential regional GDP levels are obtained. The sum of the increase in GDP levels determines the 'potential' national GDP growth rate in the following year (point A_{t+1}) through its influence on aggregate consumption, investment and imports.

Thanks to this simulation algorithm, MASST can be definitely interpreted as a 'generative' model: *ex-ante* regional growth rates play an active role in defining national growth. *Ex-post*, the national account identity is fulfilled.

Tab. A.2.3. Logic of the simulation procedure

Forecasts	year t	year t+1 (and thereafter)
Estimated national growth	A_t) Calculation of actual *national growth* with the national sub-model. (output of MASST at time t).	A_{t+1}) Calculation of actual *national growth* with the national model, as a function of lagged potential growth
	B_t) Calculation of *regional differential shift* with the regional sub-model.	B_{t+1}) Calculation of *regional differential shift* with the regional model.
Estimated regional growth	C_t) Actual regional growth is calculated as the *sum of A and B*, where B is rescaled to have 0 mean within each country. (Output of MASST at time t).	C_{t+1}) Regional growth is calculated as the *sum of A and B*, where B is rescaled to have 0 mean within each country. (Output of MASST at t+1).
	D_t) Potential regional growth is equal to the *sum of A and B* (non-rescaled). Potential national growth is equal to the increase in the sum of potential regional income levels in D_t.	D_{t+1}) Potential regional growth is equal to the *sum of A and B* (non-rescaled). Potential national growth is equal to the increase in the sum of potential regional income levels in D_{t+1}.

** The last year for which official statistics were available at the beginning of the estimations was 2002.*

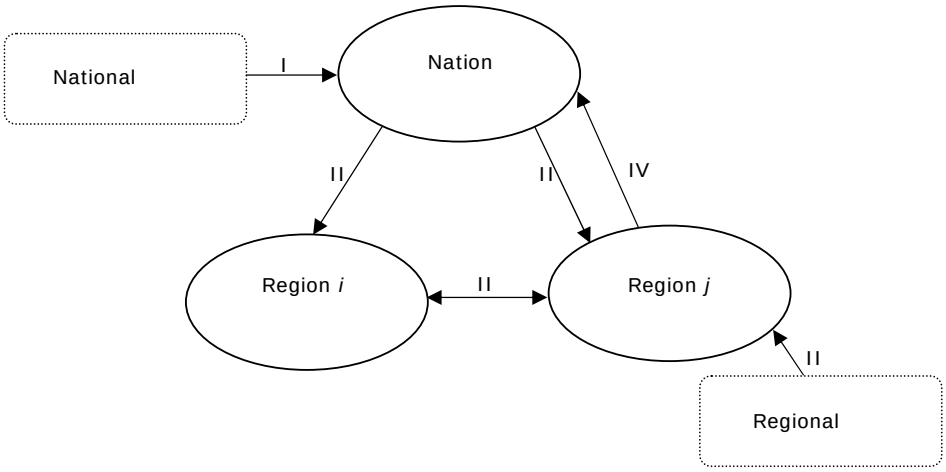
The technical specifications of the model emerge from the structure just described. The model is first of all an *interactive national-regional model*. It combines top-down and bottom-up approaches so that an interdependent system of national and regional effects is built (Fig. A.2.3). This structure enables account to be taken of vertical and horizontal feedbacks between the regional and the national economy. In fact, thanks to its structure, the MASST model is able to register the effects of a shock at the national level (whether a change in macroeconomic trends or a policy choice) on both the national and regional growth rates; moreover, it is able to interpret the effects of a shock at regional level on both the national and regional performance.

The model allows for endogenous differentiated regional feedbacks from national policies and trends; it captures the vertical feedbacks of a national policy on regional growth and distributes them differently among regions according to their capacity to capture national growth potentialities

(regional growth spillovers, settlement structure). Tab. A.2.3 shows how these linkages take place. National shocks are registered on national GDP growth rates through the national GDP growth present in the consumption and import growth equations. National shocks propagate to the regional level since regional GDP growth is obtained as the sum of the national GDP growth and the regional differential GDP growth. The latter is distributed differently among regions via spillover effects and territorial dummies.

Regional shocks, and regional feedbacks, propagate on regional GDP growth thanks to the shift equation: regional shocks differ among regions because of spillovers, dummy variables and different levels of the control variables. Regional shocks propagate to the national level through the sum of the regional GDP levels which defines the annual national GDP growth. This feedback is the only one which takes place in the simulation and not in the estimation procedure.

Fig. A.2.3. National-regional linkages in MASST



Legend: the numbers next to the arrows refer to Tab. A.2.4, where the mechanisms of national-regional linkages are explained.

Tab. A.2.4. Measurement methods of interactive national-regional linkages

Effects *Shocks*	*National*	*Regional*
National	I National effects measured through dynamic national income growth present in the estimation procedure.	II Regional effects measured through the national component in regional growth compounded by regional growth spillovers and territorial dummies present in the estimation procedure.
Regional	IV National effects measured through the national income growth obtained as an increase in regional income levels in the simulation procedure.	III Regional effects measured through the presence of regional control variables and spillovers in the estimation procedure.

Moreover, the MASST model is an *integrated model*. Its structure allocates specific places to both socio-economic and spatial (horizontal) feedbacks among regional economies. While the former are captured by the socio-economic conditions generating interregional migration flows, the latter are measured by spatial spillover effects, the growth rate of a region being also dependent on the growth rate of neighbouring regions.

MASST does not confine its explanation of regional growth to economic material resources alone. Two elements of a different nature are important in determining regional growth in the model: relational and spatial elements. In MASST, regional growth is in fact also conceived as a *relational and a spatial process*: demographic (population growth and migration flows) and territorial tendencies perform an important role in explaining regional growth differentials. In the case of relational elements, data unavailability admittedly hampers full empirical analysis of this dimension, at present replaced by socio-demographic phenomena like migration; it is nevertheless important theoretically to stress its importance and to suggest future data collections in this area at regional level. The spatial and territorial dimensions help explain regional growth in two ways. Firstly, the model directly captures proximity effects through the measurement of spatial spillovers; moreover, with the introduction of variables interpreting the territorial (agglomerated, urbanised, rural) structure, the model indirectly measures the agglomeration economy (diseconomy) effects that influence growth (decline) in a cumulative way.

Another important feature of the model is that it is an *endogenous, local competitiveness-driven model* in explanation of regional growth, as we expected it to be. Regional growth is explained by local factors, and interregional competitiveness stems from specific locational advantages and resource endowment.

MASST is a *macroeconomic (multinational) model*. Short-term (macroeconomic) effects are dealt with at the national level, and their feedbacks on national and regional economies are taken into consideration in explaining local dynamic patterns. MASST is a *dynamic model*. The outcome of one period of time at both national and regional level enters the definition of the output of the following period, in a cumulative and self-reinforcing development pattern. As mentioned above, MASST is a *generative* regional growth model in which regional performance influences national growth patterns. It is this feature that distinguishes the model from the ones present in the literature. Given the above characteristics, the model is a *multi-layer, policy impact assessment model*. The structure of the model, in fact, allows measurement of the impact of national (and supranational) policy instruments on both regional and national growth, and the impact of regional policies on national and regional growth.

A.2.3. The effects of assumptions on variables in MASST: some caveats

Section 3.2 illustrates the effects of the assumptions of the two scenarios for MASST results. In order to correctly interpret the numbers three important caveats have to be illustrated.

First, the absolute numbers have no real meaning but are only helpful to analyze qualitatively the trends induced by the assumptions. In fact, the qualitative assumptions are translated into quantitative values, i.e. precise numbers, in order to be used in the model.

The process of transforming qualitative assumptions in numbers is made on the basis of learned judgement, and under confront with past means and variances of the variables. Despite this, the actual numbers chosen maintain a degree of subjectivity, so that, for example, a lowering growth rate of BRICs GDP is in our assumptions 2 percentage points less than the reference, but the scenario would be the same should the decrease rather be of 2.5 or 3 percentage points, only with slightly different numerical results.

Second, the model is not additive, and recursive effects are taking place. For this reason, the effects induced by a modification in two targets is never the sum of the effects of the modifications induced by each target separately, nor the joint effect is necessarily lower or higher than the two separate.

Moreover, the model is generative and distributive at the same time. For this reason, any modification in a regional target has two simultaneous effects: the first one is to affect the growth rate of the country, generating more or less growth depending if the new target is more or less expansionary; the second effect is to differently distribute the national growth rate to regions, depending on how they perform in the new target.

For this reason, the regional effect of a modification in a target variable is not straightforward: if one target is reduced, its aggregate (national) effect is negative. However, when the reduction does not take place in the same proportion in all regions, the regions with lower reductions may even benefit, since they will be able to outperform the other regions of the country and, hence, get a larger proportion of total national growth. This process is the model counterparts of real world games taking place between regions which, voluntarily or not, compete to attract national production factors and firms. We observe more of these apparently counterintuitive results in the map of structural funds.

Third, spillovers are at play, so the effects induced by a target modification on the growth of one region, is not only due to the regional target, but also on the targets of the neighbouring regions. Since spillovers affect differently regions with different spatial settings, the regional effects of target modifications are not straightforward to predict.

With these considerations in mind, the analysis of the effects of the most important assumptions and explain why scenario B is more restrictive can be done, representing the modifications of growth rate induced by the targets of scenario B. What is represented in the maps is hence expressed by the following equation:

$$\text{Growth rate in scenario B} - \text{Growth rate in scenario B when some targets are set as in the reference}$$

Defined as this, a negative value in one region means that the assumptions of scenario B exert a recessionary effect on that region, whereas a positive number means that the assumption of scenario B induces more growth there.

Tab. A.2.5. The assumptions of the three scenarios for the MASST2 model

Driving forces	Reference scenario	A pro-active scenario	A defensive scenario
1Aregionalised global economy	Deflationary effect of Asia on world economies attenuated Rising interest rates Recovery of some manufacturing activities in Europe, especially open ones Limited trade increase BRICs enter progressively in the medium and high technology game	BRIC countries also moving towards more technology-intensive activities with better paid jobs; deflationary effect of Asia on world economies disappears The dollar is no longer the sole reserve currency; it devaluates with respect to the euro A more stable international financial order emerges Boosting technological investments and productivity in Europe Race towards stronger tertiarisation attenuated thanks to a rapid development of the "green economy" Investments from Europe and BRICs in poor countries (like Africa) will increase in order to create local markets Non-European FDI will slow down, but BRICs and Sovereign Funds investments will endanger competitiveness of EU Impact of demographic change on (skilled) manpower shortage	Deflationary effect of Asia remains: inflation rate is lower The dollar remains the sole reserve currency. It revaluates with respect to the euro More European businesses are taken over by non-European groups, which means in a first instance more inward capital flows. These are however for short term profits and for appropriation of technology; In US the internal demand remains low, because households put a higher priority on savings than consumption; BRICs maintain their comparative advantage in low-cost production; they however progress also in more technology-intensive sectors, competing more intensively with Europe. Service sector is less qualified than in the reference scenario. Low profile tertiary activities such as call centres, dominate; Loss of competitiveness of the European system in the long run
2. Rise of energy price	Increase in oil prices due to oil demand increase: new investments in exploration and discovery A number of new technologies will develop: nanotech, biotech, transport technologies, new materials	Increase in oil prices due to oil demand increase, partially counterbalanced by the development of the green economy	Less increase in oil prices; the increase is partially due to the use of traditional energy technologies.
3. A new paradigm: "the green economy"	Many sectors touched: manufacturing, energy, transport, building and construction, tourism, agriculture (zero-km)	Advanced economies moving towards technology oriented activities, implementing resolutely the "green economy"	The green economy cannot make a real breakthrough.

Tab. A.2.6. The quantitative hypotheses of the MASST2 model in the three scenarios

Reference scenario

Scenario Hypotheses	MASST hypotheses (with respect to the past)
Reduction of the amount of external FDIs into Europe	Reduction in the share of FDI on GFCF
The US dollar will lose its importance as reserve currency	Revaluation of Euro
Deflationary effect of Asia on world economies attenuated	Higher inflation rates with respect to the past
Recovery of some manufacturing activities in Europe, especially open ones	Increase in growth rates of open sectors and decrease in the others
A number of new technologies will develop: nanotech, biotech, transport technologies, new materials	Increase in growth rates of open sectors and decrease in the others
Aging and immigration in largest cities	Increase in death rates and decrease in birth rates, stronger in non agglomerated regions
Rising interest rates	Rising interest rates
Limited trade increase	Lower constant of import and exports
BRICs enter progressively in the medium and high technology game	High growth rate of BRICS
Increase in oil prices due to oil demand increase: new investments in exploration and discovery;	Increase in energy prices

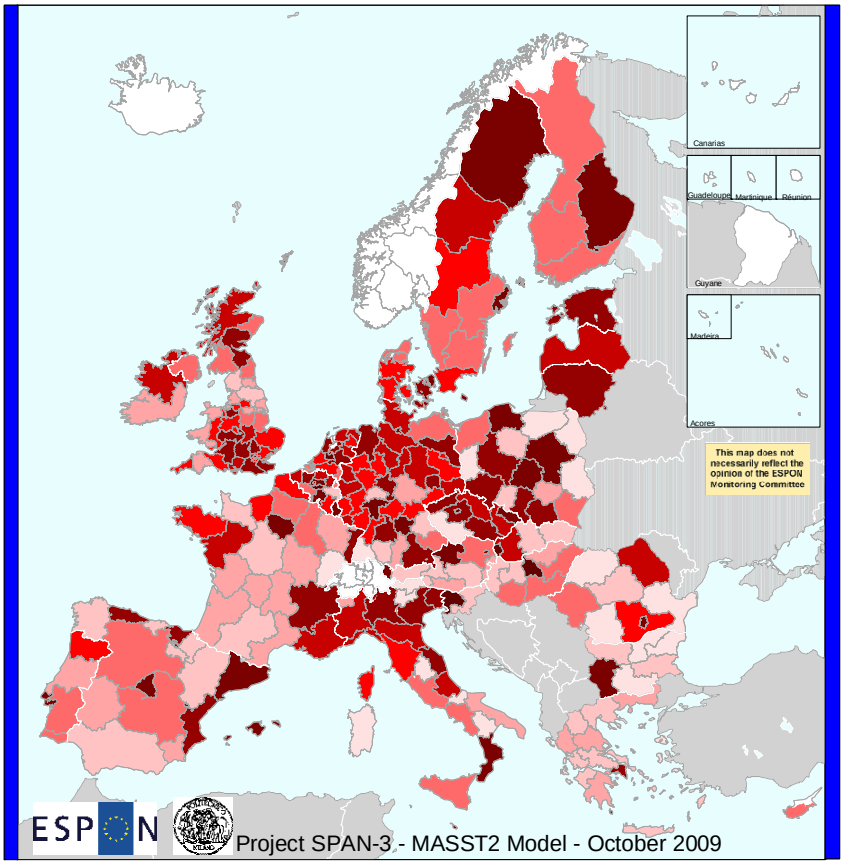
Pro-active Scenario

Scenario Hypotheses	MASST hypotheses (with respect to reference scenario)
BRIC countries also moving towards more technology-intensive activities with better paid jobs; deflationary effect of Asia on world economies disappears	Higher increase in BRICs growth rate
Recovery also in USA and Japan	Higher growth in USA and Japan
The dollar is no longer the sole reserve currency; it devaluates with respect to the euro	Euro revaluation
A more stable international financial order emerges	Only slightly higher inflation, despite high growth
Boosting technological investments and productivity in Europe	Lower unit labour costs
Higher skills and qualifications are required	Higher HRST, especially in strong regions
Increase in oil prices due to oil demand increase, partially counterbalanced by the development of the green economy	lower increase in energy prices
Advanced economies moving towards technology oriented activities, implementing resolutely the "green economy"	lower increase of energy consumption
Technological investments boost productivity; the unemployment rates increase further in a first phase (5 to 7 years) and decrease significantly afterwards	Higher unemployment rates, especially in weakest areas
Race towards stronger tertiarisation attenuated thanks to a rapid development of the "green economy"	
Investments from Europe and BRICs in poor countries (like Africa) will increase in order to create local markets	Lower FDI in Eastern regions
Non-European FDI will slow down, but BRICs and Sovereign Funds investments will endanger competitiveness of EU	
Impact of demographic change on (skilled) manpower shortage	Higher natality and lower mortality especially in weaker areas

Defensive Scenario

Scenario Hypotheses	MASST hypotheses (with respect to reference scenario)
Deflationary effect of Asia remains: inflation rate is lower	Lower inflation rate
The Euro does not achieve to become a reliable reserve currency	Lower revaluation of Euro
More European businesses are taken over by non-European groups, which means in a first instance more inward capital flows. These are however for short term profits and for appropriation of technology;	Higher FDI in Eastern regions
In US the internal demand remains low, because households put a higher priority on savings than consumption;	Lower growth rate of USA and Japan
BRICs maintain their comparative advantage in low-cost production; they however progress also in more technology-intensive sectors, competing more intensively with Europe.	Lower growth rate of BRICS
Service sector is less qualified than in the reference scenario. Low profile tertiary activities such as call centres, dominate;	Decrease of growth rate of open sectors and increase of base tertiary sectors
Loss of competitiveness of the European system in the long run.	Lower increase of HRST
Less increase in oil prices; the increase is partially due to the use of traditional energy technologies.	Lower increase in energy prices
The green economy cannot make a real breakthrough.	Higher energy consumption
While employment remains relatively protected during the first phase (5 to 7 years), the situation worsens afterwards	lower unemployment rates, especially weaker areas

Fig. A.2.1.- Annual average GDP growth rate 2005-2025 scenario A

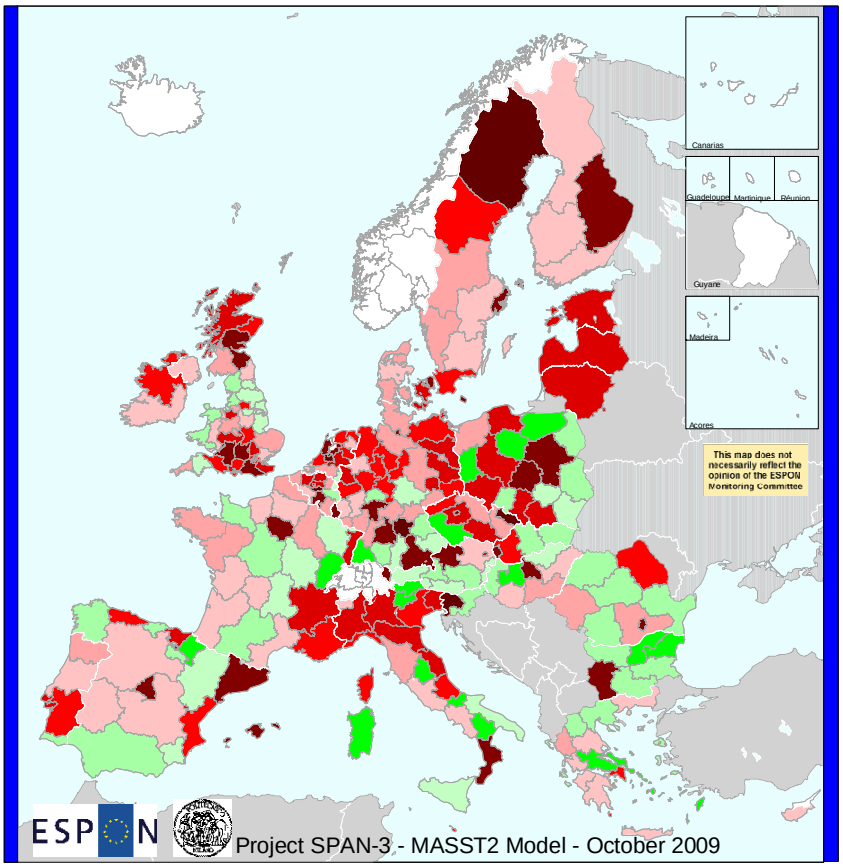


EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

Regional level: Nuts 2
Source: Politecnico di Milano October 2009
Data: MASST2 Model, October 2009
© EuroGeographics Association for administrative boundaries

Annual average GDP growth rate 2005-2025 scenario A
- < 0.995
- 0.995 - 1.575
- 1.575 - 1.927
- 1.927 - 2.394
- 2.394 - 2.832
- 2.832 - 3.28
- 3.28 - 3.884
- 3.884 - 4.618
- > 4.618
- No data

Fig. A.2.2.-Annual average GDP growth rate 2005-2025 scenario B



EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

Regional level: Nuts 2
Source: Politecnico di Milano October 2009
Data: MASST2 Model, October 2009
© EuroGeographics Association for administrative boundaries

Annual average GDP growth rate 2005-2025 scenario B
- < -0.903
- -0.903 - -0.365
- -0.365 - 0
- 0 - 0.444
- 0.444 - 0.828
- 0.828 - 1.27
- 1.27 - 1.787
- 1.787 - 2.58
- > 2.58
- No data

Annex 3. Performance and Structure of Barcelona

A.3.1. Introduction

A.3.1.1 Introduction: Barcelona, from industrial city to knowledge based metropolis

Few European metropolises have experienced in the last twenty years such intense economic, urban and demographical changes as those undertaken by Barcelona since 1986, the year when the city won the Olympic nomination and Spain joined the European Community.

Barcelona is a metropolis that, until the irruption of the international economic crisis on September 2007, has increased very significantly production and employment, and it has been exerting an intense attraction onto immigrant population. It is a metropolis in which small and medium firms predominate, with the presence of multinational companies especially in the industrial sector; its production is oriented towards the Spanish inner market (its first historical market) and the European and international markets (that have become its reference markets).

From 1986 on, a global metropolis has been progressively constructed on a historically solid basis: Barcelona has concentrated the most important part of the industrial production of the Spanish economy since the beginning of the industrial revolution, and constitutes nowadays the main European touristic market.

It is considered the eighth metropolis of the European Union as far as population is concerned (MMAMB/Papers 50, IERMB) and it shares with Lyon the territory on the eleventh Mega Region of the planet (University of Toronto).

The metropolis of Barcelona (with 4,8 millions inhabitants) is constituted by two different areas: the central agglomeration, formed by the municipality of Barcelona (with 1/3 of the population), about 30 municipalities around it without solution of continuity (conurbation) (with 1/3 of the population), and an arch of cities that goes from Mataró to Vilanova i la Geltrú, which includes cities of long industrial tradition such as Sabadell and Terrassa (outer ring) (with 1/3 of the population). The province of Barcelona is complemented by a group of cities and counties with long industrial tradition, such as Manresa, Igualada, Vic and Berga, and some rural territories.

The aim of this part of the research is to highlight some of the structural characteristics of the economy of the Barcelona metropolis and to study its internal structure.

A.3.1.1.1. Barcelona, the main industrial and technological metropolis of the Spanish economy since the Industrial Revolution.

To understand the recent evolution of Barcelona is worth pointing out some characteristics of its industrial history:

1) Since 1835, Barcelona leads the first Industrial Revolution in Spain.

2) Between 1835 and 1900 it keeps concentrating most of the manufacturing production of the Spanish economy and leads the second industrial revolution.

3) *Trade protectionism* and preservation of the inner market constitute the identity characteristics of the model of development of Spanish economy until 1959. As a consequence of the protectionism, the economy of Barcelona experienced a technological and organizational slowdown with regard to the western European economies, especially during the isolation period of the first stage of the Franco regime, between 1939 and 1959.

4) Since the Plan de Estabilización in 1959 and the great economic boom of the 60's that came after the liberalization, Barcelona developed a new productive manufacturing basis, with a central role for medium and small firms (PIMEs), and with an important presence of industrial multinational companies (French, German, Italian). The capacity of attracting population and activities increased in parallel with the decrease of the capacity of absorption, which led to an intense metropolitan dynamics.

