Modelling European Regional Scenarios:
Driving Forces of Change and Quantitative Foresights

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1. Introduction

The paper has the rather ambitious aim to provide territorial scenarios for Europe in a time span of thirteen years, up to 2015.[1] The need for the creation of territorial scenarios stems from the high economic, institutional and social pressures that the European economy is facing nowadays. From the institutional point of view, the enlargement of the European Union has exacerbated regional disparities, given the fact that the per capita GDP dropped by 12.5% on the day of the enlargement. Moreover, the low infrastructure endowment of new member countries accentuates the disparities in the level of physical accessibility, and consequently of economic growth again, between the European regions.

From the economic point of view, the globalisation of the economy and the competition put in place by emerging and dynamic areas (like China, India and Brazil) are new sources of threats influencing future European growth opportunities and income re-distribution among European regions.

The present economic growth tendencies produce at present clear effects on the European territory. From one side, they accentuate the physical congestion, and the decreasing returns deriving from it, of the most growing areas of the old EU 15, and in particular, of European core regions (the "Pentagon" area); from the other, they generate a non-ordered and non-rational land use in areas with high land availability, such as the formerly agricultural areas of the new Countries.

From the social point of view, the large migration flows from Eastern to Western European countries and from outside Europe generate once again different chances of growth for European regions. On the one hand, the socio-economic desertification is in fact a risk for those areas unable to get off the ground restructuring processes; on the other hand it amplifies the physical development of urban systems, sometimes through a large use of land with the consequence of over-extension of the urban area.

The way in which the European territory will look like in the future highly depends on how the socio-economic and institutional driving forces in the economy at work today will develop. This paper provides an insight into future regional scenarios by assuming different trajectories in the main driving forces supporting economic growth nowadays. In particular, the paper is devoted to the presentation of two alternative scenarios, built on opposite combinations of alternative assumptions on the main driving forces of change.

As we will clearly state in the paper, the choice of all possible combinations in the alternative driving forces of change is obtained through a logical reasoning on three main dimensions, namely the economic and institutional strategies put in place by three main blocks of countries, the Old EU

15, the New 12 (the New 10 plus Bulgaria and Romania), and the emerging countries, in particular BRasil, India and China – the BRIC countries.

These three dimensions allow to provide intra-European development scenarios on the basis of European country economic strategies and reactions, and on socio-economic dynamics outside Europe, the latter representing the main challenges for the dynamics inside Europe.

The paper is structured as follows. In the next section, the scenario methodology is presented, as well as the simulation methodology and characteristics. Section 3 contains the scenario building and the main dimensions characterising the scenarios. Sections 4 and 5 present the qualitative and quantitative assumptions, as well as the simulation results, of the scenarios, one for each section. Section 6 contains some concluding remarks and policy implications.

2. Quantitative Foresights: A Methodology

2.1. From Forecasts to Quantitative Foresights

The scenario building exercise presented in this paper can be defined as a *quantitative foresight*, being the result of two major methodological steps. The first step of the scenario building process is a scenario building step, in which an image of the future is built under the assumptions that a discontinuity emerges in the major elements or driving forces that influence and regulate the system. In order to implement this step, the effort required is to highlight the major driving forces of change, and foresee the discontinuities that might emerge in their future development trajectories. This step is very similar to a foresight. A foresight is in general mostly qualitative in nature and its aim is to provide an *image* on radical breaks, on structural (positive or negative) effects destroying past tendencies, assuming a medium-term perspective (decades).[2]

The second step of the methodology is to insert the changes in the driving forces into a model of structural relationships, traditionally linking conditional (explicative) variables and the dependent variable. Through an inspection into the future on the effects that the changes in the driving forces may cause on the independent causal variables of the model, the qualitative assumptions of the first step procedure are translated into quantitative ones, and inserted into the system of structural relationships; in this way, the new values of the dependent variable is obtained (Fig. 1). This step is more similar to a forecast, in general oriented towards the achievement of *precise values* of specific economic variables in the future, on the basis of extrapolations into the future of a past socio-economic relationship system. Built in order to obtain a specific value of a certain variable, forecasts have in general a quantitative nature, and, being extrapolative of past tendencies, they assume a short-term perspective.[3]

The aim is to achieve neither precise quantitative values of economic elements, nor a qualitative image of what the economic system will look like; the aim is to provide *the main tendencies, major adjustments to change, relative behavioural paths* that will be at work, if some conditional assumptions on the main driving forces of change take place. Our approach assumes the characteristics of an integrated process, of an analytic and synthetic approach at the same time; it links past and future in a joint effort of imagination and control of the complex causal relations revealed by the estimation procedure (on past trends and structure). The logic behind is the following:

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[2] On foresight methodologies see, among others, European Commission, 2004; UNIDO, 2004.
[3] On forecasting methodologies see, among others, Armstrong, 1985; Hawkins, 2001; Hendry and Clements, 2001; Loomis and Cox, 2000.