5) The crisis of the 70's and the political transition meant for Barcelona the end of a development model based in a low capital intensive production, very intensive in low-qualified labour and basically oriented to a protected domestic market.

6) A new stage began with the political transition and especially with the Moncloa Agreements in October 1977. New institutions were built up in the economic field (Programa de Saneamiento y Reforma de la Economía- Economic Reorganization Programme) and also in the political arena (development of democracy and the drawing up of the Statute for the Autonomy of Catalonia, in 1979) while at the same time was developing a severe process of economic adjustment and reform. Between 1977 and 1985, Barcelona experienced the consequences of this process.

A.3.1.1.2. The formation of a global metropolis from 1986.

Since 1986 Barcelona has experienced one of the most intense processes of economic and urban transformation in Europe. It grows very significantly in population, economic activity and employment. The provision of transport and communication infrastructures expands extraordinarily (airport, expressways, university equipments).

The metropolis of Barcelona experiences a great leap in scale. It enlarges its scope in the process of incorporating cities that occupy almost all the territory of the province of Barcelona. In this period one of the most important metropolis of Europe has being shaped, attaining a population of 4,8 million inhabitants.

Two historical events that occurred in 1986 have to be highlighted for their influence on the process of economic and urban development of the last twenty years:

- The entry of Spain into the European Community
- The nomination of Barcelona as the city to host the Olympic Games of 1992

This opening process to the world contrasts with Barcelona's historical path which, from the beginning of the industrial Revolution until 1959, was dominated by protectionism and the preservation of the Spanish domestic market.

The entering of Spain into the European Community on January 1st 1986 and the winning that same year of Barcelona as the city to organise the Olympic Games of 1992 constitute two strategic factors that became fundamental for the transformation of the main exporting metropolis of Spain. Both events allowed the start of an expansionary cycle of the Spanish economy in general and Catalan and Barcelona's economy in particular. Joining the European Community also enabled Barcelona to play a central role in the Spanish economy, taking profit of the advantages derived from the common market: the extension of markets and the attraction of external capitals.

The economic expansion went together with an intensification of the process of metropolitanisation. Barcelona increased its capacity of attraction and at the same time increased its interaction with an important group of cities with long industrial tradition, which were located near of the centre of the metropolis. A polinuclear metropolis was shaped with a powerful constellation of cities that "shine with their own light". The network of cities of the whole Barcelona area intensifies the spatial interaction.

Barcelona was able to take advantage of the celebration of the 1992 Olympic Games. This event enabled the city to be pointed at as an international reference city and, at the same time, it made possible to carry out investments in urbanism that had been systematically postponed. The city assumed the construction of Olympic equipments (the Olympic Ring, the Olympic Village) as well as it undertook big urban transformation works (construction of the communication belts, new terminal for the airport, opening of the city to the sea, extension of the network of drainpipes).

From 1997 on, a new municipal strategy centred in the notion of "Barcelona as a city of knowledge" began. This made possible that the City authorities continue to lead the economic and urban transformation of the city. A new urban policy of transformation of land uses is deployed with the target of changing industrial uses into uses for knowledge-intensive activities: the project 22@barcelona, which pursues the transformation of the Poble Nou neighbourhood, the old industrial area where the industrial revolution was located. Furthermore the urban and infrastructural transformation continues: opening of Diagonal Avenue up to the sea, enlargement of the airport and the port, diversion of the river Llobregat, High speed train, new subway lines).

A.3.1.2. Macroeconomic performance until 2007 and impact of the crisis

Barcelona has a productive basis oriented towards the foreign market (both to the rest of Spain and to the rest of Europe and the world) which is supported onto a business network in which the average dimension of production establishments is low. Regarding the foreign market as a whole, the exportation basis shows a surplus, since the large surplus with the rest of Spain compensates the commercial deficit with the rest of Europe and the world.

It achieves competitive positions both in relationship with the rest of Spain and with the rest of the world, increasing its quota of market in the external exchanges.

Between 1986 and 2007 Barcelona is able to increase production and employment intensively, but the growth of the aggregated productivity is not very high.

This low growth (until 2008) reflects a function of production with a relatively not very high intensity of capital and a relatively low intensity of human capital. In the last ten years the low growth of aggregated productivity can be basically explained through the increase of the activities related to the building sector, which shows a low growth in productivity. Conversely the growth of the industrial productivity between 2004 and 2007 is very intense.

One of the explanatory factors of the competitive success of the economy of Barcelona lies in the existence of agglomeration economies. Their extension is a consequence of the growth of scale economies (partly due to the fast development of transport and communication infrastructures), the growth of urbanisation economies (enlargement of the metropolis and large productive diversity), the growth of localisation economies (especially those linked to activities of high- knowledge economy) and the existence of network economies (synergies and complementarities).

In this section we will show some of the main macroeconomic data of the economy of Barcelona, in order to outline the main trends.

Barcelona, which started in 1986 from a productive basis that took advantage from the availability and low cost of land, employment and capital, is now going through a new productive structure based on knowledge, with an important growth of human capital, social capital and technological capital.

A.3.1.2.1. Population

- **Size.** The province of Barcelona is one of the largest NUTS 3 regarding its total population (5.416.000 inhabitants) and the metropolitan region of Barcelona is the tenth largest metropolis in the UE (OECD 2009).

- **Growth.** The population has been steady during the 1990s in about 4.6 million inhabitants. However, between the years 2000 and 2008 the population has raised to 5.4 millions, with 16% accumulated growth rate (Tab. A.3.1 and Fig. A.3.1).

- **Immigration.** This rapid growth of the population from the year 2000 is due to the attractiveness of foreign born (non-Spanish) population. Foreign born population of

the province rises from 150,000 in 2000 (3.2% of the population of the province) to 660,000 in 2008 (12.2% of the population of the province) with an accumulated growth rate of 440%. (Tab. A.3.2, Figures A.3.2a and A.3.2b). This attractiveness is due to the existence of a dynamic labour market. In this sense, it is necessary to notice that the labour market of the province of Barcelona is characterized by a dual structure: a core of workers with permanent contract and high costs of redundancy, and a rising periphery made of young people and new foreign-born residents with unstable and precarious contracts and low costs of redundancy.

A.3.1.2.2. Gross domestic product

- **Growth**. The evolution of production (GDP) between 1986 and 2009 shows several differentiated stages: fast growth between 1986 and 1992, a severe recession between 1993 and 1994, recovery and intense growth between 1997 and 2007, and again a severe recession from the second trimester of 2008 until now.

- **Convergenge in GDP per capita.** EUROSTAT series allows to compare the population of the province of Barcelona with the rest of Spain from 1995 (first year available of the homogeneous series). Thus, in 1995 the GDP per capita of the province was 13,900 euro, slightly lower than the UE-27 (14,700 euro) (Tab. A.3.2). This is, the GDP per capita of the province was 95% of the UE. After 12 years (2006 is the last year available of the homogeneous series), the GDP per capita of the province raised to 26,300 euro, about 111% of the UE average. As a consequence, there was a process of convergence in GDP per capita of about 16.4%, this is, about 1% every year. In fact, when the data are expressed in PPA, the figure raises to 123% of the UE average (Tab. A.3.2)[11].

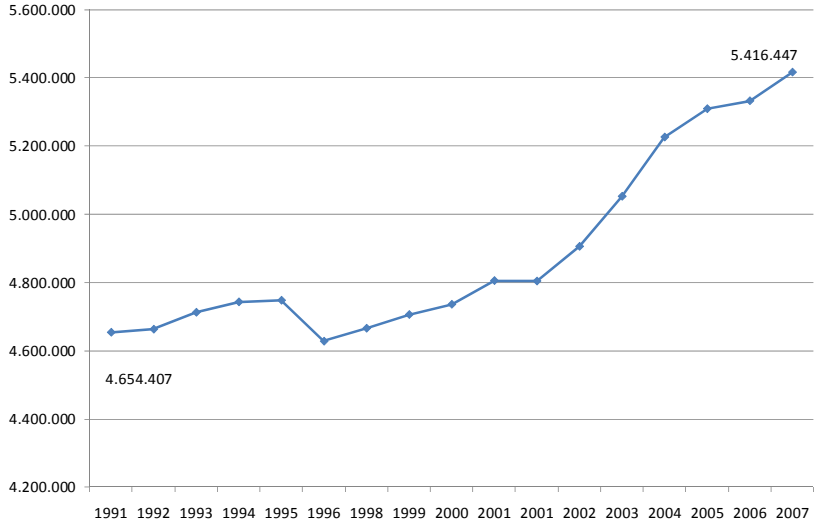
[11] The process of convergence is faster in the Barcelona's province than in the rest of Catalonia.

Tab. A.3.1. Population. Province of Barcelona. 1991-2007.

Year	Population	Population (1991=100)	Year	Population	Population (1991=100)
1991	4,654,407	100.00	2001	4,805,927	103.26
1992	4,663,378	100.19	2001	4,804,606	103.23
1993	4,712,850	101.26	2002	4,906,117	105.41
1994	4,743,481	101.91	2003	5,052,666	108.56
1995	4,748,236	102.02	2004	5,226,354	112.29
1996	4,628,277	99.44	2005	5,309,404	114.07
1998	4,666,271	100.25	2006	5,332,513	114.57
1999	4,706,325	101.12	2007	5,416,447	116.37
2000	4,736,277	101.76			

Source: Elaborated from Idescat

Fig. A.3.1. Population. Province of Barcelona. 1991-2007.



Source: Elaborated from Idescat

Tab. A.3.2. Foreign-born people. Province of Barcelona.

	Foreign Residents	Growth	Share of total population	Growth of foreign population, 2000=100
2000	150,462	-	3.18%	100
2001	206,395	37.17%	4.29%	137
2002	237,513	15.08%	4.94%	158
2003	267,894	12.79%	5.46%	178
2004	314,702	17.47%	6.23%	209
2005	410,739	30.52%	7.86%	273
2006	441,599	7.51%	8.32%	293
2007	575,315	30.28%	10.79%	382
2008	660,254	14.76%	12.19%	439

Source: Elaborated from Idescat

Tab. A.3.3. Gross domestic product (GDP) at current market prices at NUTS level 3.

Euro per inhabitant

	1995	2000	2005	2006	Growth 1995-2006, units	Growth 1995-2006, %
eu27 European Union (27 countries)	14,700	19,100	22,500	23,600	8,900	60.5%
eu15 European Union (15 countries)	18,085	23,186	26,761	27,970	9,885	54.7%
es Spain	11,600	15,700	20,900	22,300	10,700	92.2%
es51 Catalunya	14,100	19,100	24,800	26,300	12,200	86.5%
es511 Barcelona	**13,900**	**18,900**	**24,800**	**26,300**	**12,400**	**89.2%**

Purchasing Power Parities per inhabitant in percentage of the EU average

	1995	2000	2005	2006	Growth 1995-2006, units	Growth 1995-2006, %
eu27 European Union (27 countries)	100.0	100.0	100.0	100.0	0	0.0%
eu15 European Union (15 countries)	115.8	115.3	112.8	112.2	-4	-3.1%
es Spain	91.7	97.3	102.0	104.1	12	13.5%
es51 Catalunya	111.4	118.6	120.7	122.8	11	10.2%
es511 Barcelona	**110.1**	**117.7**	**120.7**	**122.8**	**13**	**11.5%**

Millions of euro (from 1.1.1999)/Millions of ECU (up to 31.12.1998)

	1995	2000	2005	2006	Growth 1995-2006, units	Growth 1995-2006, %
eu27 European Union (27 countries)	7,012,911	9,201,967	11,061,982	11,671,360	4,658,449	66,4%
eu15 European Union (15 countries)	6,740,683	8,763,924	10,396,375	10,924,332	4,183,649	62,1%
es Spain	456,495	630,263	908,792	982,303	525,808	115,2%
es51 Catalunya	86,084	119,225	170,109	184,035	97,951	113,8%
es511 Barcelona	**64,994**	**89,838**	**127,021**	**136,880**	**71,886**	**110,6%**
es511 Barcelona over eu27	**0.93%**	**0.98%**	**1.15%**	**1.17%**	**0.25%**	**26.5%**

Source: Elaborated from Eurostat.

A.3.1.2.3. Employment and sectorial structure of employment

- **Dynamism of employment**. The dynamism of employment between 1986 and 2007 is rather impressive in the province of Barcelona: from 1,852,000 to 2,775,000 jobs and 50% accumulated growth rate in 20 years (Tab. A.3.3, Fig. A.3.3). It could be said that is one of the most intense processes of growth of employment in the recent UE history. Growth of employment has been continuous, with the exception of 1993-1994 and after 2007 (where the growth rate is negative about 10%).

- **Sectorial structure**. Regarding the sectorial structure of employment between 1995 and 2006, two strong trends can be observed (Tab. A.3.4, Fig. A.3.4):

  a) The relative growth has been positive in all the sectors:

  - 24% in manufacturing and energy
  - 29% in construction
  - 55% in services

  b) Absolute growth in all the sectors, particularly intense in the services sector. This means that, against the opinion of most of the analysts, the growth of the province was not based on the construction sector:

  - New jobs in the tertiary sector: 602,000
  - New jobs in construction: 129,000
  - New jobs in manufacturing: 116,000

  Notice that in this province and metropolis initially based on industry, there is a distinct growth of employment in export-oriented sectors: manufacturing and (tourist) services.

Tab. A.3.4. Employment in the province of Barcelona

Year	Employees	1991=100	Year	Employees	1991=100
1991	1,458,990	100.00	2000	1,772,358	121.48
1992	1,413,485	96.88	2001	1,809,023	123.99
1993	1,312,892	89.99	2002	1,829,947	125.43
1994	1,325,626	90.86	2003	1,869,126	128.11
1995	1,358,344	93.10	2004	1,914,615	131.23
1996	1,397,608	95.79	2005	2,001,675	137.20
1997	1,478,182	101.32	2006	2,058,976	141.12
1998	1,576,612	108.06	2007	2,095,777	143.65
1999	1,682,934	115.35	2008	1,997,746	136.93

Source: Elaborated from Departament de Treball (GENCAT).

Tab. A.3.5. Employment by sector, Barcelona prov. 1996-2008, thousands.

A) Per 1,000 employees

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 (P)	2006 (P)	Growth 1995-2006	Growth 1995-2006, 1995=100
Agriculture, hunting, forestry and fishing	23	19	18	20	25	29	30	30	29	29	31	34	11	148
Energy	12	13	13	12	11	12	12	12	12	14	13	14	2	119
Industry	486	518	549	573	604	620	627	610	611	612	612	602	116	124
Construction	126	137	156	168	177	194	210	212	216	228	228	255	129	203
Services	1,206	1,214	1,236	1,286	1,368	1,446	1,476	1,503	1,582	1,663	1,777	1,871	665	155
Total Employment	1,852	1,901	1,972	2,059	2,185	2,300	2,354	2,367	2,451	2,546	2,660	2,775	923	150

B) Percents

Compos Sectorial	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 (P)	2006 (P)
Agriculture, hunting, forestry and fishing	1.2%	1.0%	0.9%	1.0%	1.1%	1.2%	1.3%	1.3%	1.2%	1.1%	1.2%	1.2%
Energy	0.6%	0.7%	0.7%	0.6%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Industry	26.2%	27.2%	27.9%	27.8%	27.6%	27.0%	26.6%	25.8%	24.9%	24.0%	23.0%	21.7%
Construction	6.8%	7.2%	7.9%	8.2%	8.1%	8.4%	8.9%	9.0%	8.8%	9.0%	8.6%	9.2%
Services	65.2%	63.9%	62.7%	62.5%	62.6%	62.8%	62.7%	63.5%	64.5%	65.3%	66.8%	67.4%
Total Employment	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

(P) Provisional
Source: CRE, INE

A.3.1.2.4. Productivity

- **Low growth of productivity.** Despite the impressive growth of production (GDP) and employment, productivity growth has been low: it was negative between 1997 and 2001, slightly positive from 2002 to 2005, and close to zero in 2006-2007 (Tab. A.3.5, Fig. A.3.5).

- This is, almost all the growth of production has been explained by the growth of employment, particularly by the fast growth of sectors where productivity tend to rise slowly. Manufacturing is the sector more related to the growth of productivity in the economy of Barcelona (and in Spain as a whole). However, the growth of productivity in this sector was only important between 2004 and 2007, and it is expected to be again significant in the new period of crisis (2007-2008).

- Regarding productivity, the profile of the economy of Catalonia or Barcelona is quite similar to the profile of the Spanish economy, where Catalonia represents 20% of the production and employment.

A.3.1.2.5. Firm size

- **Small firm size.** One of the distinctive features of the economy of Barcelona is the small average size of firms and establishments. In other researches it has been observed that this size is quite similar to some economies of industrial basis as Japan and some European countries whereas USA regions tend to show an average size two or three times higher.

- **Main characteristics of firm size**:

    - About 97% of firms have less than 50 employees, whereas medium-sized firms add up to 2.3% and large firms are only 0.41% (Tab. A.3.7). The province of Barcelona have only 806 large firms and 433 are concentrated in the city of Barcelona[12]. The ratios are quite similar for the city of Barcelona, the province and Catalonia. In Catalonia, about 80% of large firms tend to concentrate in the province of Barcelona, particularly in the metropolitan region of Barcelona and the city of Barcelona.

    - Medium and large firms have showed an intense growth in recent times. Thus, medium firms increased from 2,786 in the year 1996 to 4.517 in 2008. Large firms rises from 526 to 806.

    - Decentralization of some activities / incubator hypothesis

[12] The data is inflated by a headquarter-effect in the city of Barcelona.

Tab. A.3.6. Productivity and productivity growth in Catalonia and Spain, 1995-2008.

A) Catalonia

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 (P)	2006 (P)	2007 (A)	2008 (1ªE)
Productivity (euros)	41,450	41,338	41,140	40,120	39,036	38,523	39,059	40,089	40,510	40,610	40,613	40,630	40,770	42,205
Productivity growth rate	-	-0.27%	-0.48%	-2.48%	-2.70%	-1.32%	1.39%	2.64%	1.05%	0.25%	0.01%	0.04%	0.34%	3.52%

B) Spain

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 (P)	2006 (P)	2007 (A)	2008 (1ªE)
Productivity, (euros)	38,865	39,173	38,722	37,982	37,232	36,685	37,046	37,811	38,178	38,383	38,474	38,461	38,465	39,821
Productivity growth rate	-	0.79%	-1.15%	-1.91%	-1.98%	-1.47%	0.98%	2.06%	0.97%	0.54%	0.24%	-0.03%	0.01%	3.52%

Source: Elaboration from CRE, INE .

Tab. A.3.7. Firm size.

A) City of Barcelona

Rank Size	1996	2001	2006	2007	2008
0 to 49 employees	73,842	71,992	76,445	76,386	74,261
50 to 249 employees	1,260	1,669	1,920	1,992	1,924
250 employees or more	286	376	422	439	433
Total	75,388	74,037	78,787	78,817	76,618

Rank Size	1996	2001	2006	2007	2008
0 to 49 employees	97.95%	97.24%	97.03%	96.92%	96.92%
50 to 249 employees	1.67%	2.25%	2.44%	2.53%	2.51%
250 employees or more	0.38%	0.51%	0.54%	0.56%	0.57%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

B) Barcelona province

Rank Size	1996	2001	2006	2007	2008
0 to 49 employees	170,850	178,348	197,843	198,488	189,187
50 to 249 employees	2,786	3,967	4,548	4,683	4,517
250 employees or more	526	708	795	832	806
Total	174,162	183,023	203,186	204,003	194,510

Rank Size	1996	2001	2006	2007	2008
0 to 49 employees	98.10%	97.45%	97.37%	97.30%	97.26%
50 to 249 employees	1.60%	2.17%	2.24%	2.30%	2.32%
250 employees or more	0.30%	0.39%	0.39%	0.41%	0.41%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

C) Firm size, Catalunya

Rank Size	1996	2001	2006	2007	2008
0 to 49 employees	228,405	241,039	275,403	277,714	263,474
50 to 249 employees	3,533	5,001	5,951	6,129	5,916
250 employees or more	646	854	985	1,025	1,001
Total	232,584	246,894	282,339	284,868	270,391

Rank Size	1996	2001	2006	2007	2008
0 to 49 employees	98.20%	97.63%	97.54%	97.49%	97.44%
50 to 249 employees	1.52%	2.03%	2.11%	2.15%	2.19%
250 employees or more	0.28%	0.35%	0.35%	0.36%	0.37%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

Source: Elaborated from Departament de Treball, Generalita de Catalunya.

A.3.1.2.6. External trade

The exports of the province have grown 458% between 1991 and 2008, rising from 7,100 to 39,800 million euro (nominal values). Exports from Barcelona to the rest of the world have increased faster than the growth of the UE or the whole world's exports so that Barcelona has increased its contribution to the UE-15 trade and to the world trade. Imports have grown 307% between 1995 and 2008, rising from 15,400 to 62,900 million euro. Despite the higher relative growth rate of exports, the total value of imports has increased more than the value of exports so that the negative balance rose from 8,300 to 23,100 million euro (178% growth rate). However, after 2007 the crisis has reduced in a significant way the imports (contraction of the demand) whereas exports have maintained better. As a result, the negative trade balance has reduced.

The export rate was 69% in 1995 and still above 70% until 2002. The growth of the internal demand fostered imports so that the export rate decreased to 62% between 2005 and 2007. In 2008, the contraction of the demand caused a reduction of imports whereas the value of exports still steady. As a consequence, the export rate has grown again. Catalonia and Barcelona are very open economies. Exports account for 30% of GDP if the rest of Spain is not taken into account, and 68% if it does. Openness measured as exports plus imports on GDP is about 70% and if the rest of Spain is included as a foreign country the rate raises to 130%. The share of foreign trade (abroad of Spain) on production is still growing. The main origins and destination of trade flows have not suffered significant changes from 1995. Around 80% of exports and 65% of imports goes and comes from Europe. The most important destinations are France, Germany and Italy. The most important suppliers of the Catalan economy are Germany, Italy, and France. It is noticed that 20% of the imports comes from Asia, where the share of China on the total imports has growth.

Barcelona has succeeded to increase the value of its exports and enhance its share on the world's trade from 1995. Although successful, this model continues to show two main drawbacks: first, an important share of trade still based on cost differentiation; this type of competition faces the emergence of other cheap producers (in the UE or abroad) as well as the higher differential inflation of the Catalan and Spanish economy. Second, in global terms, productivity has no increased from 1995 and an important share of the exports are concentrated on weak demand products.

Tab. A.3.8. International trade, Barcelona province-rest of the world, Million euro. 1991-2008.

Year	Exports	Imports	Balance (X-M)	Year	Exports	Imports	Balance (X-M)
1991	7,137	15,448	-8,311	2000	27,815	40,828	-13,013
1992	8,312	16,351	-8,039	2001	30,478	42,885	-12,407
1993	9,349	15,873	-6,524	2002	29,942	43,834	-13,891
1994	11,862	19,068	-7,207	2003	30,081	45,366	-15,285
1995	14,506	22,156	-7,651	2004	31,455	51,254	-19,799
1996	17,533	23,811	-6,278	2005	33,467	56,262	-22,794
1997	20,440	27,634	-7,194	2006	38,325	62,497	-24,172
1998	22,758	32,095	-9,337	2007	39,443	66,477	-27,033
1999	23,205	35,103	-11,898	2008	39,807	62,943	-23,136

Source: Elaborated from AEAT

A.3.1.2.7. Trade with the rest of Spain

Catalonia is the region with a largest share regarding interregional trade in Spain. When external trade is consolidated with interregional trade, the negative trade balance of Catalonia and the province of Barcelona becomes positive. This contrasts with the important interregional negative balance of other provinces as Madrid. Thus, there is an outstanding pattern of regional specialization in Spain: whereas Barcelona produces goods and services for internal and external markets, Madrid seems to focus on the production of services for the rest of the country and exports Spanish savings to the rest of the world.

Tab. A.3.9.1. Imports to Catalonia from the rest of Spain (millions euro)

Origin	2003	2007	Growth 2003-2007
Andalusia	2,825	3,868	137%
Aragon	3,884	5,378	138%
Asturias	388	548	141%
Balearic Islands	388	243	63%
Canarias	221	335	151%
Cantabria	620	478	77%
Castilla and Leon	1,948	1,745	90%
Castilla-La Mancha	1,437	1,813	126%
Catalonia	44,170	51,122	116%
Valencia	4,325	5,162	119%
Extremadura	151	132	87%
Galicia	1,173	1,576	134%
Madrid	3,283	4,672	142%
Murcia	908	1,167	129%
Navarra	1,166	1,195	102%
Basque country	2,790	2,742	98%
La Rioja	216	222	103%
Ceuta and Melilla	0	0	307%
Total	69,895	82,399	118%

Tab. A.3.9.2. Exports from Catalonia to the rest of Spain (millions euro)

Destination	2003	2007	Growth 2003-2007
Andalusia	3.991	3.985	100%
Aragon	7.074	11.506	163%
Asturias	414	756	182%
Balearic Islands	2.392	2.303	96%
Canarias	2.380	2.666	112%
Cantabria	1.014	851	84%
Castilla and Leon	2.861	3.490	122%
Castilla-La Mancha	1.430	3.726	261%
Catalonia	44.170	51.122	116%
Valencia	7.482	6.700	90%
Extremadura	264	197	75%
Galicia	2.113	2.124	100%
Madrid	6.004	7.170	119%
Murcia	1.279	1.706	133%
Navarra	1.517	1.556	103%
Basque country	2.634	3.846	146%
La Rioja	636	521	82%
Ceuta and Melilla	77	105	136%
Total	87.729,77	104.329,21	119%

Source: C-intereg

A.3.1.2.8. Foreign direct investment

Catalonia has consolidated itself as one of the most dynamic regions in Europe in attracting multinationals: more than 3,000 foreign multinationals there are currently in Catalonia (600 are manufacturing firms and more than 2,000 are services firms) where the province of Barcelona shares a large amount of this multinationals. The most important FDI investments are concentrated in Motor vehicles, Electric materials, Chemicals and Food and beverages. In the period 2000-2008 the annual average inflow of Catalonia has been around 2,290 million euro and the outflow 4.800 million euro with a negative balance of 2.500 million euro. Around 80% of flows have origin or destination in OECD countries where 50% belongs to the UE-27. Despite this figures, Catalonia does not play the same role on FDI that on external trade in Spain. In the period 2000-2008 accounts for only 13.4% of Spanish inflows and 11.4% of Spanish outflows. This is due to the fact that Madrid Stock Market is much more important than the Barcelona's one and concentrates most of the Spanish FDI flows. About 90% of Catalan multinationals are located in the city of Barcelona.

The strategy of subsidiaries of multinationals in Catalonia and Barcelona has modified along the time. In the 1970s FDI were attracted by the proximity to a Spanish internal market protected by tariff barriers and the existence of specialized suppliers and appropriate infrastructures. As the objective was basically the internal market, the size of the plants was small. After the incorporation of Spain to the European market (1986) and during all the 1990s, FDI were more oriented towards the production for the European market, so that the existence of endogenous factors of attraction became more important (suppliers, infrastructures, complementary services). The investments became more specialized to attend the European market and also their size increased. During the 2000s, R&D oriented to the market, as well as design activities, complements the productive orientation of FDI in Catalonia and Barcelona. In these functions, collaboration between several subsidiaries of the same firm is becoming more usual, as well as collaboration between multinationals and their local suppliers.

During the latter 20 years, the role of multinationals has been decisive to avoid the disappearance of industries as Motor vehicles (cars, motorcycles), electronic equipment, computer equipment or glass production, as a consequence of the industrial crisis in the 1980s and 1990s. This role has also been important to reinforce the competitiveness of chemicals, food and beverages, pulp and paper, and machinery and electrical equipment. From the 1990s and especially in the 2000s, one of the most important role of foreign companies has been the activation of knowledge, R&D and innovation, as some of the important investments have relied on this issue, sometimes coming from firms that already had a productive plant in the region (e.g. Hewlett Packard). The leave of some concrete multinational companies or reductions in production and investment could produce an irreparable damage on some specific activities as suggest the recent tensions with Volkswagen-SEAT and Nissan. The leave of one of these two firms or an important reduction in their lines of production could have affect all the powerful network of local suppliers, perceived as strategic for the development of some new industries.

To address the role played by the regional firms in the international economy, it is possible divide firms in local and multinational. Largest local firms belongs to national companies in the energetic (electricity as Endesa, gas as Gas Natural), water (Sociedad

General de Aguas de Barcelona), construction (Fomento de Construcciones y Contratas, Abertis) and retail (Caprabo) industries, as well as some manufacturing sector. Other largest firms are currently subsidiaries of foreign multinationals, as Volkswagen-SEAT, Nissan or LEAR European Holding (investments). Only Abertis has showed and active and influent international strategy by acquiring the management of motorway and airport infrastructures in other European countries. In general, the role played by regional firms in the international economy is not especially significant. The importance could be found in the contribution of some of these large but also small firms to concrete processes, for example: contribution of some local aerospace firms to Galileo, Boeing, Airbus and Eurofighter; the diffusion of the technologies of the food and beverages clusters to other countries (control of quality, industrial refrigeration); centres of design for automotive industries (Audi, SEAT, Lamborghini, FIAT); biotech (Almirall, Prodesfarma, Ferrer International, and Uriach, are local industries), renewable energies, etc.

On the other hand, Catalan FDI in other countries starts in the 1960 although accelerates from 1990 and especially from the year 2000. There is not a complete census of Catalan multinationals as the partial census only covers manufacturing activities. The data available suggest that the number of Catalan multinationals is low (less than 200 in the manufacturing sector) and presents particular characteristics regarding their strategies, size (they tend to be small and often quoted as “pocket multinationals”) and ownership structure (basically, familiar ownership). The raisons for the establishment in other countries basically focus on commercial strategies (new markets) and lower costs of production. Due to their small number and size, the role played by the regional multinationals in the international economy is not significant.

Tab. A.3.10. Foreign direct investment, incoming and outcoming, Catalonia.

Year	Foreign investment inward	Foreign investment, outward	Net flow
1995	1,227	548	-679
1996	1,427	377	-1,049
1997	1,478	1,026	-452
1998	1,971	1,597	-374
1999	1,866	4,699	2,833
2000	2,676	6,233	3,557
2001	3,317	2,248	-1,069
2002	2,141	2,624	484
2003	1,305	4,637	3,332
2004	1,545	5,134	3,589
2005	2,263	2,836	573
2006	2,663	6,228	3,565
2007	2,568	7,094	4,526
2008	2,135	5,815	3,680
jan-jun/2009	584	334	-250

Source: IDESCAT,Sec de Estado de Comercio,Ministry of Industria, Turismo y Comercio.

A.3.1.2.9. Knowledge economy

- **Employment by knowledge intensity**. A detailed analysis of the evolution of the employees in the knowledge economy can be performed using Social Security series (wage-earning employees)[13]. Some trends are observed:

    - Employment growth in knowledge-based industries is faster than in non-knowledge industries. Knowldge-based jobs doubles between 1991 (398,000 jobs) and 2008 (796,000 jobs). This growth has been especially intense in services.

    - Knowledge-intensive jobs resist better the effect of the crisis: in 2007 knowledge-intensive industries have lost 14,000 employees whereas non-knowledge-intensive industries have lost 84,000 employees.

- **Research and development.** The share of R&D of Catalonia and the province of Barcelona has rise from 0.79% in 1995 to 1.49%. The total growth of this ratio has been 0.59, slightly higher than the Spanish (0.48) and much more than the UE average (0.05). Despite the ratio still lower than the UE average (1.85).

  About 63% of the expenditures in R&D belong to firms, which is more than the Spanish average (56%). Since 2004, there is a significant rise of public expenditures in R&D so that public contribution rises from 9.3% to 13.7%.

[13] The analysis still valid when self-employment and special regimes are incorporated although the detail in the series is lower and also reduces the period of analysis as some data are disaggregated after 1998 only.

Tab. A.3.11. R&D expenditures. Catalonia. 1995

A) Total intramural R&D expenditure (GERD), Percentage of GDP

Region	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Growth 1995-2007
UE 27	1.8	1.75	1.78	1.79	1.84	1.85	1.86	1.87	1.86	1.82	1.82	1.85	1.85	0.05
UE 15	1.85	1.8	1.83	1.84	1.89	1.91	1.92	1.93	1.92	1.89	1.88	1.92	1.93	0.08
Spain	0.79	0.81	0.8	0.87	0.86	0.91	0.91	0.99	1.05	1.06	1.12	1.2	1.27	0.48
Catalonia	0.89	0.9	0.91	1.06	1.03	1.06	1.04	1.18	1.27	1.33	1.35	1.42	1.48	0.59

B) Total intramural R&D expenditure (GERD) by sectors of performance, Catalunya, milion euro

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Growth 1995-2007
Business enterprise sector	460	416	467	515	555	684	756	850	891	1,107	1,244	1,393	1,455	1,698
Government sector	73	78	79	86	90	84	93	94	104	137	170	197	263	311
Higher education sector	188	189	207	233	214	278	265	304	331	378	456	511	579	598
Private non-profit sector	8	7	9	10	21	24	17	13	8	6	5	6	6	7
All sectors	728	691	763	843	880	1,070	1,130	1,262	1,334	1,628	1,875	2,107	2,302	2,614

Source: Eurostat and Idescat.

A.3.1.2.10. Effects of the crisis. 2007-2009

The analysis of the effect of the crisis on the province of Barcelona exceeds the scope of this report. Some basic facts can be, however, pointed out:

- The economic crisis starts in USA at September 2007. Since the third trimester of 2007 the Spanish economy, including the province of Barcelona, declines, giving pass to a recession in the second semester of 2008.

- Between the first quadrimester of 2007 and the third quadrimester of 2009, the economy of Catalonia and Barcelona, growing at an annual growth rate of 3.6%, becomes negative (-4.7%).

- This decline of the productive activity shows its consequences on the unemployment rate (rises from 7.2% to 16%), on the employment (the city of Barcelona loss 4.15% of its jobs, the province loss 10.2%, Catalonia loss 9.91% and Spain 9.7%). This means that the effects of the crisis on the city of Barcelona are lower than on the rest of the province. Furthermore, the unemployment growth rate is higher than the destruction of employment. The labour market is quite flexible and with an important cyclical sensibility.

- The price of housing decreases 4.2% in the province.

Tab. A.3.12. Impact of the crisis, 2007-2009.

Unemployment, % (1)	**2007 3Q**	**2009 3Q**	**2007 3Q=100**	**2009 3Q**
Barcelona	6,5	13,3	100	204,62
Barcelona Prov	7,2	16,0	100	222,22
Catalunya	6,8	16,0	100	235,29
Espanya	8,0	17,9	100	223,75
Employment, % (1)	**2007 3Q**	**2009 3Q**	**2007 3Q=100**	**2009 3Q**
Barcelona	55,4	53,1	100	95,85
Barcelona Prov	58,0	52,1	100	89,83
Catalunya	58,5	52,7	100	90,09
Espanya	54,4	49,1	100	90,26
GDP Growth, % (2)	**2007 2Q**	**2009 2Q**		
Catalunya	3,6	-4,7		
Huose prices, euro/m2 (3)	**2007 1Q**	**2009 3Q**	**2007 1Q**	**2009 3Q**
Barcelona Prov	2.357,4	2.260,9	100	95,91

(1) Source: EPA, INE
(2) Surce: Idescat
(3) Source: Secretaria d'Habitatge, Gencat

A.3.2. International structure of the province

A.3.2.1. An introduction to the territorial structure of the province of Barcelona

The province of Barcelona has an area of 7.700 Km2, with a population of 5.416.000 inhabitants and a density of 700 inhabitants/Km2. The most important city is Barcelona (1,615,000 inhabitants) and other four cities have more than 200,000 inhabitants: L'Hospitalet de Llobregat (254,000 inhabitants) and Badalona (215,000 inhabitants) are contiguous to Barcelona, whereas Terrassa (206,000 inhabitants) and Sabadell (204,000 inhabitants) are 25 kilometres far from Barcelona and also neighbour cities. Other important cities in the neighbourhood of Barcelona are Santa Coloma de Gramanet (117,000 inhabitants), Cornellà de Llobregat (85,000 inhabitants), Sant Boi de Llobregat (81,000 inhabitants) and El Prat de Llobregat (63,000 inhabitants). Other medium cities in the metropolitan agglomeration of Barcelona are Mataró (120,000 inhabitants), Sant Cugat del Vallès 76,000 inhabitants), Rubí (72,000 inhabitants), Vilanova i la Geltrú (65,000 inhabitants), Viladecans (62.573 inhabitants), Castelldefels (60.572 inhabitants), Granollers (60.122 inhabitants), Cerdanyola del Vallès (58.493 inhabitants) and Mollet del Vallès (51.912 inhabitants). The only city of more than 50,000 inhabitants located away from the metropolitan agglomeration is Manresa (75.000 inhabitants).

Inside the province there are at least three administrative levels: vegueries (Barcelona Metropolitan Ambit; Central Counties), *comarcas* or counties (Alt Penedès, Baix Llobregat, Barcelonès, Garraf, Maresme, Vallès Oriental, Vallès Occidental, Anoia, Bages, Berguedà, Osona and Solsonès) and municipalities (314 municipalities). Although recognised by the legal system and updated their boundaries, comarcas and veguerias are a reminiscence of the ancient organization of Catalonia. Both are inappropriate for most of the current necessities of the XXI Century and, have only few tasks and reduced budget. In the case of veguerias, continuous territorial disputes and disagreements, as well as the fact that their use only is functional under the improbable case of dissolution of the provinces, makes it real use unlikely enough.

The real socioeconomic structure of the province is however quite different from the administrative proposals. Several points of view better serve to this propose in the concrete case of the province of Barcelona: metropolitan areas and local labour markets provides a good picture of the socioeconomic areal divisions of the province whereas the design of the networks of cities presents the structure of relations between the municipalities, which are the basic nodes in the province.

A.3.2.2. Metropolitan areas

A.3.2.2.1. The real metropolitan region. The most outstanding division of the province of Barcelona is the differentiation between the metropolitan region of Barcelona and the rest of the province and the expansion of this metropolitan territory. In 1986 the Metropolitan Region of Barcelona began a process of economic and territorial expansion that led to it becoming one of the ten largest urban agglomerations in Europe, with a size similar to the 10th largest North American agglomeration (Washington) and ranked as one of the thirty largest metropolises in the OECD. The territorial expansion has arisen not from a process of hierarchical decentralization but rather as the effect of the increasing interaction between the urban continuum of Barcelona and a group of medium-sized cities that were old industrial centres (Mataró, Granollers, Sabadell, Terrassa, etc.).

The expansion takes place in several ways. Regarding its spatial dimension, the metropolitan region of Barcelona increased from 90 municipalities in 1986 to about 220 in 2006 and multiplied by three its spatial area (Fig. A.3.2 Tab. A.3.12). However, the spatial expansion basically stopped in 1996 because the boundaries of the metropolitan region of Barcelona achieved the boundaries of other metropolitan areas (also in expansion). As a result of the both the spatial expansion and a procedure of endogenous growth, the population of the metropolitan region of Barcelona increased from 3.56 million inhabitants in 1986 to 4.54 in 2001, and from 1.04 million jobs in 1986 to 1.85 in 2001. It is necessary to point out that after 1996 all the growth of population and jobs respond to endogenous factors as the number of municipalities does not increase.

Box A.1. The delimitation of the metropolitan region of Barcelona

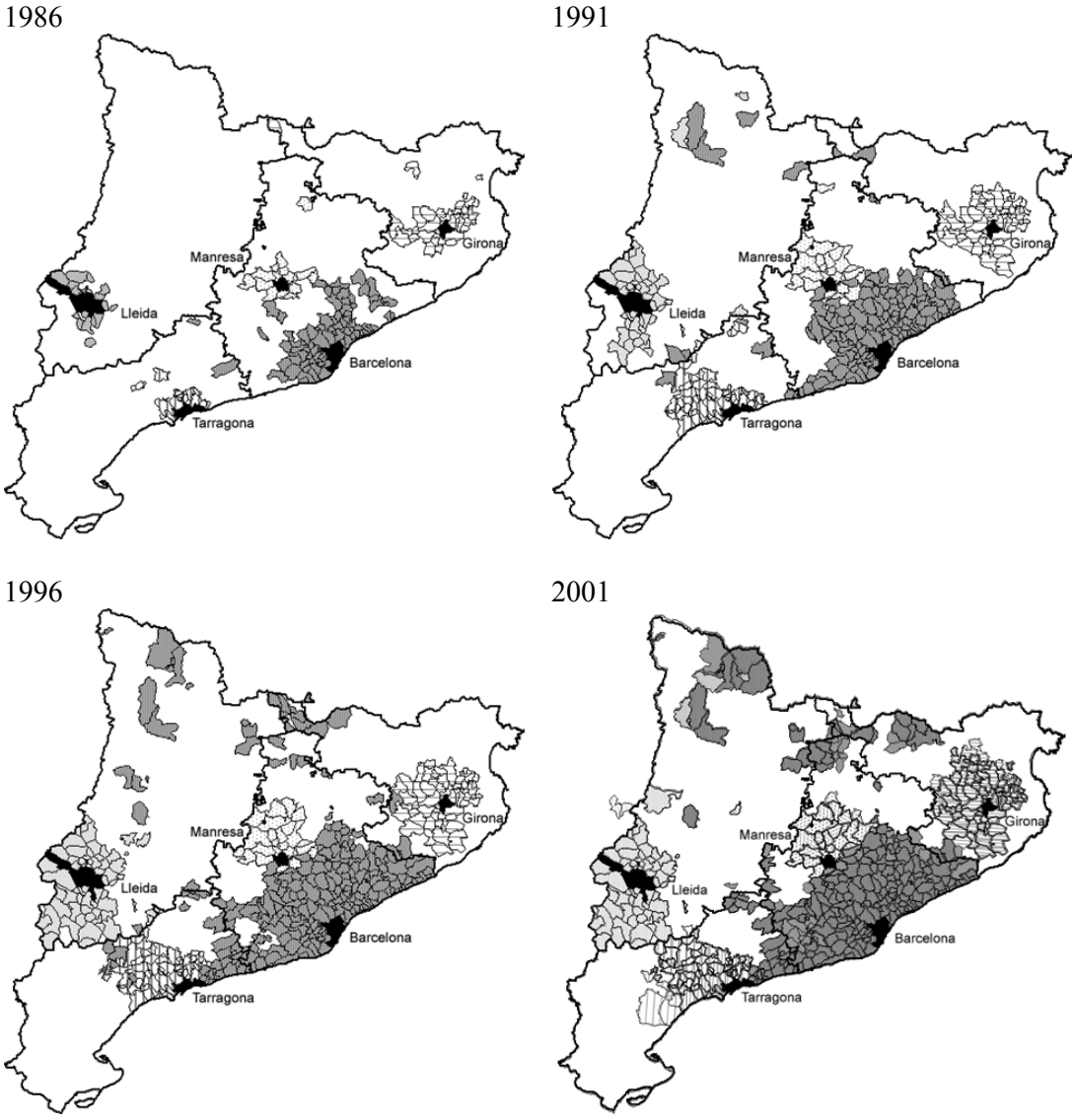
The identification of the metropolitan area of Barcelona has been an outstanding issue in the agenda of researchers and practitioners from the 1980s because it was more than recognised than the province (administrative unit) was clearly inappropriate (large in excess) to approach the boundaries of the real city of Barcelona which were spreading fast from the early 1980s. Several procedures have been used in order to identify the boundaries of the metropolis. Morphological approaches based on densities and contiguities have proved to be useful to capture the central and denser part of the metropolis although have been the functional approaches based on commuting data which have succeed in the provision of an accurate picture of its boundaries. A detailed discussion on this issue can be found in Boix (2006) and Boix and Veneri (2009).

The functional procedure preferred by many researchers (Trullén and Boix 2000, Boix and Galletto 2004, Roca et al. 2005) was initially proposed by Clusa and Roca (1997) and is an algorithm in two stages based on the former USA Federal Register (Office of Management and Budget, 1990) procedure for the identification of metropolitan areas in New England. In the first step, they identify a central core as a municipality of more than 50,000 inhabitants plus those municipalities in which at least 15% of their resident employees commutes to this municipality. The hinterland is formed by those municipalities in which at least 15% of their resident employees commutes to the central core. As a difference from the USA procedure, Clusa and Roca iterate four times the criterion to form the hinterland, each time using the result of the previous iteration as the core. Contiguity criteria are used after the last iteration. As labour markets tend to be self-contained, the choice of four iterations is based on the empirical

fact that after the third iteration the number of municipalities included is very small and in subsequent iterations tend to nil.

This procedure has been applied by Trullén and Boix (2006) to the four years in which commuting data were available (1986, 1991, 1996 and 2006). Recently, Boix and Venery (2009) have provided an improvement of the procedure to be applied to an entire country and have compared the results of the iterative algorithm with the GEMACA II (1996) procedure to identify Functional Urban Regions. The results prove to be quite similar in both procedures which agrees with the application of the GEMACA II procedure made by Salvador et al. (1997) using 1991 commuting data.

Fig. A.3.2. The process of territorial expansion of metropolitan areas in Catalonia. Iterative methodology. 1986-2001.



Source: Elaborated from Trullén and Boix (2000), Boix and Galletto (2004), and Boix and Veneri (2008).

Tab. A.3.13. The process of territorial expansion of metropolitan areas in Catalonia. Iterative methodology. 1986-2001.

Area	Variable	1986	1991	1996	2001
Barcelona	Nº municipalities	90	157	252	219
Girona	Nº municipalities	41	58	62	69
Lleida	Nº municipalities	16	45	59	62
Manresa	Nº municipalities	17	26	31	29
Tarragona	Nº municipalities	17	56	71	70
Barcelona	Population	3.577.469	4.182.769	4.359.596	4.454.776
Girona	Population	123.714	170.957	191.688	207.480
Lleida	Population	128.774	157.123	177.934	181.416
Manresa	Population	101.746	141.183	149.144	147.963
Tarragona	Population	220.781	282.355	312.933	329.482
Barcelona	Jobs	1.039.151	1.555.414	1.557.517	1.852.873
Girona	Jobs	45.145	71.719	77.068	92.036
Lleida	Jobs	40.742	57.686	63.450	72.584
Manresa	Jobs	31.004	48.920	50.296	60.866
Tarragona	Jobs	65.972	99.430	115.473	130.835

Source: Elaborated from Trullén and Boix (2000), Boix and Galletto (2004), and Boix and Veneri (2008).

A.3.2.2.2. The metropolitan region used for planning. Although the boundaries of the metropolitan region have been expanding until 2001, the most used definition for planning, proposed by the *Pla Territorial Metropolità* is quite similar to the 1991 real metropolitan region and covers 164 municipalities. The metropolitan region has currently 5.4 million inhabitants (91% of the province), 195,000 companies (91% of the province) and more than 2.4 million jobs (92.5% of the province).