- starting from a "seminal idea" on the driving forces which are believed to characterize the future economic-territorial development and
- going through an examination of the main past tendencies of the elements that are influenced by the changes in the driving forces (based on an econometric model)
- the basic characteristics of a scenario are built (the big conditional elements, the big possible bifurcations in the driving forces).
- these conditional elements are inserted in the econometric model of the past causal relationship and trends through the impact that they have on the causal variables affecting the outcome of the system
- giving rise to the identification of the magnitude of the likely effects.

Fig. 1. Logical steps of the simulation step
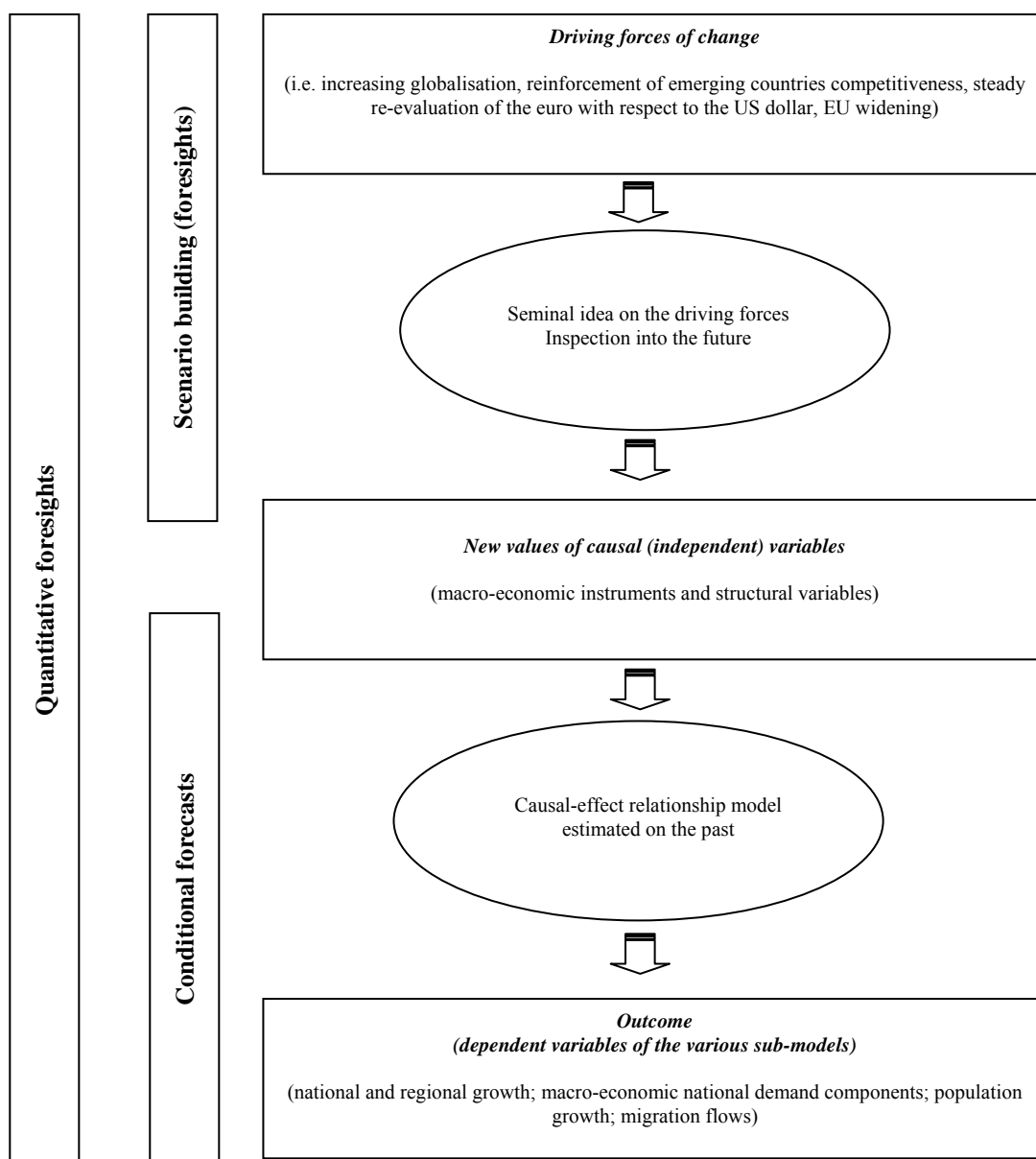
Complexity is the major characteristic of evolutionary systems. Our approach reflects such complexity by taking into considerations different possible sources of change at the same time; in this sense, the approach is not interested in depicting the effects of only one structural break in the driving forces of change, as is the case of most qualitative foresights, but of many structural breaks at the same time.

Our approach is thus similar to a forecasting exercise because it is rooted in quantitative estimates of a relationships system; however it differs from typical forecasting exercises since it inserts discontinuities into the driving forces of the system that allow for bifurcations in the dynamic trajectories of the system. These discontinuities stem from an inspection into the future, based on rational thinking on what the effects would be on the major causal variables if a discontinuity in some driving forces occur. These discontinuities in the main trajectories are qualitative in nature, and stem from the imagination of what happens to the main causal variables if some structural discontinuities in the driving forces are assumed (Fig. 1). It is in this respect that our approach is similar to a foresight.