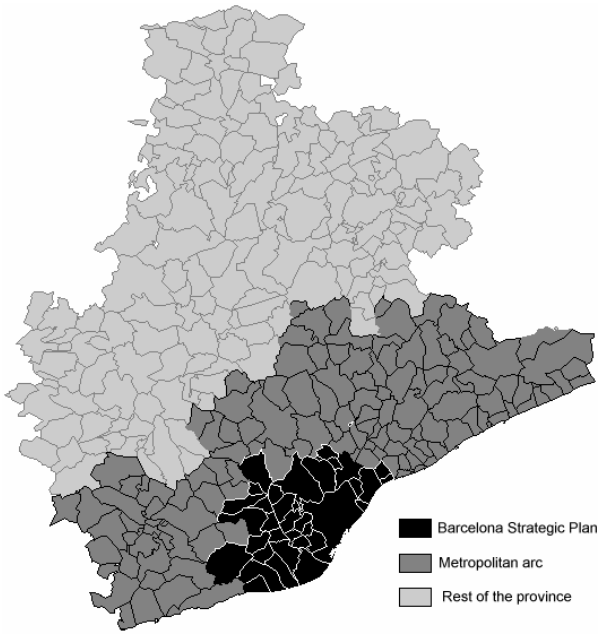
This area for planning is usually divided in two parts: the core or inner part of the metropolitan area, which mainly matches up with the area for the Barcelona Metropolitan Strategic Plan (Barcelona and other 35 surrounding municipalities) and the so called "metropolitan arc" or outer part (the other 128 municipalities) (Fig. A.3.2).

The inner part of the metropolitan region is sometimes referred by some organisms as "the metropolitan area" so that we should be careful about the nomenclature. Most of this area forms an urban continuum and has currently 3,150,000 inhabitants (59% of the province), 120,000 companies (29% of the companies in the province) and more than 1.6 million jobs (67% of the province). The largest cities of the province are located in the central part of this inner area (Barcelona, L'Hospitalet de Llobregat and Badalona). The city of Barcelona is the true economic engine of the province as well as of the economy of Catalonia. Barcelona has 1.6 million inhabitants (30% of the province), 77,000 firms (39% of the province), and around 1,050,000 jobs (43% of the province)[14].

[14] Data about firms and jobs could be slightly inflated due to the existence of a "headquarter effect" in the city of Barcelona.

The outer part of the metropolitan (metropolitan arc) has currently 1,700,000 inhabitants (32% of the province), 57,000 companies (29% of the companies in the province) and 620,000 jobs (26% of the province). In many aspects, the economic size of this area is similar to the third Spanish metropolitan area (Valencia). Other important medium cities are located in this area, mainly old industrial subcenters in the XIX Century (Mataró, Granollers, Sabadell, Terrassa, and Vilanova i la Geltrú).

Fig. A.3.3. Basic division of the province: Barcelona's Metropolitan Strategic Plan, metropolitan arc, and rest of the province



3. Other metropolitan areas in the province of Barcelona. There are other three small-medium cities in the province of Barcelona with capacity to structure the territory: Igualada (38,000 inhabitants), Manresa (75,000 inhabitants) and Vic (39,000 inhabitants). The procedures of identification of metropolitan areas suggest that Manresa forms an small area independent from the metropolitan region of Barcelona having 29 municipalities and about 148,000 inhabitants and 60,000 jobs (Tab. A.3.12). At this moment the population and jobs of the area have increased to 170,000 inhabitants, more than 6,000 firms and about 70,000 jobs. The Functional Urban Region procedure suggests that also Vic could form another small area (Boix and Veneri 2009).

A.3.2.3. Local labour markets

The province of Barcelona can be also divided in local labour markets. This division is not administrative or "official" but provides valuable information about the internal organization of the socioeconomic dynamics. There are 19 LLMAs centred in the province of Barcelona: Artés, Barcelona, Berga, Calaf, Calella, Capellades, La Garriga, Granollers, Igualada, Manresa, Mataró, Monistrol de Montserrat, Prats de Lluçanès, Sabadell, Sallent, Sant Celoni, Sant Sadurní d´Anoia, Vic, Vilafranca del Penedès. Parts of the LLMAs could be in other provinces or the inverse, as LLMAs do not observe the administrative boundaries of provinces and regions. In fact, LLMAs do not fit well with

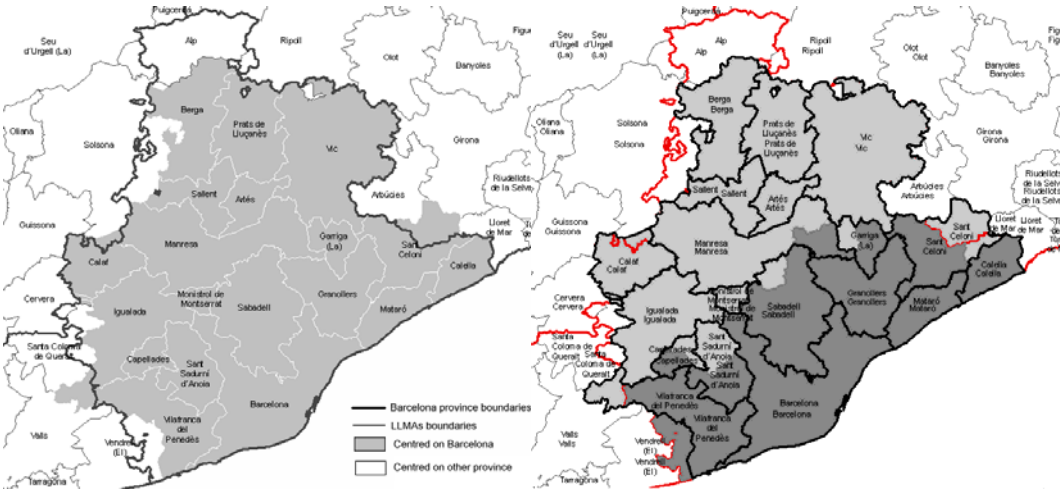
other administrative boundaries as comarcas or vegueries, showing a quite different design of the sphere of influence of big and medium cities in th province.

On the other hand, a half of the local labour markets are included in the boundaries of the definition for planning of the metropolitan region of Barcelona. Although the boundaries are not exacts, the metropolitan region of Barcelona (real or for planning) might be assimilated to the LLMAs of Barcelona, Vilafranca del Penedès, Sant Sandurní d'Anoia, Capellades, Sabadell, Granollers, La Garriga, Sant Celoni, Mataró, and Calella.

Box A.2. The delimitation of local labour markets areas (LLMAs)

The delimitation of LLMAs is carried out using an algorithm in five steps originally designed for the Travel-to-Work areas in Great Britain and later adapted to Italy by the ISTAT (Italian National Institute of Statistics). The version used in Spain by Boix and Galletto (2006) is the same proposed by ISTAT and has been applied to the entire country. The detail of the procedure could be read in Boix and Galletto (2006) and Boix and Trullén (2009). The algorithm departs from the municipalities (8,100 in Spain) and uses data on jobs, resident employees and travel-to-work flows collected as a part of the national Censuses. The application of the algorithm to the year 2001 divides Spain in 806 local labour markets.

Fig. A.3.4. Local labour market areas in the province of Barcelona and comparison with the metropolitan region for planning



A.3.2.4. Networks of cities

Networks of cities provide a complementary approach to the study of the internal structure of the province. This approach allows to identify the articulation of the links between the municipalities of the province (Fig. A.3.4).

The main centre of the network is the city of Barcelona, where most of the relevant flows of the network converge. The range of the city of Barcelona is especially important in the metropolitan region of Barcelona although spread to the rest of the province.

The metropolitan region of Barcelona is a polycentric network of cities well-weaved around some of the old industrial subcentres and other newer industrial cities. This space cannot be simply understood as a "belt" as the subcentres are not satellites of Barcelona and the complexity of the network is high. Despite this fact, the several parts of the metropolitan arc appear as poorly connected. Thus, there is a well connected network articulating the space between Sant Celoni, Granollers, Sabadell and Terrassa; a dense network across the Llobregat basin basically made of non-hierarchical links; the area of Vilafranca del Penedès and Vilanova i la Geltrú is poorly few connected with the rest of the metropolitan arc; in the same way, there is another corridor across the coast connecting the city of Barcelona and their surroundings with Mataró and Calella. This design shows not only the location of the subcentres that articulates the metropolitan territory but also the deficiencies in the infrastructures between several parts of the technological arc, that at this moment are being improved. The city of Barcelona serves as a common nexus connecting these spaces as the system of infrastructures continues to be highly radial. Furthermore, the figure shows that there is not a true differentiation between the centre of the metropolitan region and the rest of the arc.

The differentiation between the metropolitan network and the rest of the province is more evident as the flows of the metropolitan cities are more intense with Barcelona and the same metropolitan cities. The rest of the province is articulated around four cities: Igualada, Manresa, Vic and Berga. Other small cities articulates the spaces between this medium cities, forming small networks even if self-contained enough to explain the formation of small labour markets (Fig. A.3.5). The largest cities form quite compact networks which are intensely connected with the city of Barcelona although few connected between them as well as with the cities of the metropolitan arc.

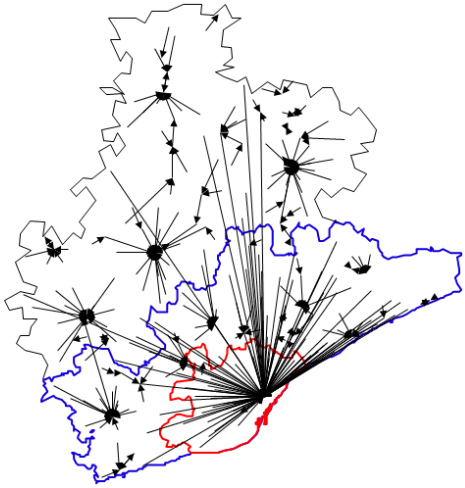
The figure A.3.5 also shows the evolution of the network between 1986 and 2001. The urban structure tends to be stable in short and medium periods of time, although some changes can be reported between the both parts of the figure. The most relevant fact is that the network becomes denser in 2001. The ambit of influence of the city of Barcelona becomes more important in all the ambits of the province. At the same time, the metropolitan network becomes more connected. In the rest of the province, the most outstanding fact is a light trend to connect the networks of the largest cities thanks to some small cities that revolve around more than one network.

Box A.3. Identification of networks of cities

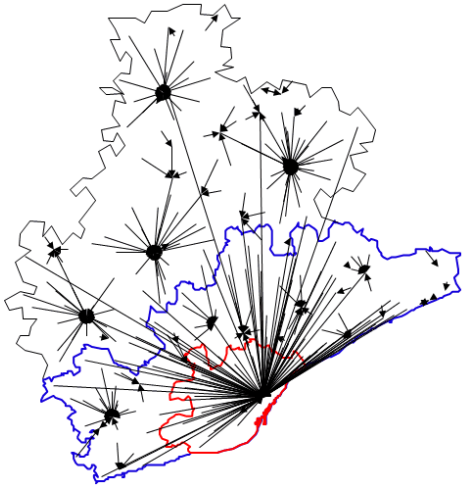
There are several procedures to identify networks of cities, depending on the information available and the ambit of the interaction. In regional ambits, one of the easier and effective methods is the isolation of the k-nearest neighbourhoods of a matrix of travel-to-work flows. Although not exempt of limitations, in regional ambits commuting data offers a good synthetic indicator of economic and social flows and also weights the effects of infrastructures. In this case, the four more important flows departing of each municipality have been taken into account as relevant neighbours. A minimum of five commuters by flow has been also requested.

Fig. A.5. Networks of cities in the province of Barcelona

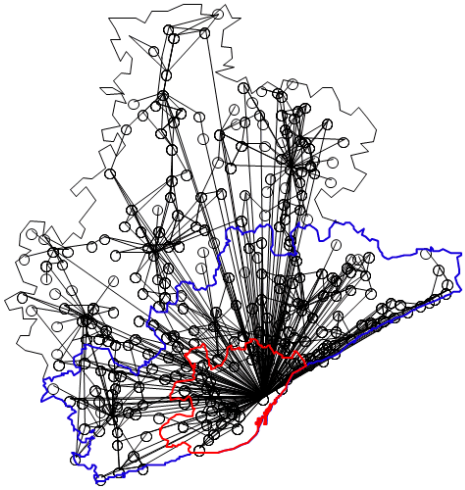
A.1) First director flow. 1986



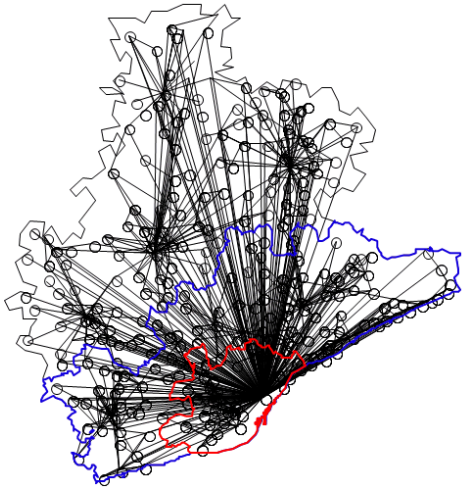
B.1) First director flow. 2001



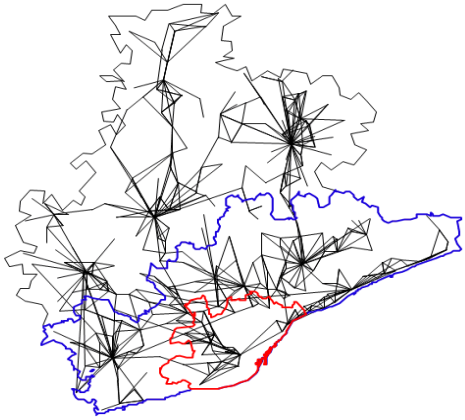
A.2) Four director flows. 1986



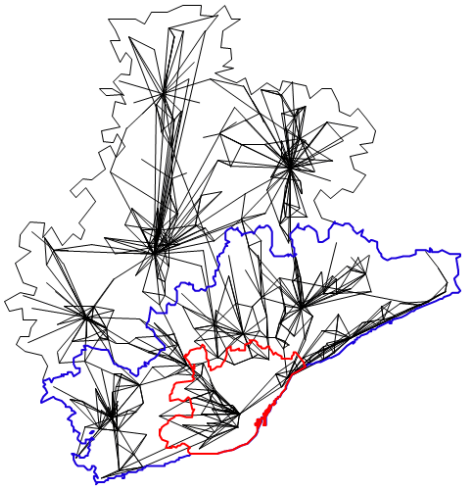
B.2) Four director flows. 2001



A.3) Four director flows without Barcelona. 1986



B.3) Four director flows without Barcelona. 2001



A.3.2.5. Rurality

The province of Barcelona is classified by the OECD as predominantly urban (OECD 2009) since the average density of the province is 700 inhabitants/Km2, 99.4% of the population live at least of 45 minutes by road of a city of more than 50,000 inhabitants.

However, not all the municipalities of the province are considered as urban. In fact, there is a clear differentiation between the metropolitan region of Barcelona and the rest of the province (Fig. A.3.6). The metropolitan region concentrates the municipalities with the highest density of the province, and only some concrete parts of the Penedès and the Vallès Oriental could be classified as rural. In the other part of the province, density is lower so that, with the exception of the medium cities (Igualada, Manresa, Vic, Berga) and some surrounding municipalities, most of this other part of the province has rural characteristics regarding density. This in part explains why the networks of cities were very hierarchical in this non-metropolitan part of the province.

Regarding the local labour markets, most of them are classified as urban following the OECD criteria as the "urbanity" of medium cities and their contribution to the population of their labour markets counterbalance the rurality of the small municipalities. Only three small local labour markets (Sallent, Prats de Lluçanès and Monistrol de Montserrat) could be classified as rural. The total population of these small labour markets is less than 30,000 inhabitants.

Box A.4. The definition of "rural" in the OECD Rural Policy Review of Spain 2009

Even if rural areas have constituted an object of analysis for decades, there is no single definition of "rural area" commonly accepted. As a result each country employs its own national definition to the identification of these areas. The European Commission (2006) suggests that this is due to the various perceptions of what is, and what is not, rural and the elements characterizing rurality, the use of different definitions according to the object or the policy concerns, and the difficulty to collect data of similar geographical units. For the purposes of a cross-country research, homogeneous classifications are provided by international organisms as Eurostat and OECD. In fact, although Eurostat initially used their own definition of rural areas, in the "Rural Development in the European Union" report (2006, p.3) the European Commision implements the OECD methodology due to the fact that it is able to define the NUTS' rural character and this methodology is the most widely used approach[15]. The OECD (2009c) methodology uses as spatial units the TL3 (Territorial Level 3, which for European countries agrees with the NUTS-3 units) and establishes a regional typology according to which regions are classified as predominantly rural, intermediate or urban on the basis of three criteria (OECD 2009c):

1. Population density: if the population density of the municipality is below 150 inhabitants per km2 the community is considered as rural[16].

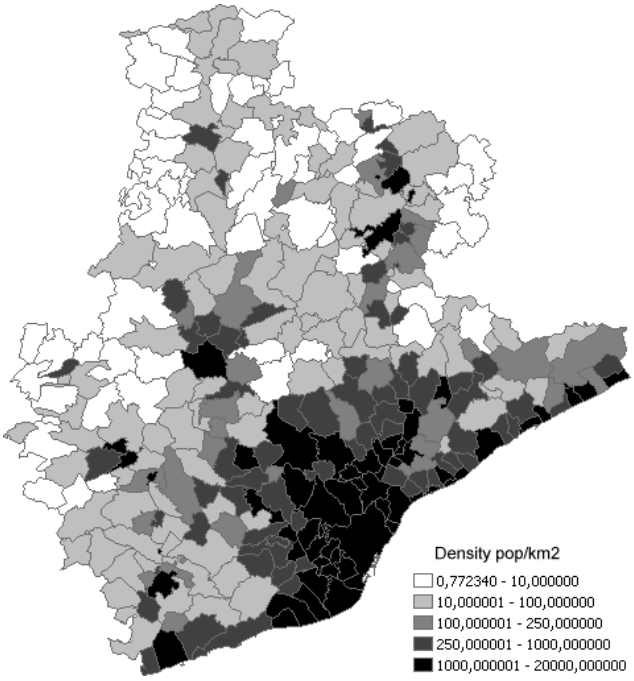
2. Percentage of population in rural communities: if more than 50% of the population of a region lives in rural communities (as defined in the previous point) the region is considered as rural, if this percentage is between 15% and 50% is considered as intermediate, and is considered as urban if the share is less than 15%.

3. Proximity to urban centres. A region classified as rural by the previous criteria is subsequently classified as intermediate if it has an urban centre or more than 200,000 inhabitants (500,000 in Japan) having at least 25% of the regional population. A similar rule is applied to an intermediate region if it contains an urban centre of more than 500,000 inhabitants (1 million for Japan) which represents at least 25% of the regional population.

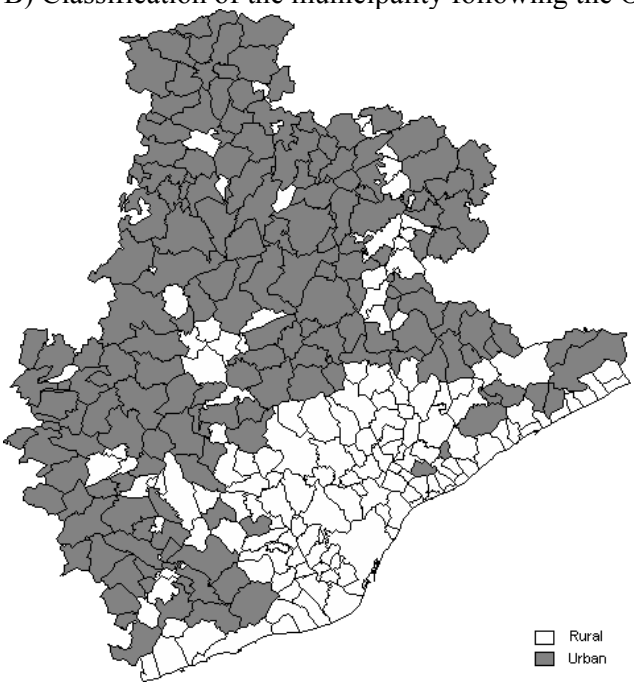
[15] However, the report considers that this methodology imperfectly reflects the rural carácter of areas in densely populated regions.

[16] For Japan the threshold is 500 inhabitants per Km2 due to the enormous density of the country.

Fig. A.3.6. Density of population and rurality of the municipalities of the province
A) Density population/Km2



B) Classification of the municipality following the OECD criteria



Source: Elaborated from 2001 Census (INE) and OECD (2009).

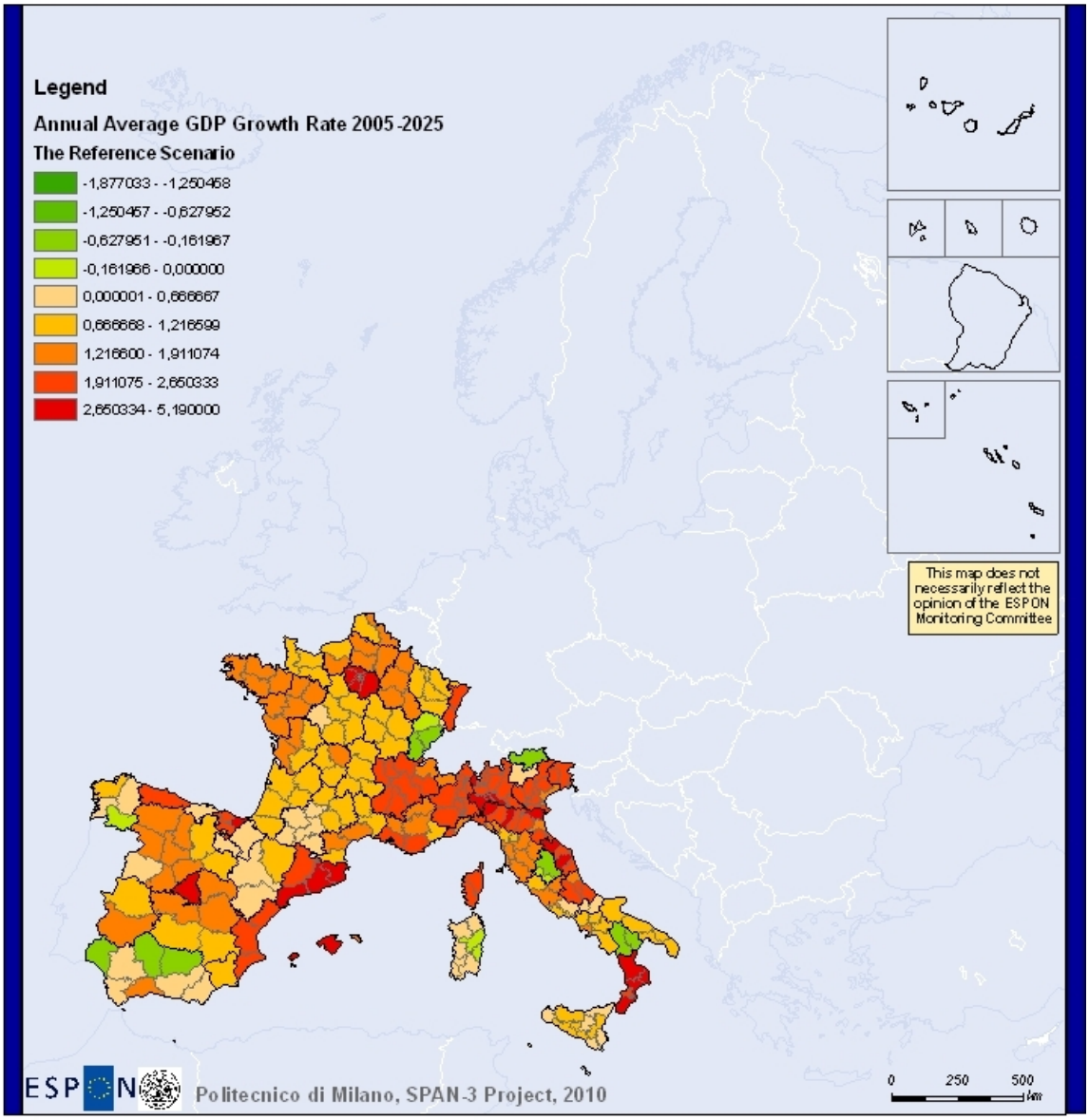
Tab. A.3.14. Local labour markets in the province of Barcelona by rurality

Local labour market	Nº municipalities	Nº rural municipalities	Muns > 200000 inhabs.	Muns > 500000 inhabs	Total population 2001	Population in rural municipalities	% rurality	Rural/Urban
Barcelona	51	3	3	1	3.046.956	8.321	0%	Urban
Sabadell	17	5	0	0	564.735	5.905	1%	Urban
Granollers	23	4	0	0	252.417	6.508	3%	Urban
Mataró	16	3	0	0	223.616	4.505	2%	Urban
Vilafranca del Penedès	22	15	0	0	130.818	17.699	14%	Urban
Manresa	22	15	0	0	121.719	18.594	15%	Urban
Vic	38	26	0	0	113.837	21.034	18%	Urban
Calella	9	2	0	0	83.914	12.067	14%	Urban
Igualada	16	13	0	0	62.590	10.283	16%	Urban
Sant Celoni	16	11	0	0	42.177	9.504	23%	Urban
Sant Sadurní d´Anoia	9	4	0	0	38.959	6.911	18%	Urban
Berga	14	12	0	0	30.625	11.089	36%	Urban
Garriga (La)	6	3	0	0	21.876	1.862	9%	Urban
Sallent	**4**	**4**	**0**	**0**	**15.782**	**15.782**	**100%**	**Rural**
Capellades	5	2	0	0	10.588	2.161	20%	Urban
Artés	3	2	0	0	7.529	3.009	40%	Urban
Prats de Lluçanès	**12**	**11**	**0**	**0**	**7.045**	**4.358**	**62%**	**Rural**
Monistrol de Montserrat	**3**	**2**	**0**	**0**	**5.667**	**3.146**	**56%**	**Rural**
Calaf	10	9	0	0	5.129	2.154	42%	Urban

Source: Elaborated from 2001 Census (INE) and OECD (2009).

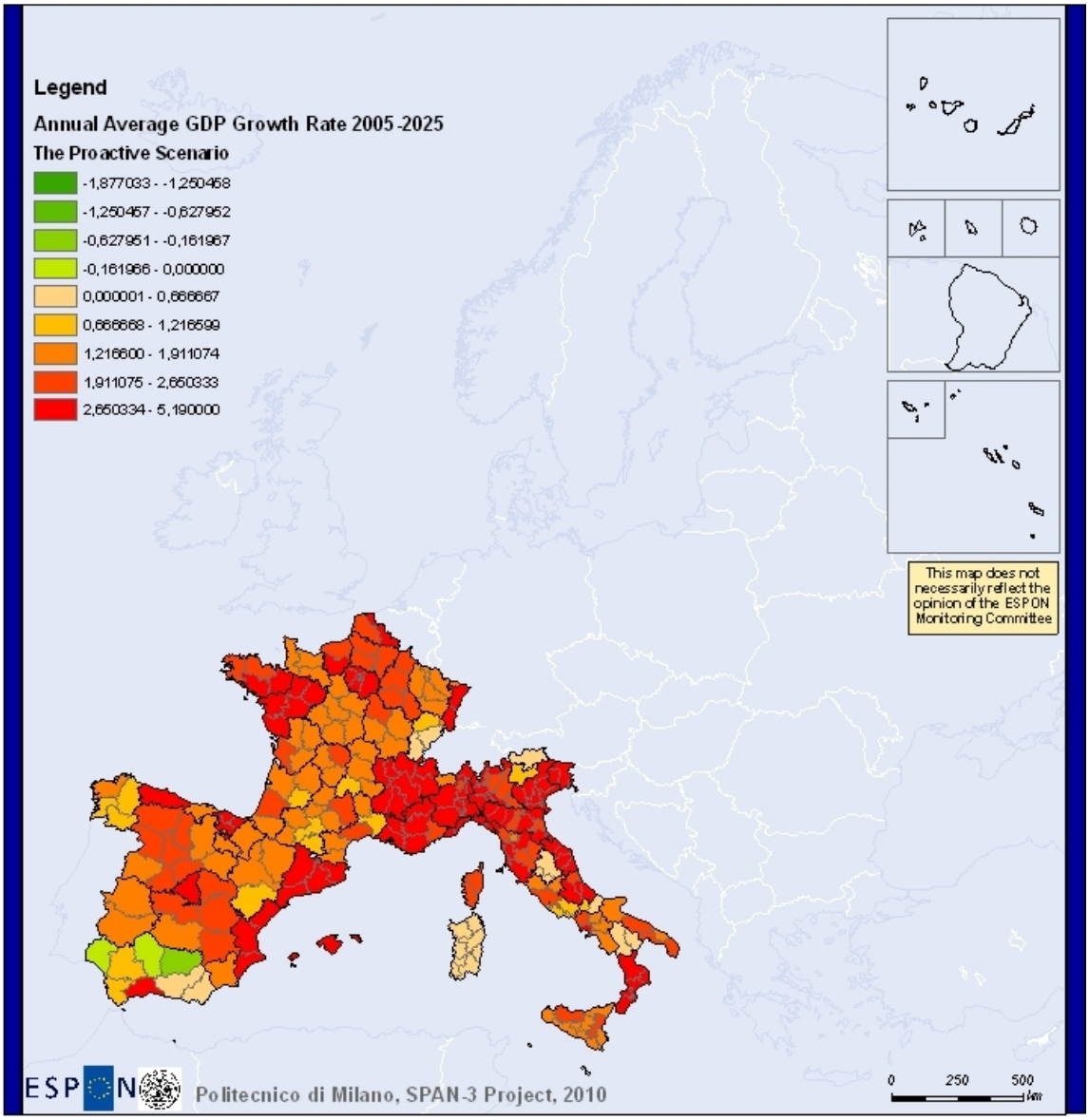
Annex 4. Figures and Tables

Fig. A.4.1.-Annual average GDP growth rate 2005-2025; the reference scenario



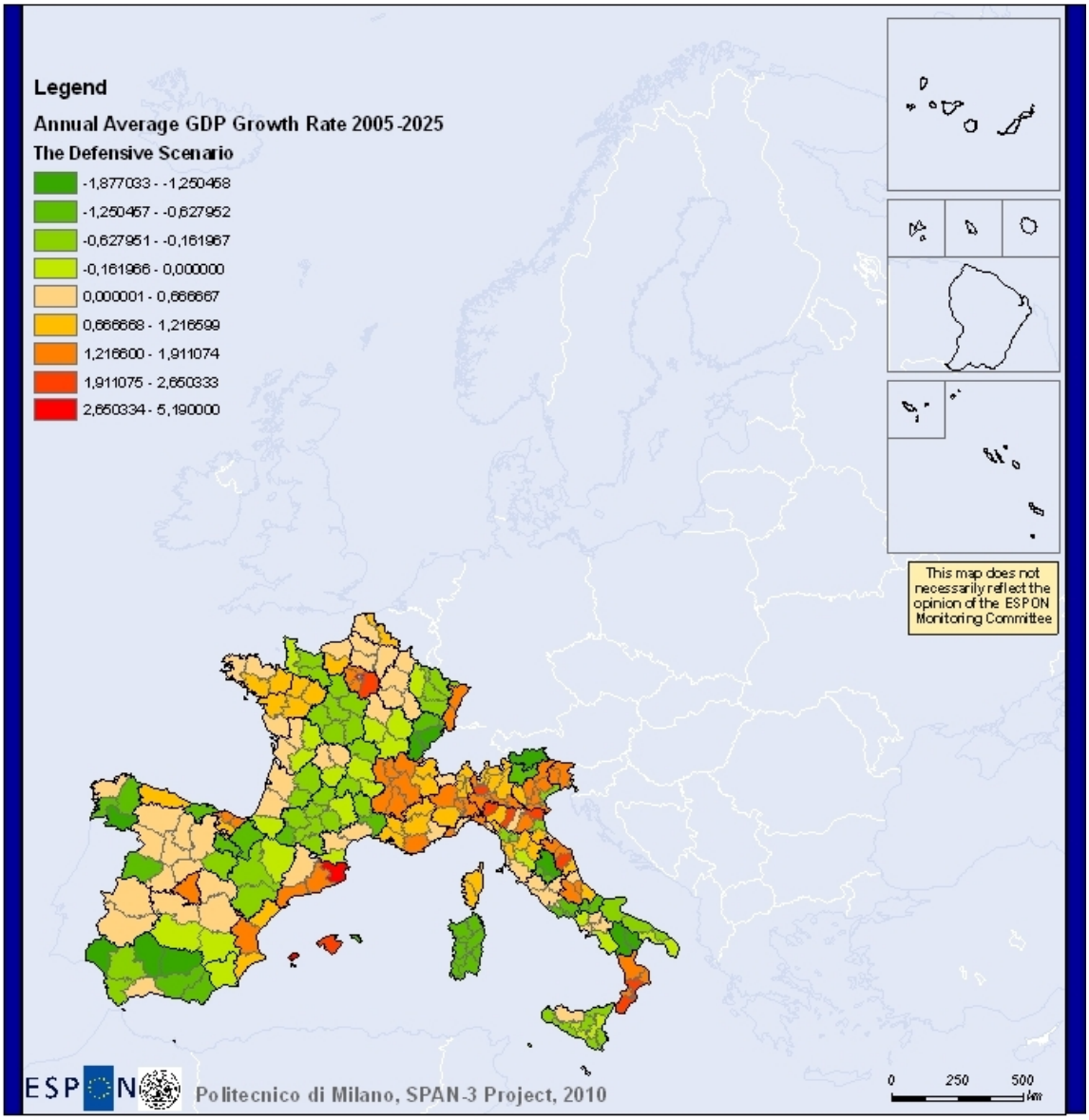
Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010

Fig. A.4.2.-Annual average GDP growth rate 2005-2025; the proactive scenario



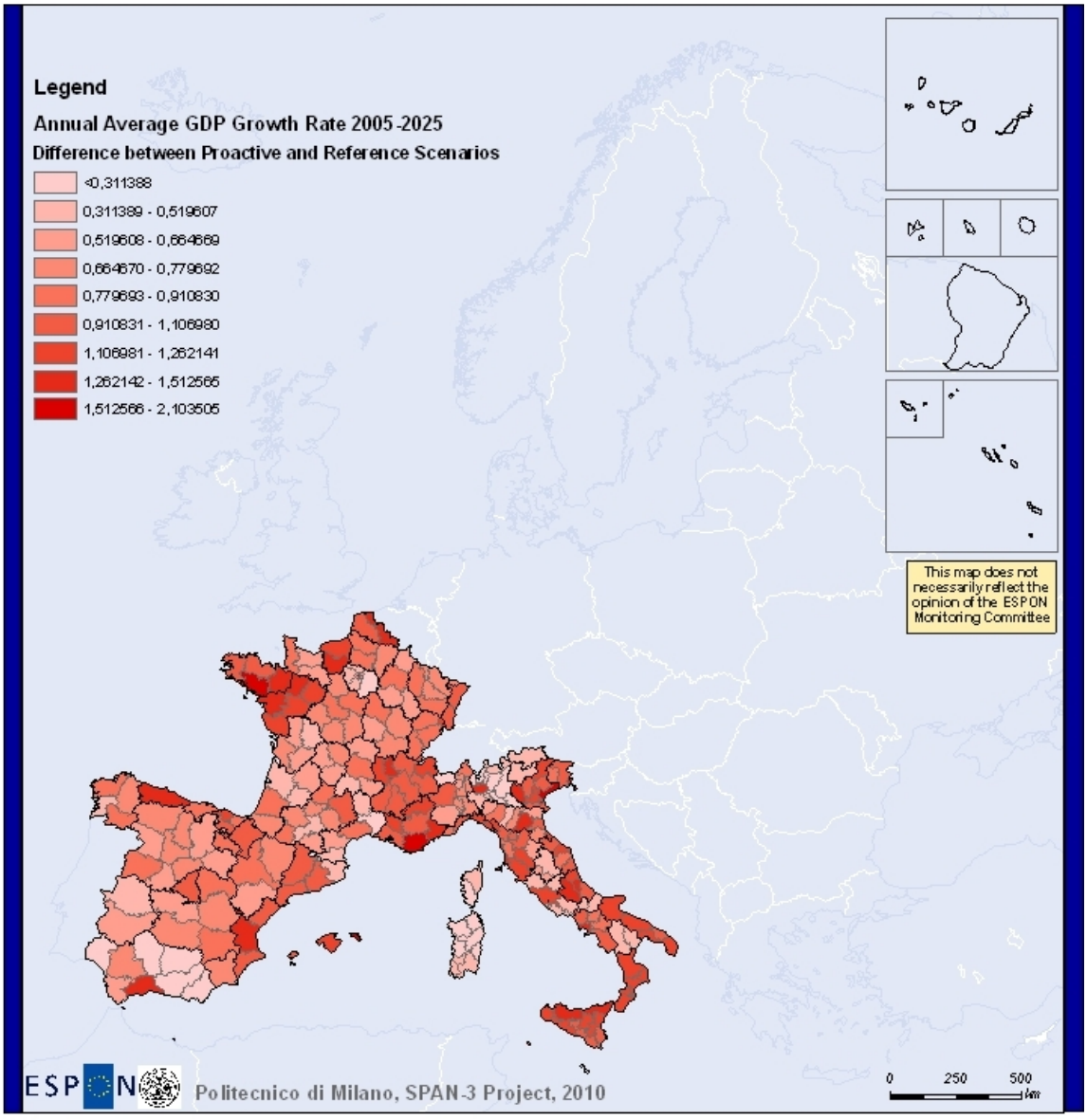
Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010
© EuroGeographics Association for administrative boundaries

Fig. A.4.3.-Annual average GDP growth rate 2005-2025; the defensive scenario



Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010
© EuroGeographics Association for administrative boundaries

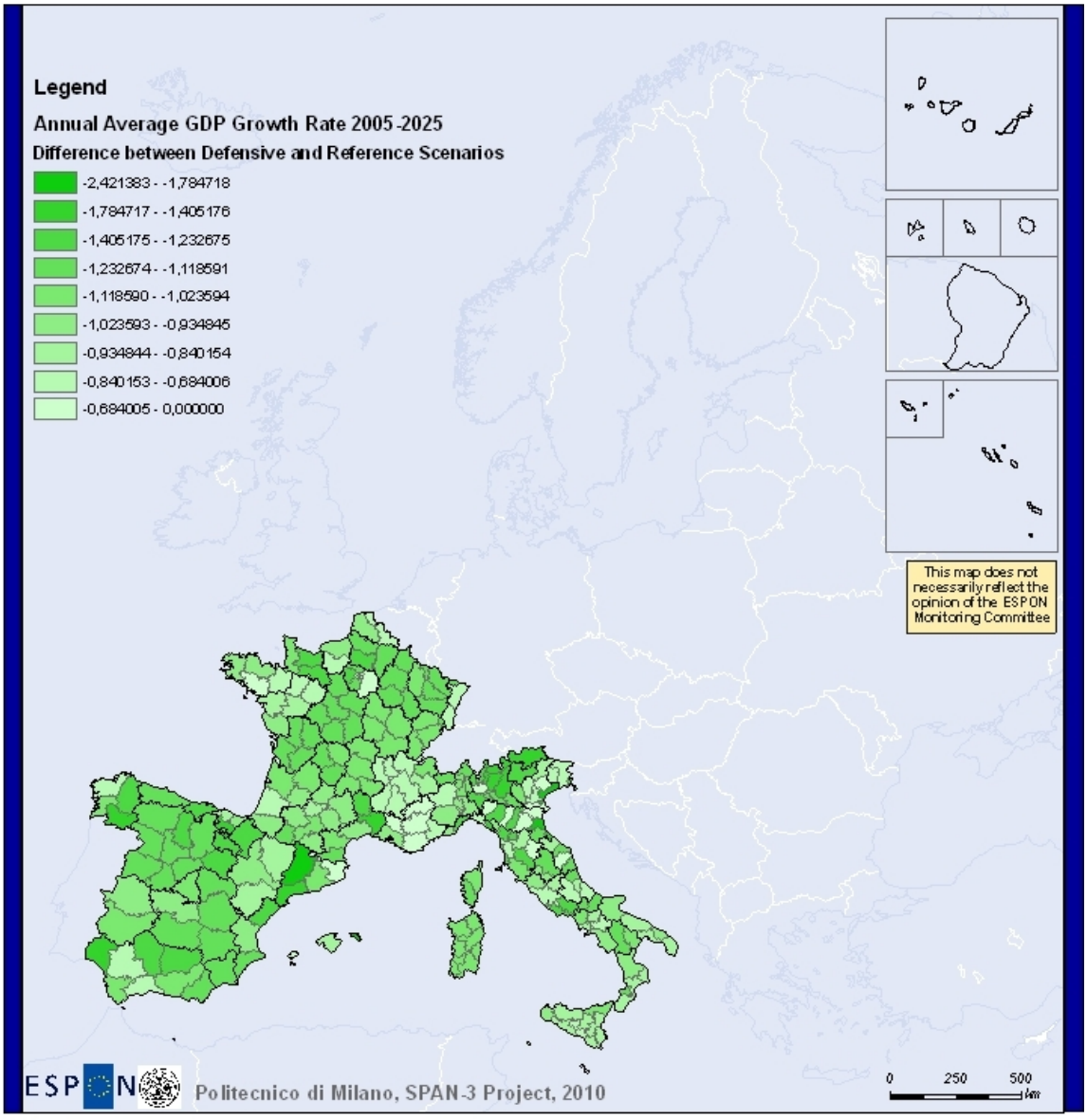
Fig. A.4.4.-Annual average GDP growth rate 2005-2025; difference between proactive and reference scenarios



EUROPEAN UNION
Part-financed by the European Regional Development Fund

Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010

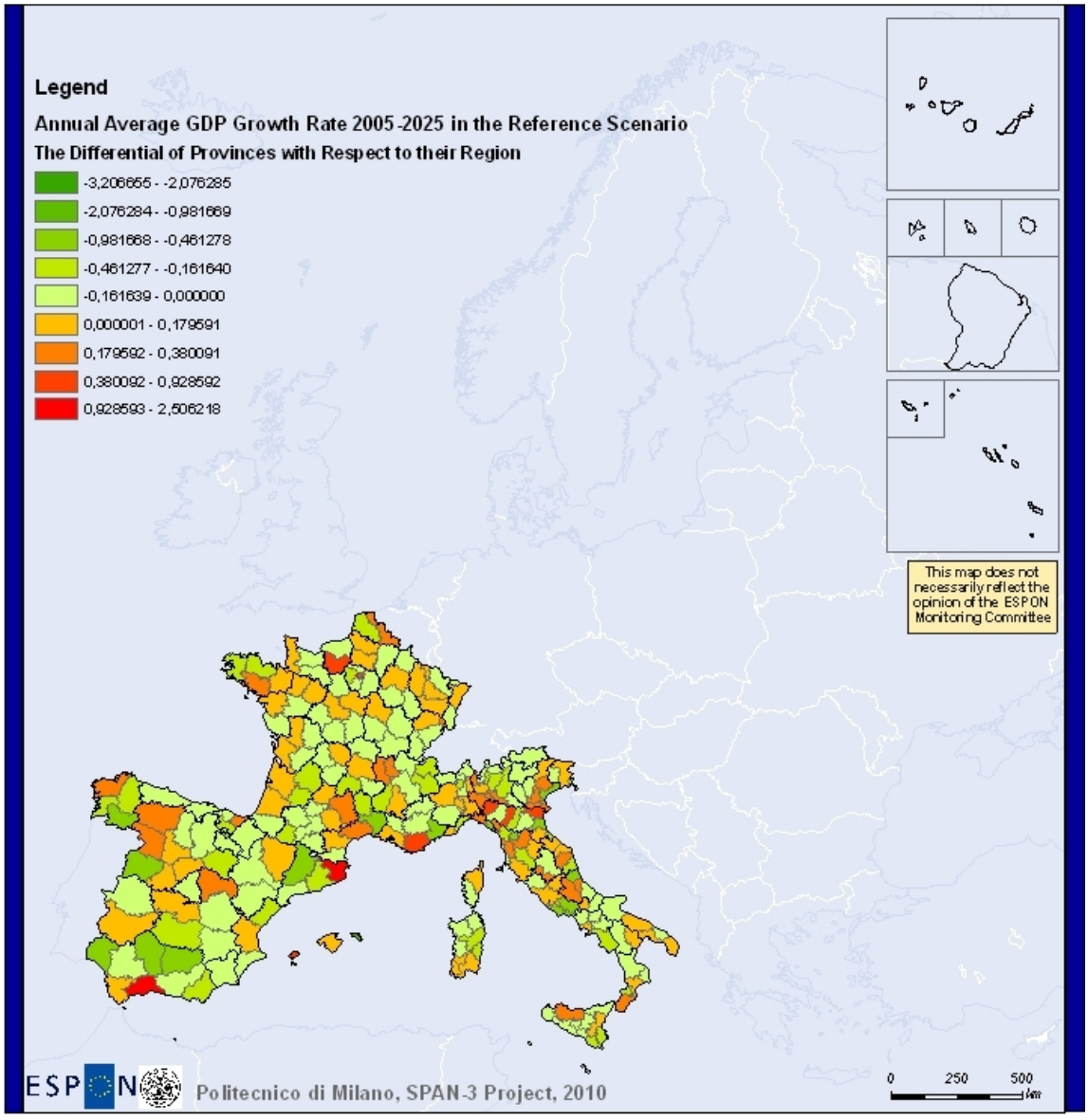
Fig. A.4.5.-Annual average GDP growth rate 2005-2025; difference between defensive and reference scenarios



EUROPEAN UNION
Part-financed by the European Regional Development Fund

Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010

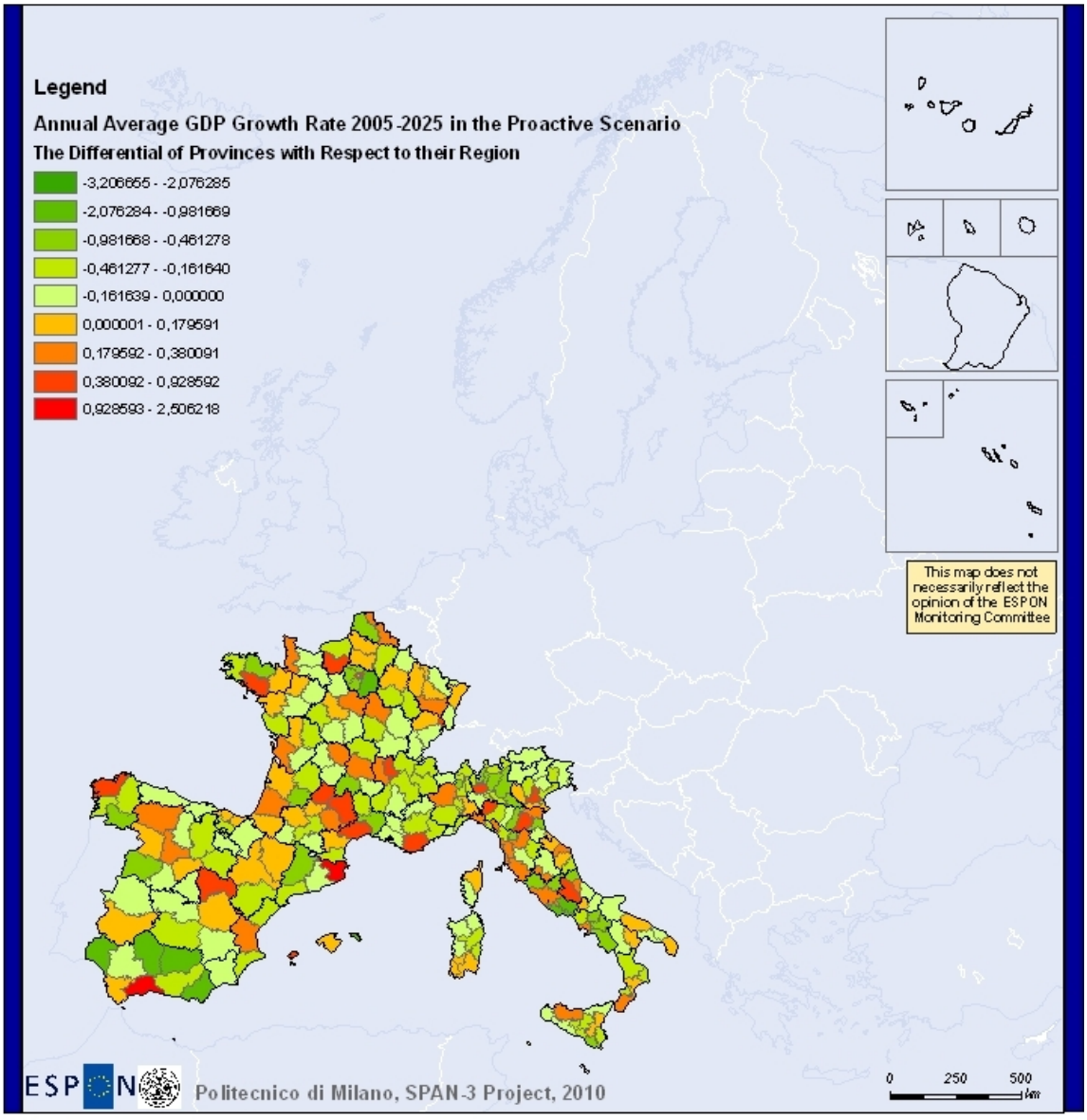
Fig. A.4.6.-Annual average GDP growth rate 2005-2025 in the reference scenario: the differential of provinces with respect to their region



EUROPEAN UNION
Part-financed by the European Regional Development Fund

Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010

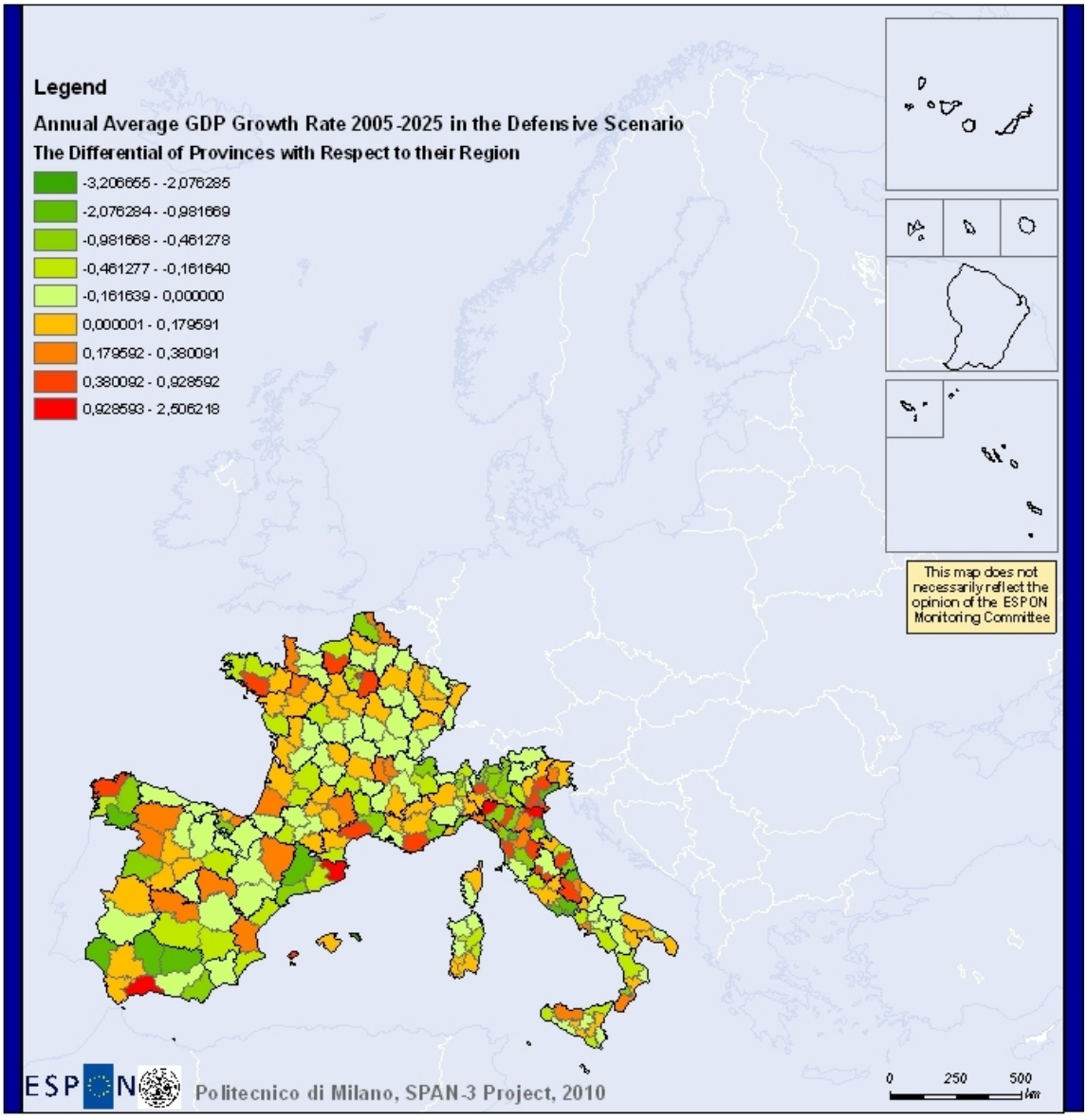
Fig. A.4.7.-Annual average GDP growth rate 2005-2025 in the proactive scenario: the differential of provinces with respect to their region



EUROPEAN UNION
Part-financed by the European Regional Development Fund

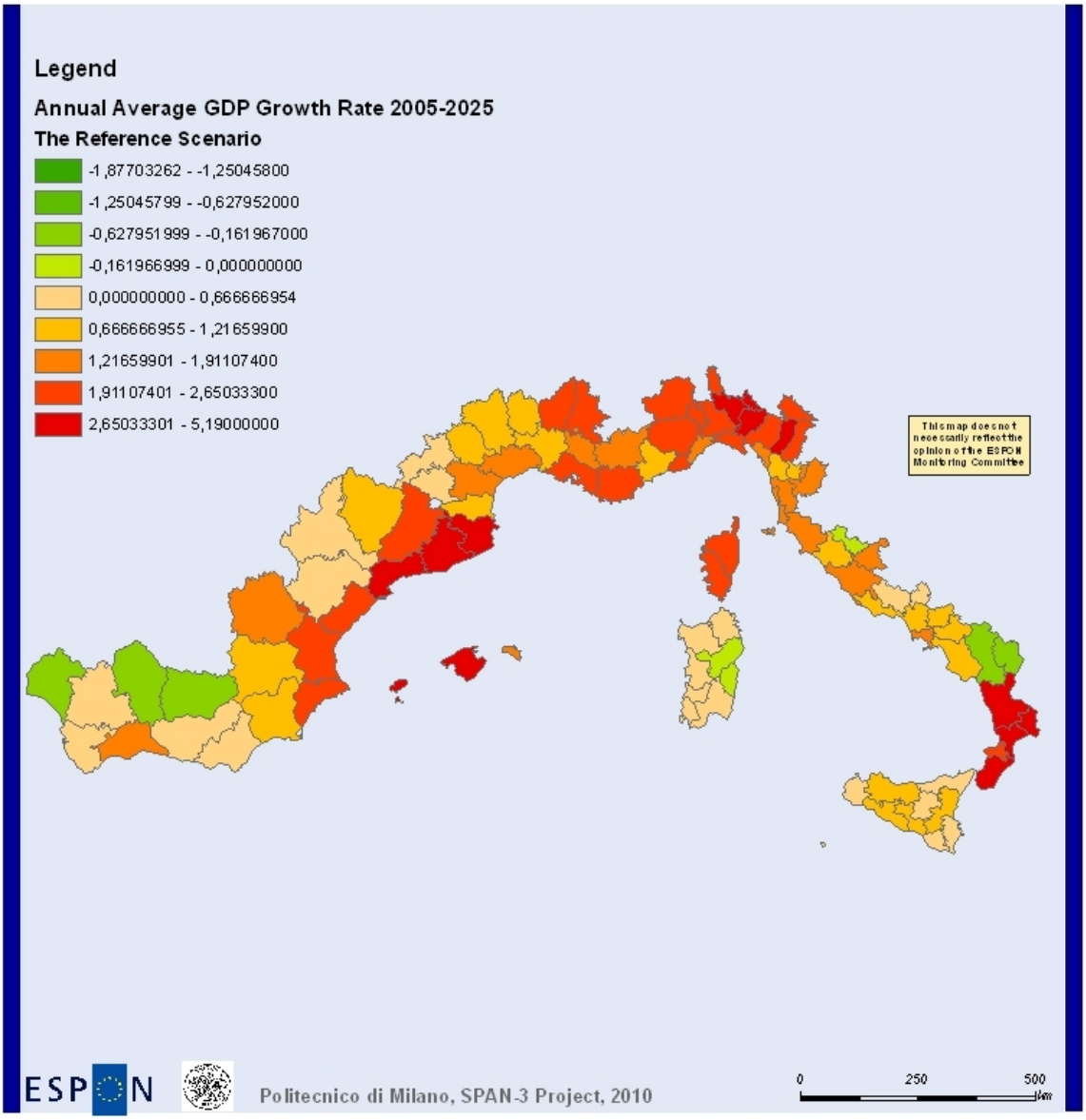
Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010

Fig. A.4.8.-Annual average GDP growth rate 2005-2025 in the defensive scenario: the differential of provinces with respect to their region



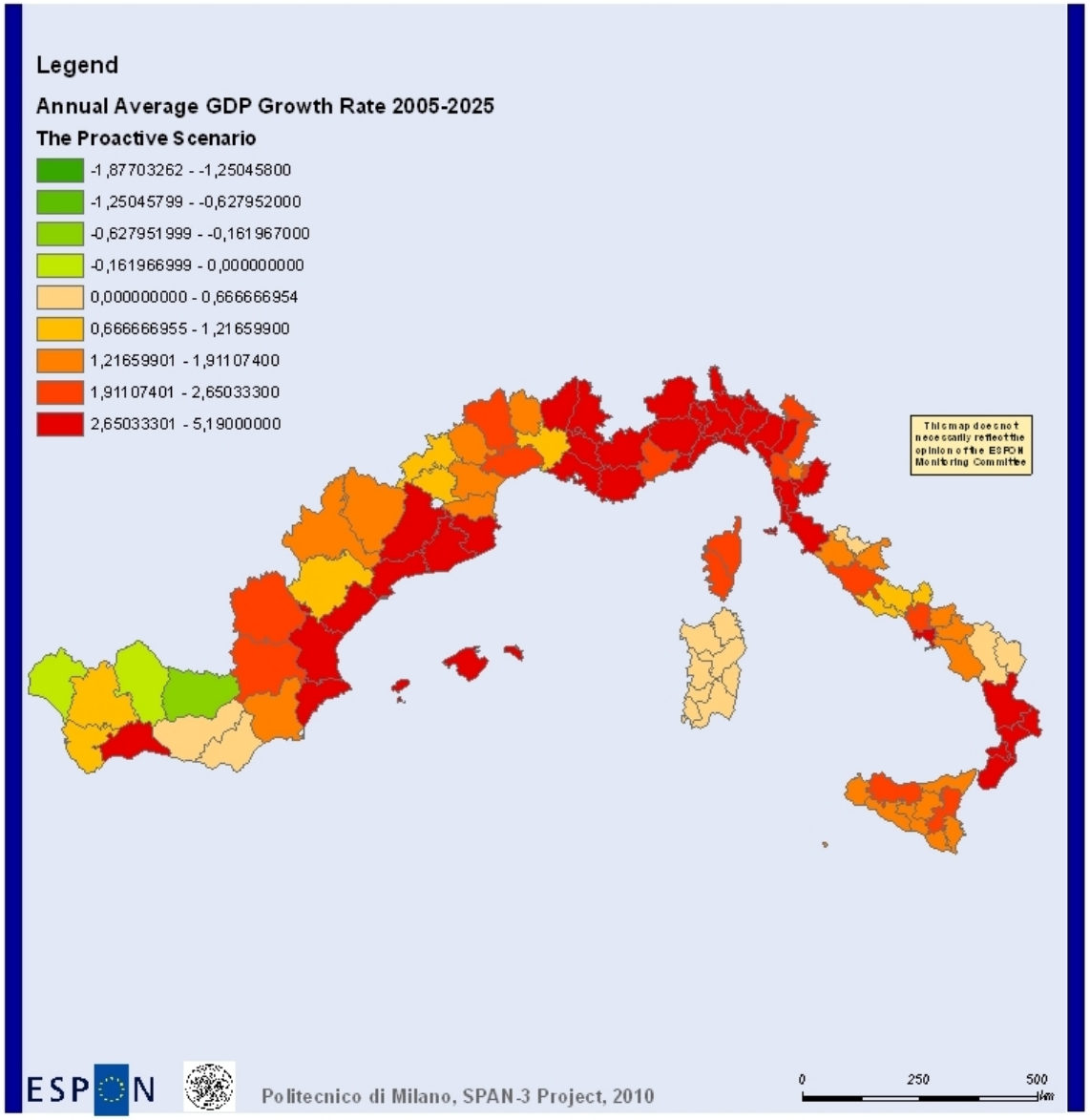
Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010

Fig. A.4.9.-Annual average GDP growth rate 2005-2025; the reference scenario in Latin Arc provinces



Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010
© EuroGeographics Association for administrative boundaries

Fig. A.4.10.-Annual average GDP growth rate 2005-2025; the proactive scenario in Latin Arc provinces



Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010

Fig. A.4.11.-Annual average GDP growth rate 2005-2025; the defensive scenario in Latin Arc provinces

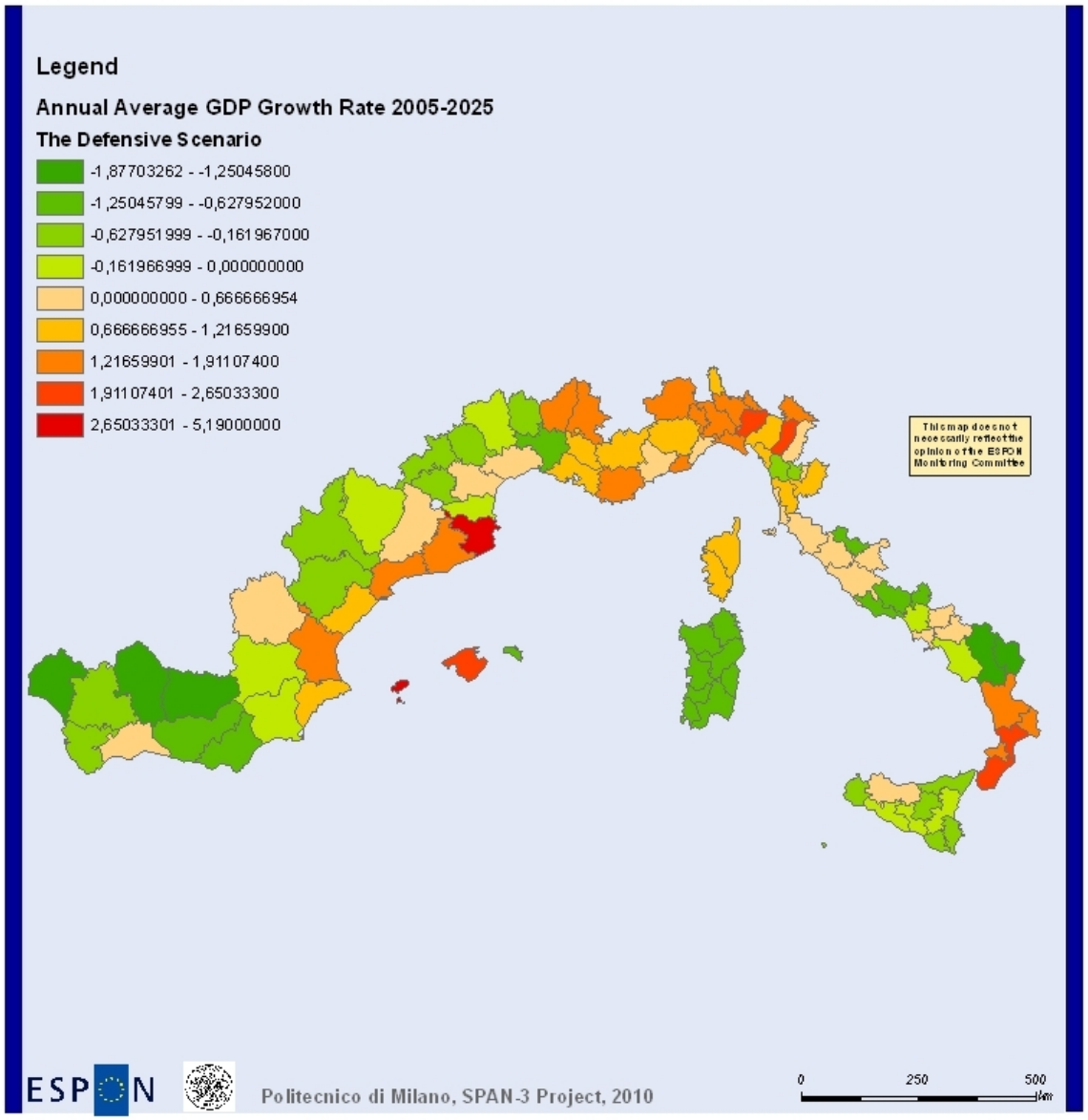


Fig. A.4.12.-Annual average GDP growth rate 2005-2025; difference between proactive and reference scenarios in Latin Arc provinces

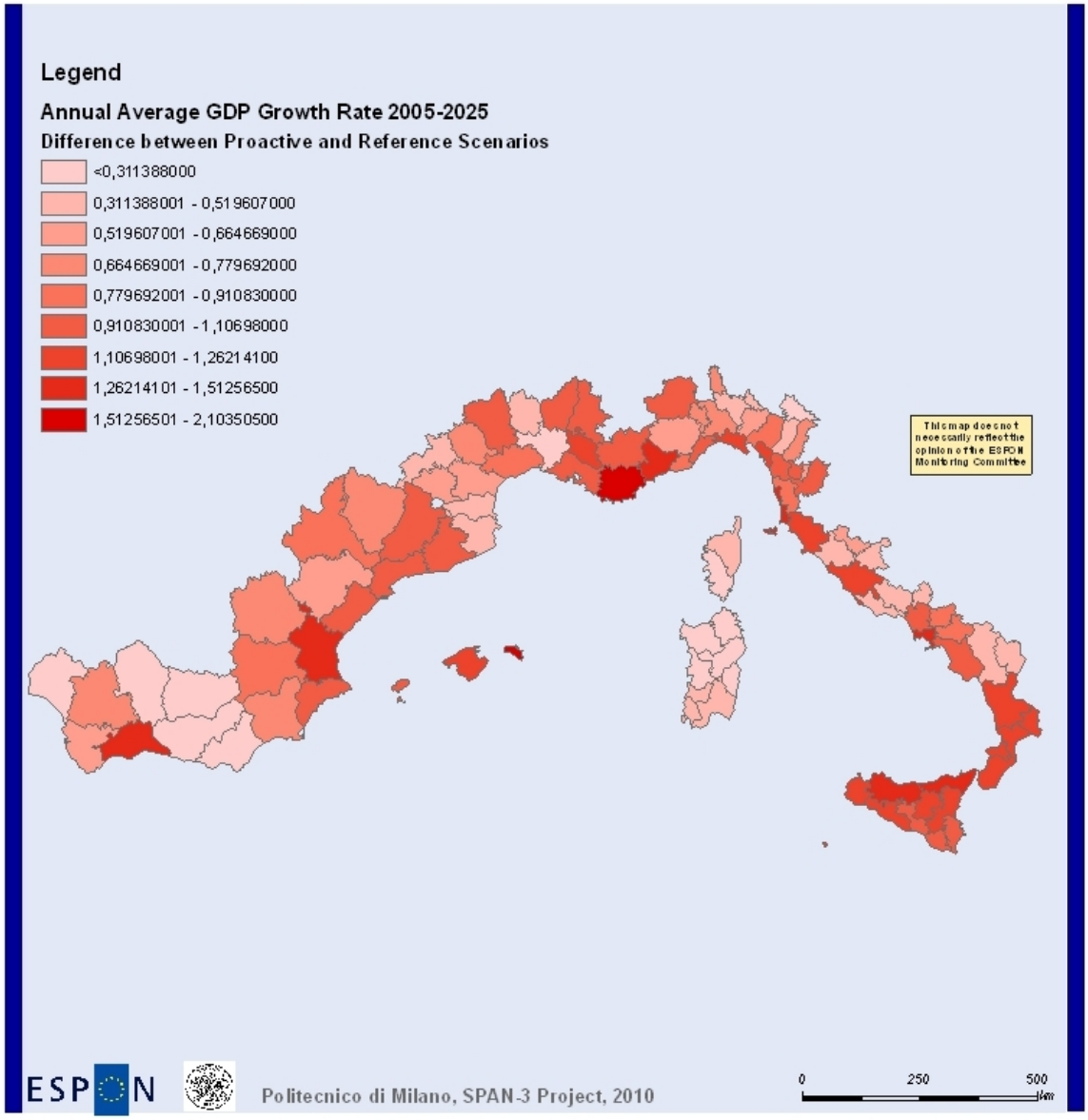
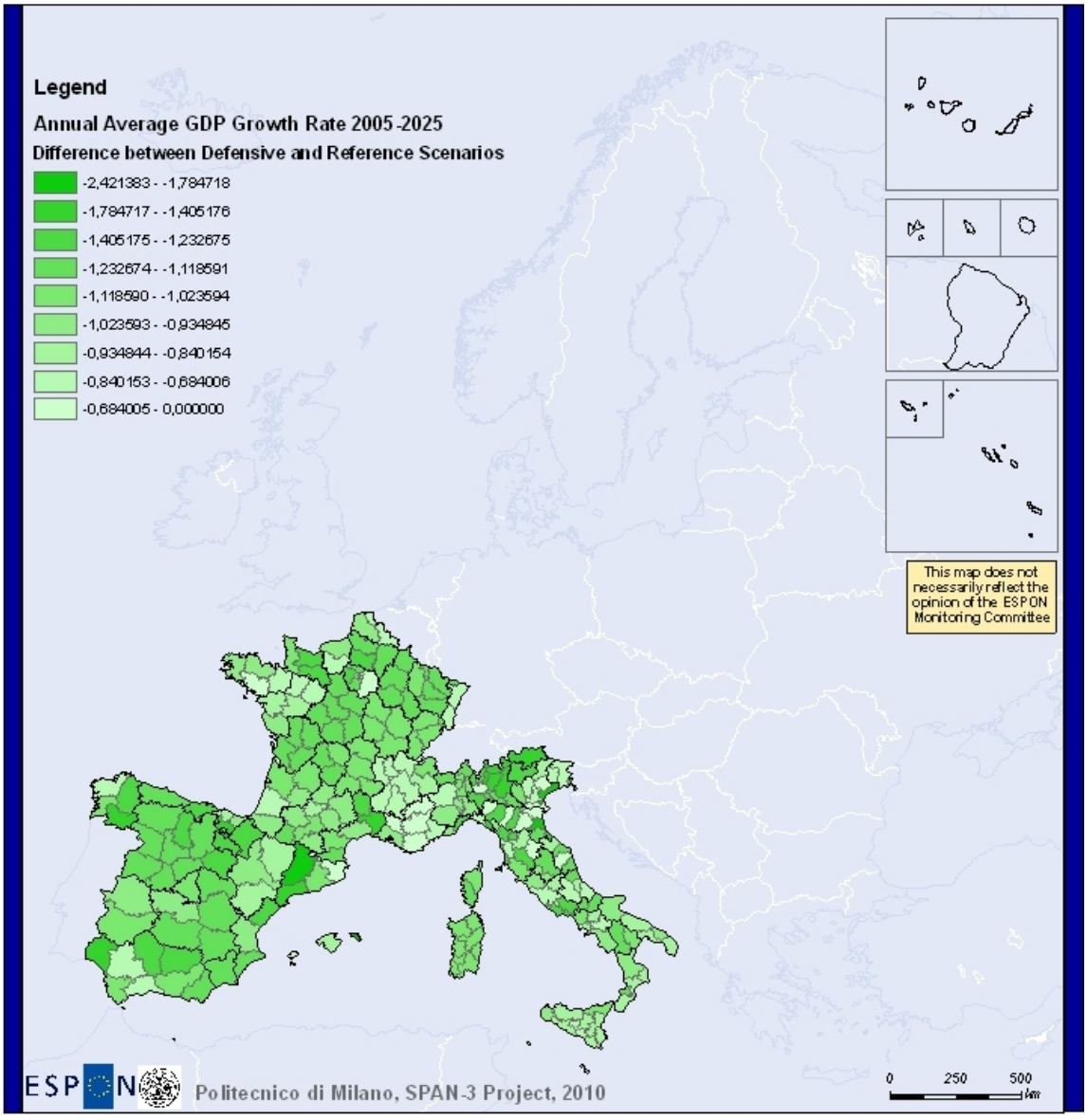


Fig. A.4.13.-Annual average GDP growth rate 2005-2025; difference between defensive and reference scenarios in Latin Arc provinces



EUROPEAN UNION
Part-financed by the European Regional Development Fund

Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010

Fig. A.4.14.-Annual average GDP growth rate 2005-2025 in the reference scenario: the differential of Latin Arc provinces with respect to their region

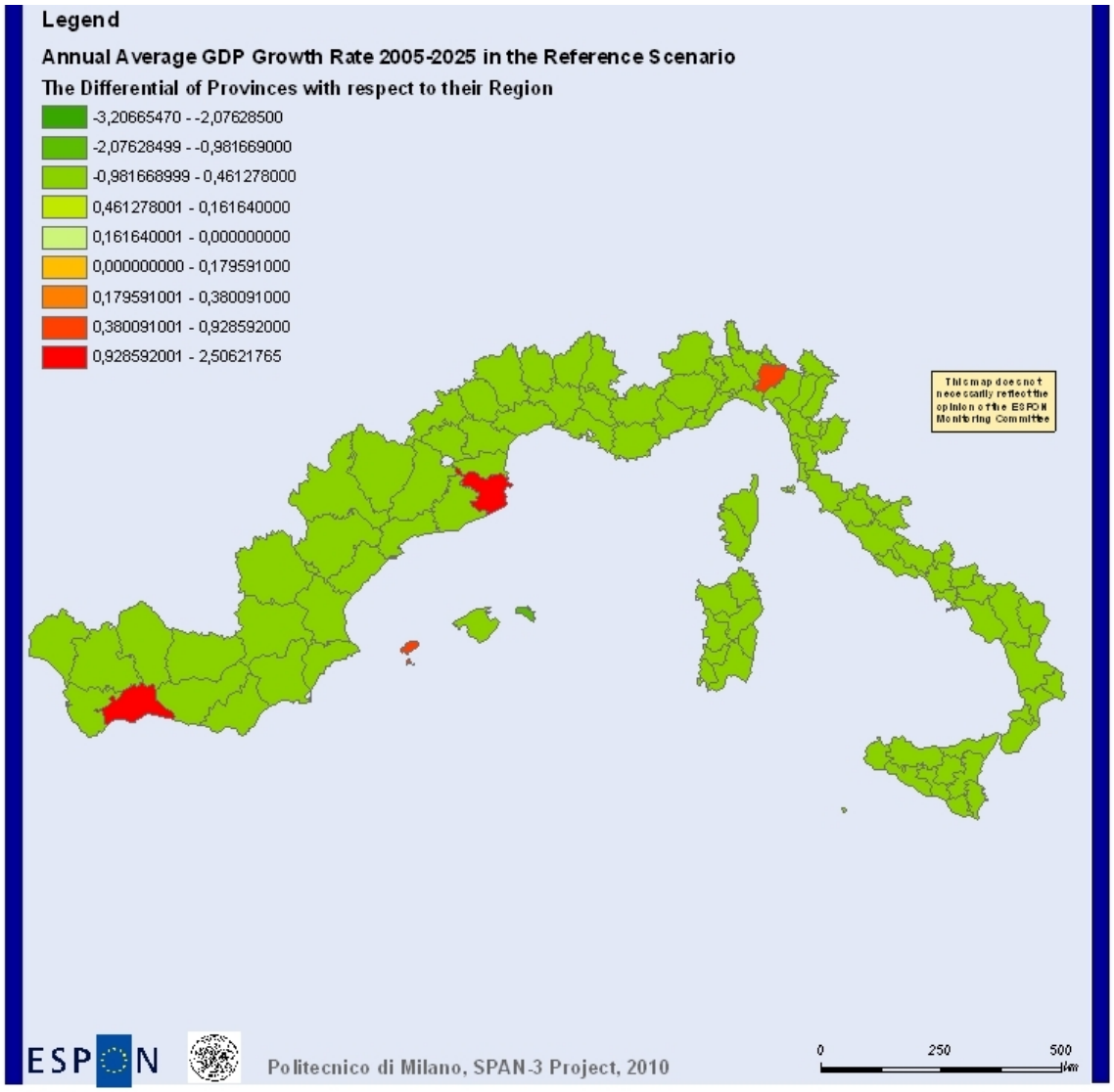
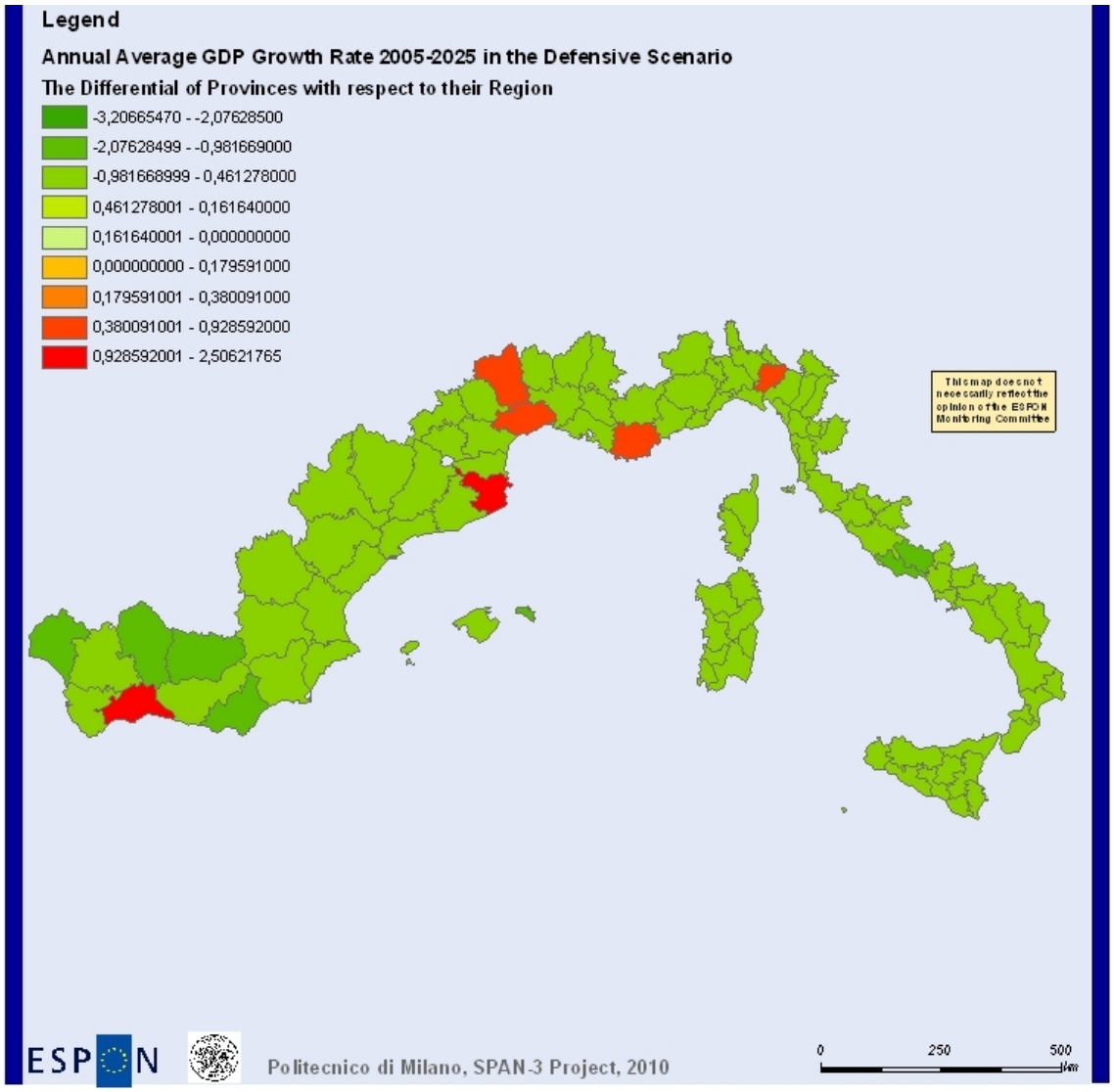


Fig. A.4.15.-Annual average GDP growth rate 2005-2025 in the proactive scenario: the differential of Latin Arc provinces with respect to their region



Regional level: NUTS 3
Source: Politecnico di Milano, May 2010
Origin of data: SPAN-3 model, May 2010
© EuroGeographics Association for administrative boundaries

Fig. A.4.16.-Annual average GDP growth rate 2005-2025 in the defensive scenario: the differential of Latin Arc provinces with respect to their region

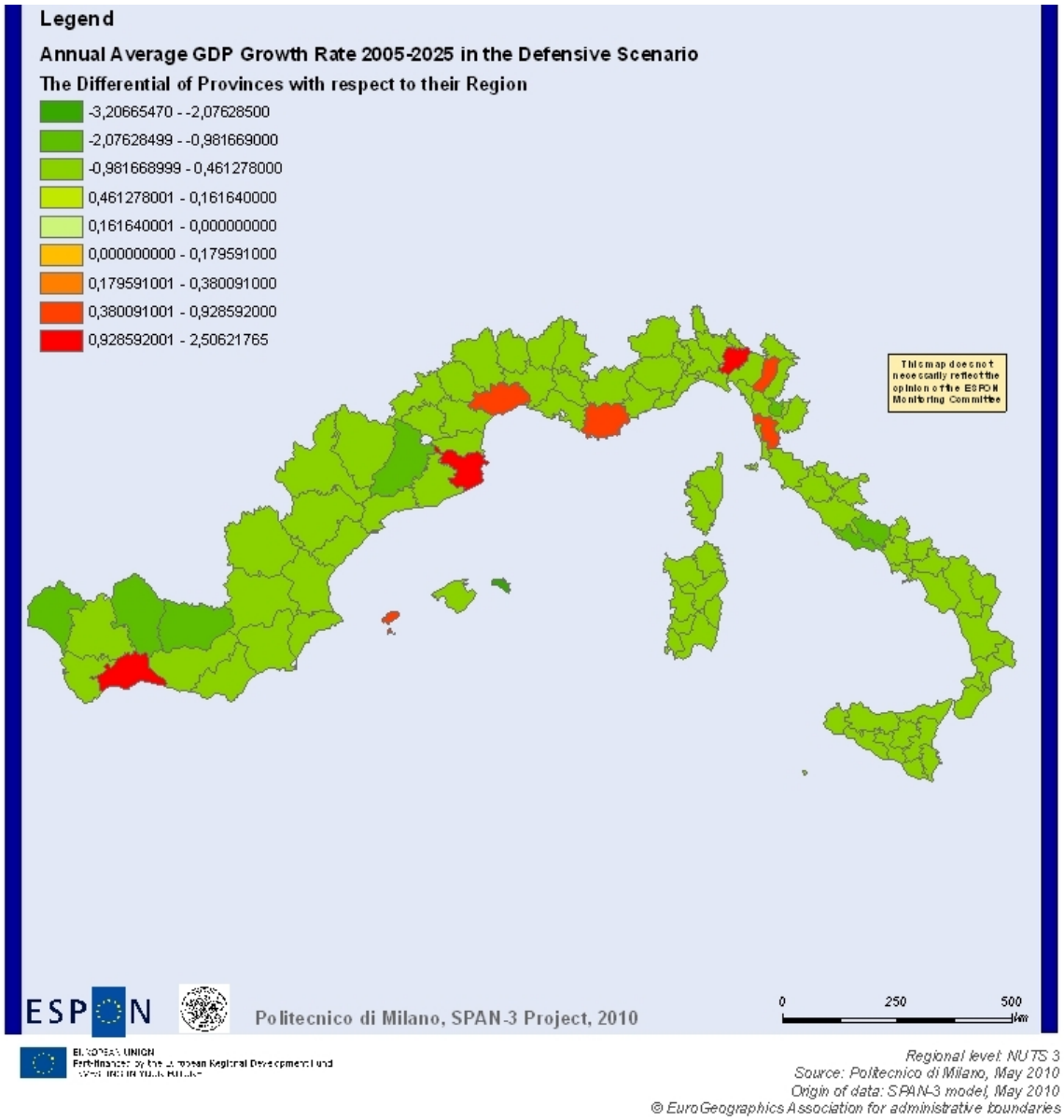


Fig. A.4.17.- Catalonia: Transeuropean motorway network

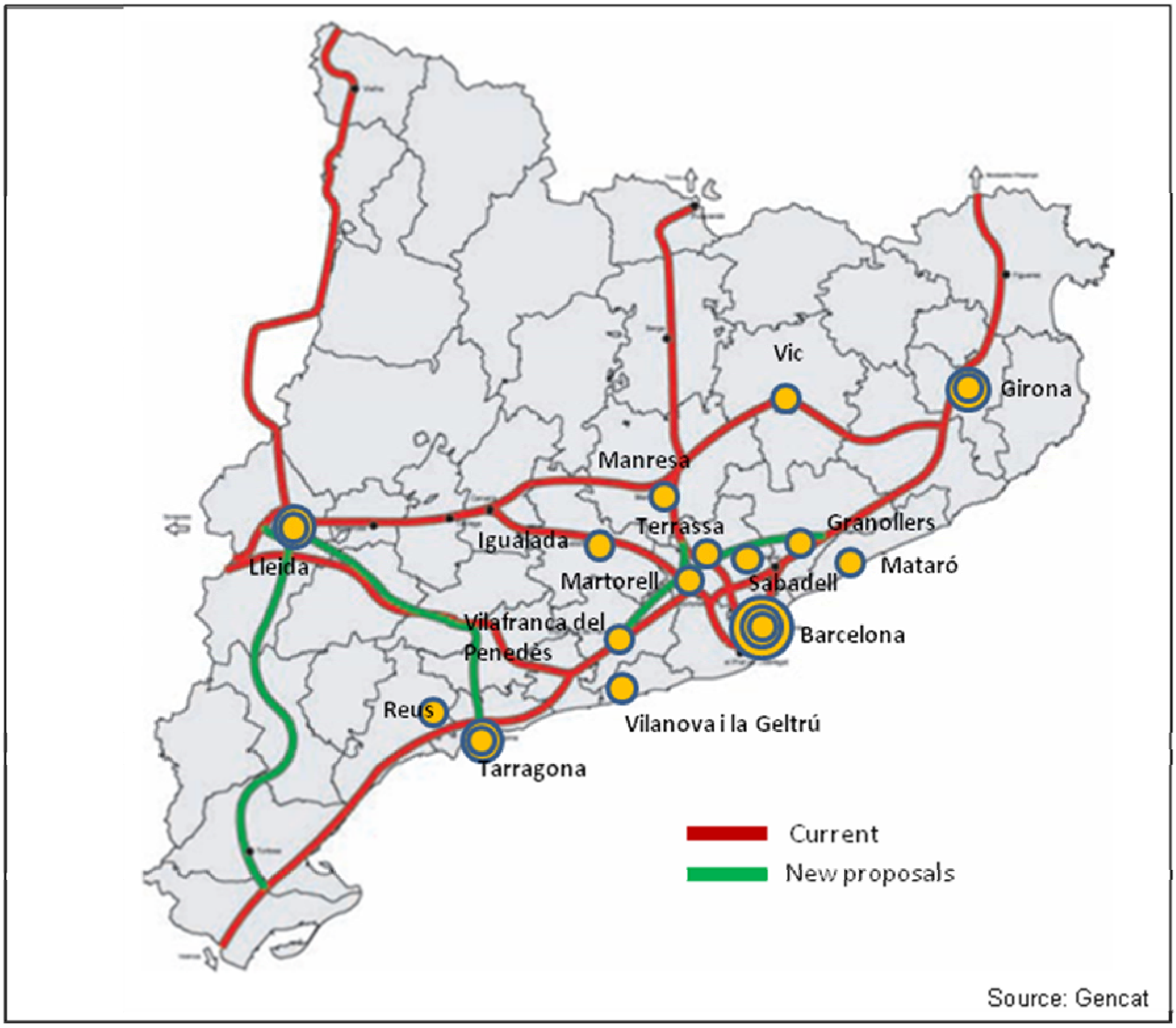


Fig. A.4.18.- Catalonia: Transeuropean railway network

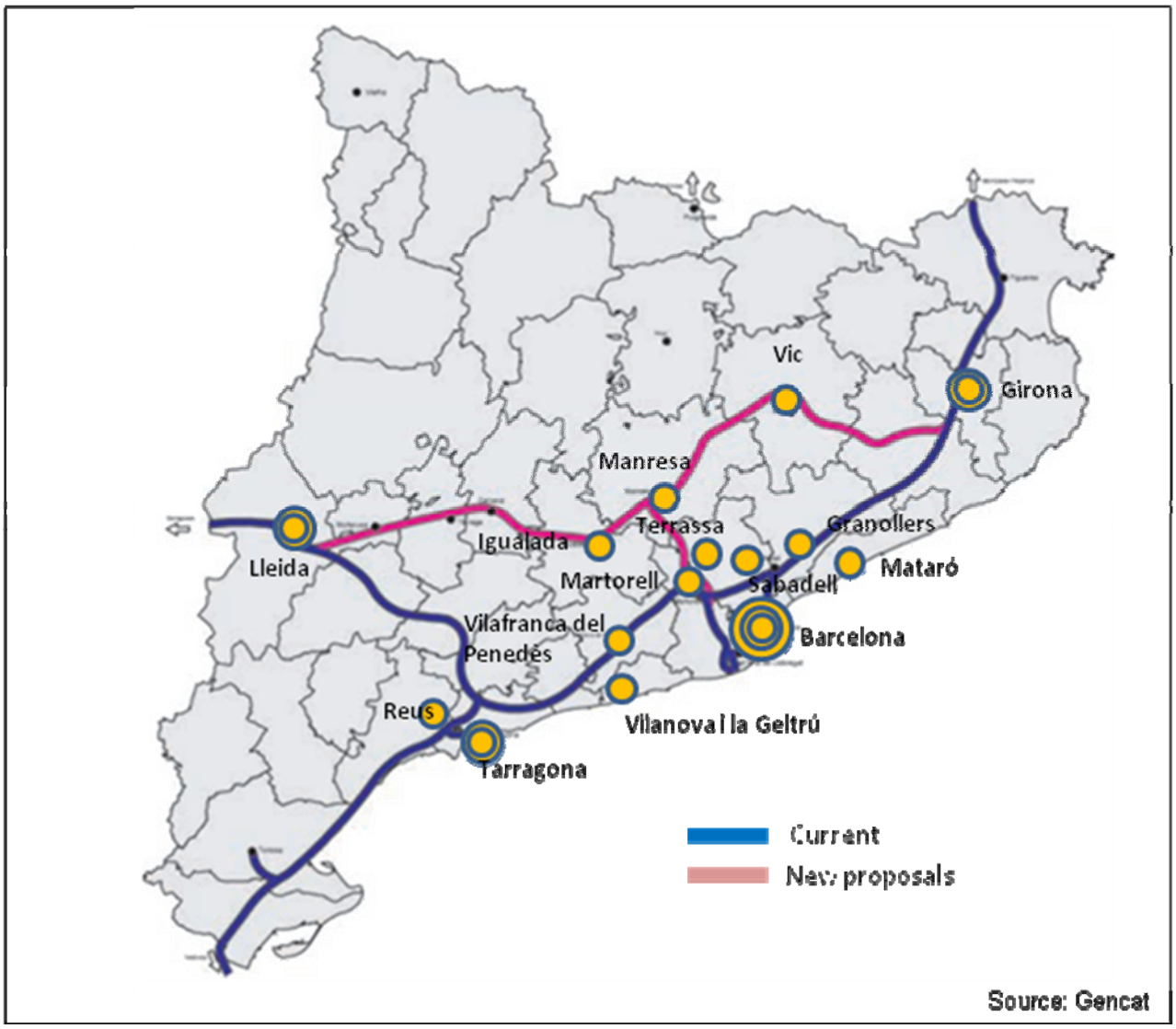


Fig. A.4.19.- Catalonia: New railway axis (proposal)

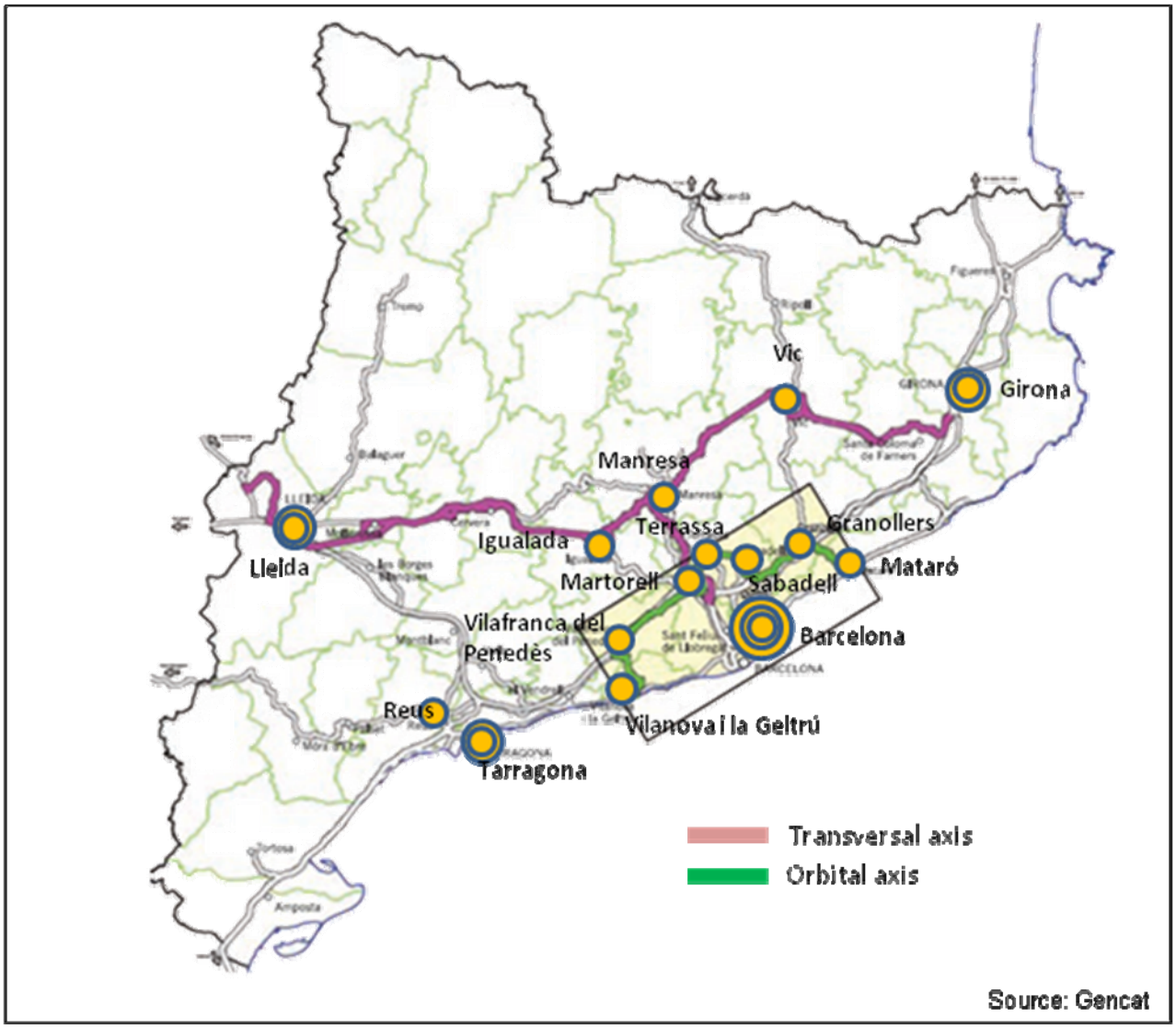


Fig. A.4.20.- Catalonia: Knowledge intensive city-networks

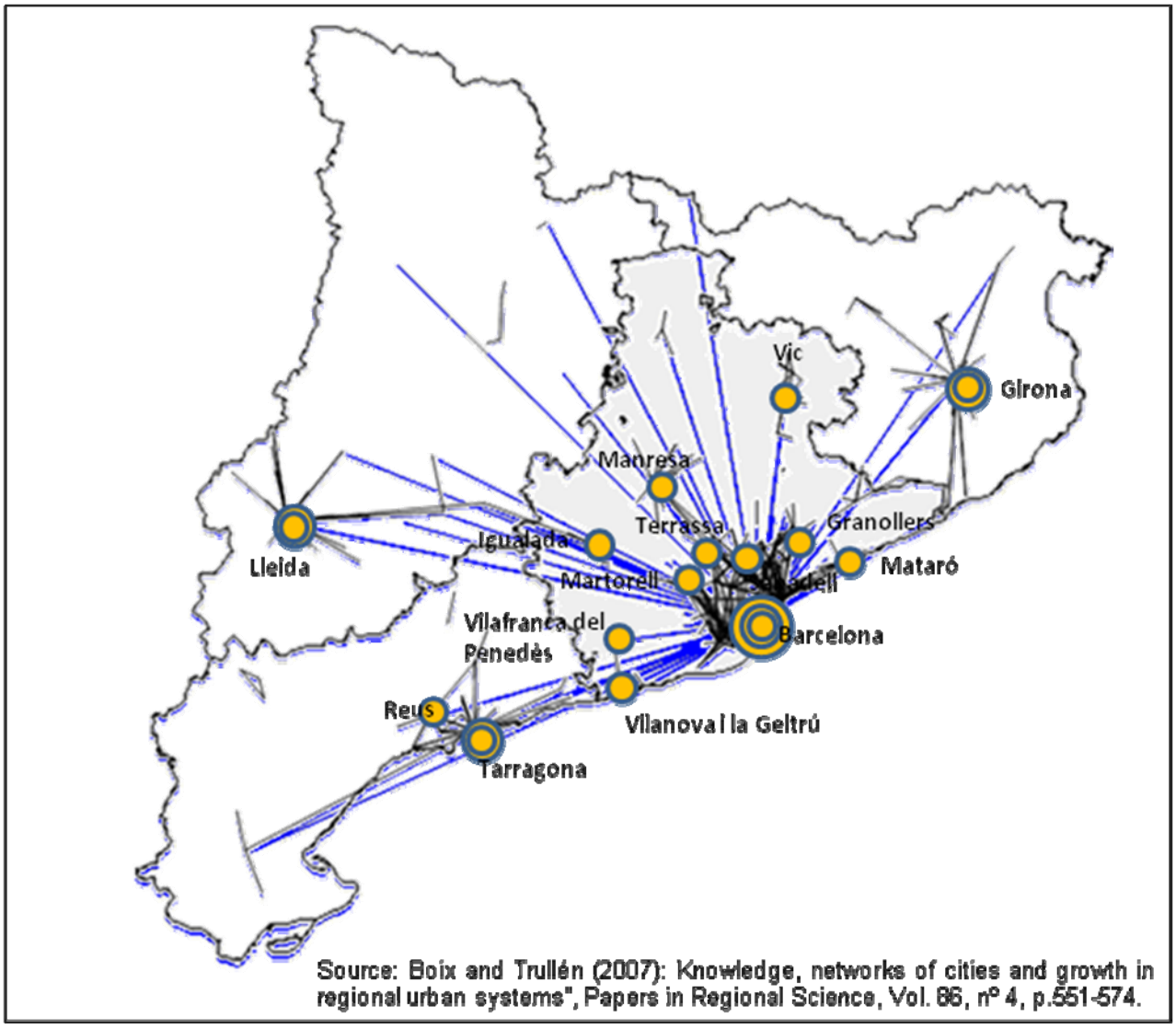


Fig. A.4.20.- Catalonia: Knowledge intensive city-networks without Barcelona

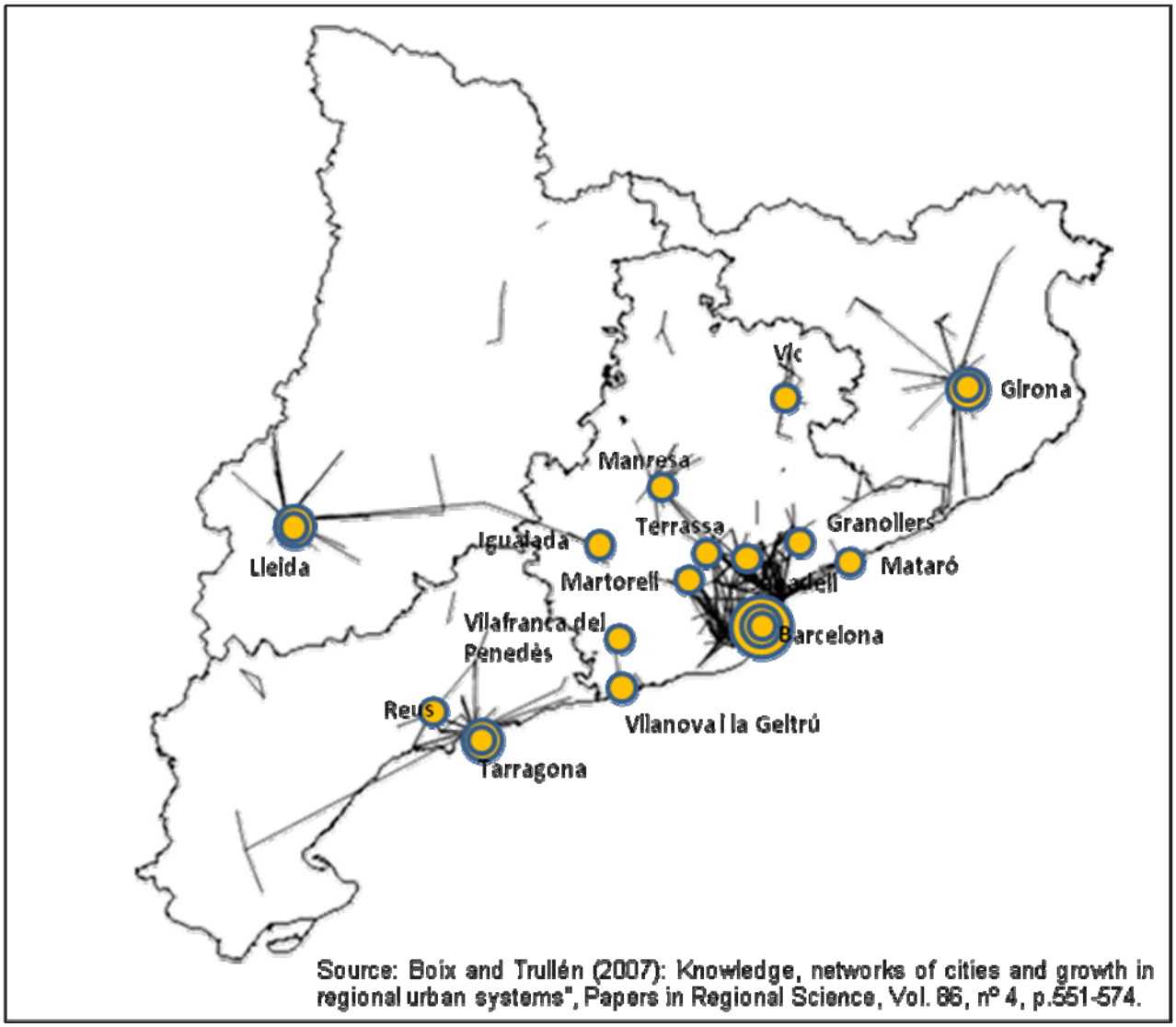


Fig. A.4.21.- The Province of Barcelona: The Reference Scenario

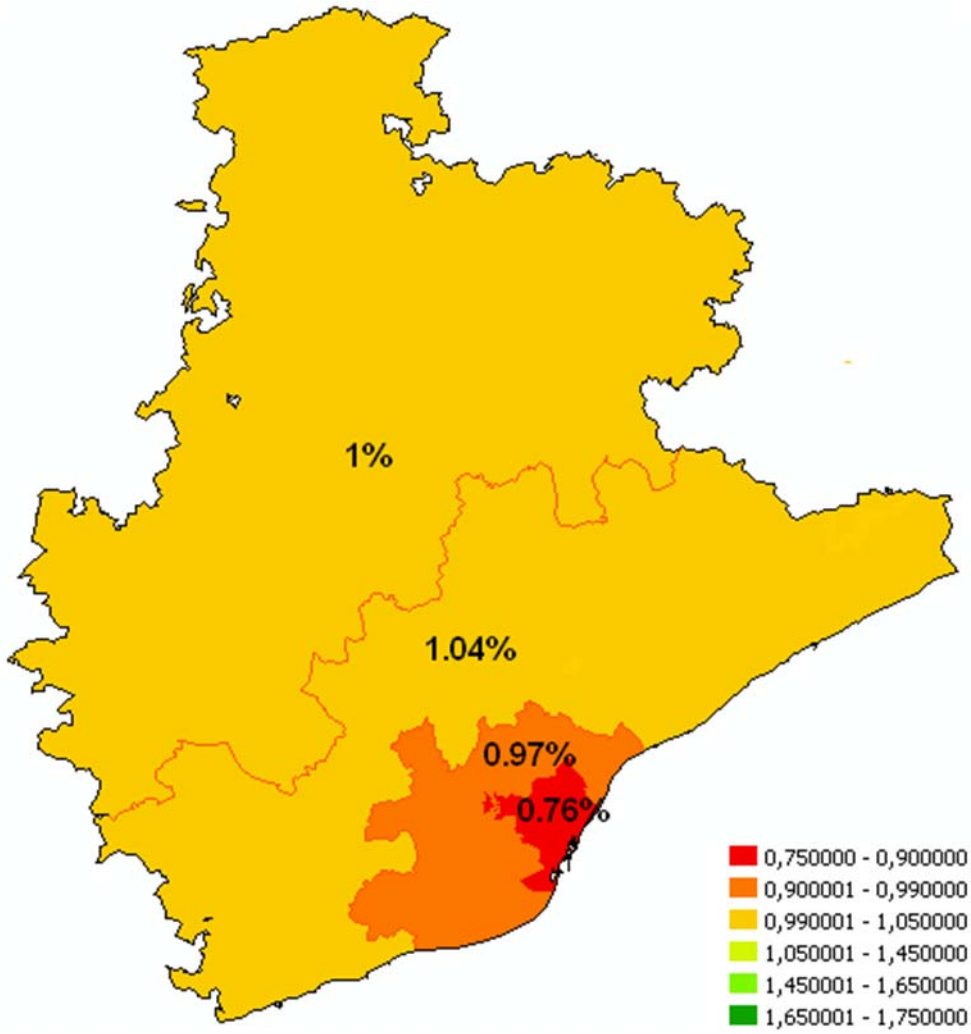


Fig. A.4.22.- The Province of Barcelona: The Proactive Scenario

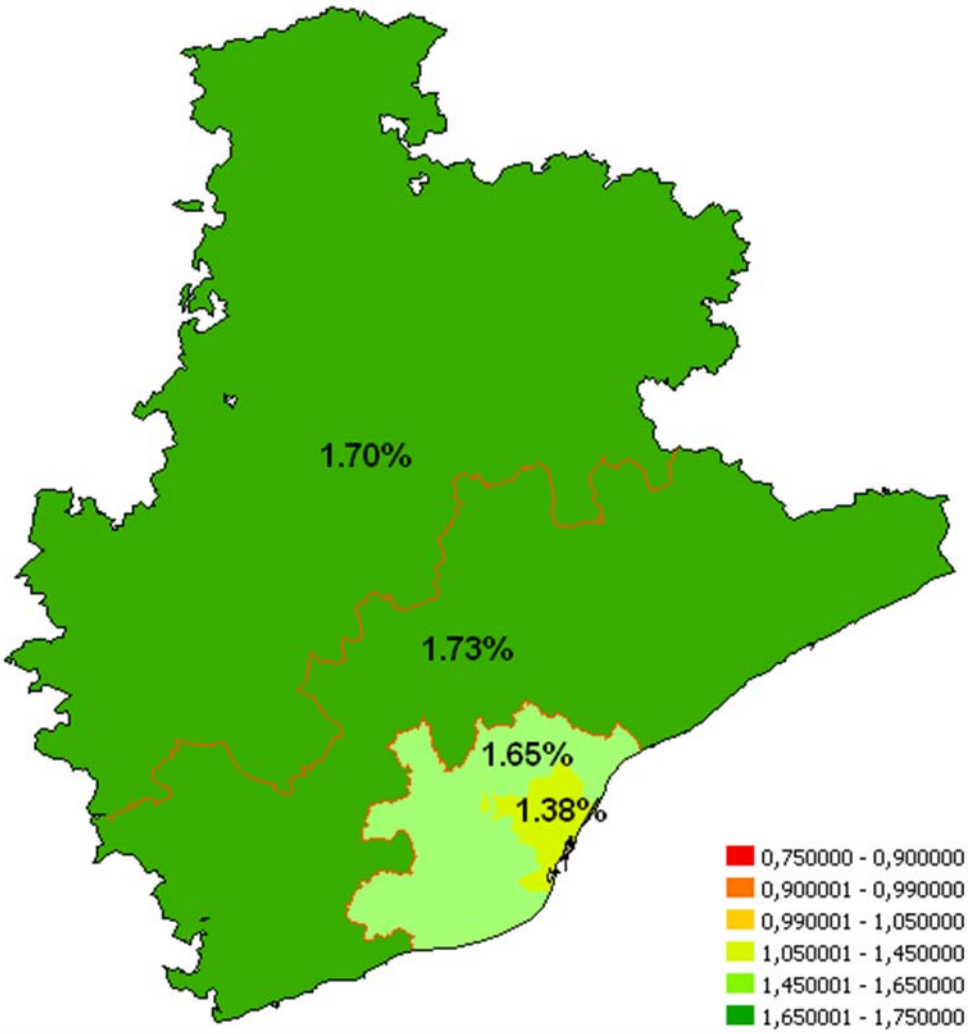
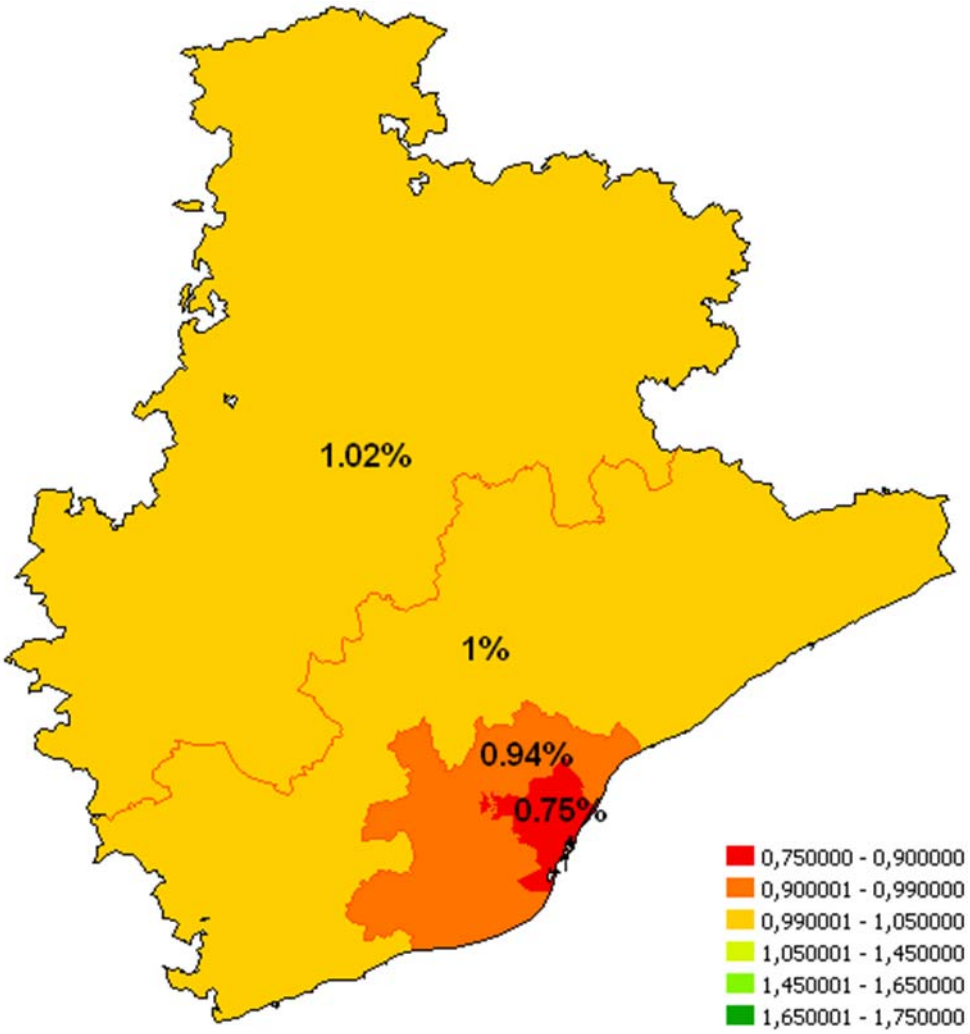


Fig. A.4.23.- The Province of Barcelona: The Defensive Scenario



Annex 5. References

Boix, R. (2006), "Las áreas metropolitanas en España", XXXII Reunión de Estudios Regionales, Ourense 16-28 de Noviembre de 2006.

Boix, R., and Galletto, V. (2004), "Anàlisi econòmica comparada del Cens de 2001. Principals resultats per a Catalunya", Nota de Economia, nº79. ISSN: 0213-3640.

Boix, R., and Galletto, V. (2006), "Sistemas locales de trabajo y distritos industriales marshallianos en España", Economía Industrial, nº 359,
p.165-184.

Boix, R., and Trullén, J. (2010), "La relevancia empírica de los distritos industriales marshallianos y los sistemas productivos locales manufactureros de gran empresa en España", IERMB Working Paper in Economics, nº 10.01, January 2010.

Boix, R., and Veneri, P. (2008), "Identification of metropolitan areas in Spain and Italy", 48th European Congress of the European Regional Science Association. Liverpool, August 27th - 31st.

Boix, R., and Veneri, P. (2009),"Metropolitan areas in Spain and Italy", IERMB Working Paper in Economics, nº 09.01, March 2009.

Camagni R.(1993), "From city hierarchy to city network: reflections about an emerging paradigm", in T.R. Lakshmanan e P. Nijkamp (eds.), Structure and change in the space economy, Festschrift in honor of Martin Beckmann, Berlin, Springer Verlag, 66-87.

Camagni R. (2008), "Regional competitiveness: towards a concept of territorial capital", in Capello R., Camagni R., Fratesi U., Chizzolini B., Modelling regional scenarios for the enlarged Europe, Springer Verlag, Berlin, 33-48.

Camagni R., Capello R. (2004), "The city network paradigm: theory and empirical evidence" (R. Camagni, R. Capello), in R. Capello, P. Nijkamp (eds.), Urban dynamics and growth: advances in urban economics, Amsterdam, Elsevier, 495-532.

Camagni R., Maillat D. (eds.) (2006), Milieux innovateurs: théorie et politiques, Economica, Paris.

Camagni R., Salone C. (1993), "Network urban structures in northern Italy: elements for a theoretical framework", Urban Studies, n. 6, 1993, 1053-64.

Capello R. (2007), "A Forecasting Territorial Model of Regional Growth: the MASST Model", The Annals of Regional Science, Vol. 41, n. 4, pp. 753-787.

Capello, R., Camagni, R., Chizzolini, B. and Fratesi, U. (2008), "Modelling Regional Scenarios for the Enlarged Europe: European Competitiveness and Global Strategies", Springer-Verlag, Berlin.

Capello, R. and Fratesi, U. (2009) "Modelling European Regional Scenarios: Aggressive versus Defensive Competitive Strategies", Environment and Planning A, vol. 41(2) pages 481 – 504.

Clusa, J., and Roca, J. (1997), "El canvi d'escala de la ciutat metropolitana de Barcelona", Revista Econòmica de Catalunya, nº 33, p.44-53.

ESPON Project EDORA (2009), "European Development Opportunities for rural Areas", Interim report, April.

European Commission (2005), *Territorial state and perspectives of the European Union, Scoping document and summary of political messages*, Brussels, May.

European Commission (2007), "Growing Regions, Growing Europe", Fourth Report on Economic and Social Cohesion.

OECD (2001), Territorial Outlook, Paris.

OECD (2009): OECD Rural Policy Review. Spain. OECD, Paris.

Putnam, R. D. 1993, "Making Democracy Work: Civic Traditions in Modern Italy", Princeton, NJ: Princeton University Press.

Roca, J., Burns, M., and Moix, M. (2005), "Las áreas metropolitanas españolas. Evolución 1991-2001", en Centro de Política del Suelo y Valoraciones (mimeo).

Salvador, N., Mora, C., and Salvat, E. (1997), "La regió urbana funcional de Barcelona en el context europeu", Revista Econòmica de Catalunya, nº 33.

Torrero A. M. (2009), "La crisis financiera internacional. Repercusión sobre la Economía Española", Documentos de Trabajo Instituto Universitario de Análisis Económico y Social, 98/09, Universidad de Alcalà

Trullén, J., and Boix, R. (2000), "La ampliación del área metropolitana de Barcelona y su creciente interacción con las áreas metropolitanas de Tarragona, Lleida y Girona. Avance de resultados". Ajuntament de Barcelona (mimeo).

Trullén, J., and Boix, R. (2006), Anàlisi econòmica del centre de la regió metropolitana de Barcelona: economia del Pla Estratègic Metropolità de Barcelona. Elements de Debat Territorial. Diputació de Barcelona, Barcelona.

UNCTAD, (2009), World Investment Report 2009: Transnational Corporations, Agricultural Production and Development.