Three main specific methodological steps are necessary in the approach:

- a *theoretical step*, identifying: a) the theory behind the relationships model; b) the formulation of the model itself (in verbal or mathematical terms);
- an *estimation step* of the causal relationship model;
- a *simulation step*, identifying (Fig. 1): a) the "seminal idea" on the driving forces expected to characterise the future development patterns; b) the impact in qualitative and quantitative terms of the driving forces on the independent-causal variables of the model; c) the simulation procedure and the outcome.

The first two steps have been extensively presented in previous works of the authors.[4] Instead, in this paper we extensively present the simulation procedures in terms of:

- the simulation methodology and procedures (sec. 2.2);
- the seminal ideas characterising the two alternative scenarios (sec. 3);
- the qualitative assumptions on the two scenarios (sec. 4.1 and 5.1, respectively);
- the translation of the qualitative assumptions into quantitative changes in the levies (the independent variables) of the model for respectively the two scenarios (sec. 4.2 and 5.2).

Section 6 highlights some concluding remarks and policy implications.

2.2. Simulation Methodology and Characteristics

2.2.1. The Choice and definition of Target Variables

The simulation procedure is based on seminal ideas on the driving forces of change and on their (quantitative) impact on national and regional growth. In our methodology the quantitative impact is obtained through the change in the values of the variables that represent the levers of growth in a

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[4] This paper is a third one of a series of papers undertaken by the team in this research field. In the first paper, the main theoretical approach to the regional growth model on which the simulation results are based is presented (Capello, 2005). The second paper is devoted to the presentation of the main driving forces of change at work nowadays and of the so-called baseline scenario, i.e. a reference scenario built under the assumptions the present driving forces of change will persist in the future and that no drastic changes take place that can change the trajectories of the driving forces (Capello, 2006).

quantitative econometric model, developed with this purpose. The model, called MASST (Macroeconomic, Setoral, Social and Territorial model) is presented in details in previous works of the one of the authors (Capello, 2005). Appendix 1 contains a brief explanation.

The output of the simulation procedure is represented by new values of the endogenous variables, calculated by the model at each run (i.e at each year), using the equations with the estimated coefficients in the model. There is a total of 12 endogenous variables. At national level: real GDP growth rate; consumption growth; investment growth; import growth; export growth. At regional level: real GDP growth rate; the share of self employed on total workforce; population growth; immigration of people between 17-27 years; immigration of people between 32-42 years; immigration of people between 52-67 years); spillovers, i.e regional growth due to the growth of neighbouring regions (See Table A.1 in Appendix 1). All other variables are exogenous in the model, and represent the levers be used to produce different scenarios.

In order to produce simulations, the values of the exogenous variables are to be set up in the model for each year and each geographical unit. This can be accomplished with an ad-hoc procedure, providing ad-hoc values, but this procedure would be very hard in terms of data entering and, more important, would not make explicit enough the actual hypotheses on which the scenario is built upon. To have an idea, to simulate the model for 13 year, the period until 2015, 2108 values of exogenous variables are needed at national level and 30303 at regional level.

A significant reduction in the number of values to be entered can be achieved if they are inserted as "targets". We can in fact assume that any regional or national starting value tends to achieve a long-run value, adjusting to it with a given speed of adjustment. The formula is the following:

$$x_t = x_{t-1} + s(T - x_{t-1})$$ (1)

where x is the value of the exogenous territorial variable for a given region/country, T is the long run (target) value to which the variable converges and s is the speed of adjustment. A value of 1 in the speed of adjustment implies an immediate adjustment (in one year) of the variable to its target. This procedure can be used if the variable is expressed in levels and also if it is expressed in yearly variations.

The target values can be the same for all geographical units (for example, at national level, the growth rate of public expenditure in our first scenario), can be different for each geographical unit and entered as a vector (for example, at regional level, the CAP expenditure) or can be differentiated by regional/country typologies.

The use of targets has some theoretical implications. First of all, it implies that regions or countries of the same type share the same long-run value to which they all convergence. The importance of the initial value, therefore, fades out with time. The convergence path is smooth, as implied by equation 1. The loss of regional/country differentiation, however, is not total due to mechanisms that will be described below. Secondly, once the target is reached, there will no longer be any variation due to the scenario assumptions. Hence, this is a reason why the model is not to be used in the very long run, where its predictions will be purely extrapolative. Moreover, the model cannot be used for long term predictions since the relationships among variables are estimated on the past, and cannot therefore be assumed to remain constant over a long period of time.

The national targets are normally differentiated in three main groups: the Old 15 members of the EU, the New 10 member states of the EU and, finally, the two candidate member states of Bulgaria

and Romania. This differentiation is due to the economic structure similarities within groups and to the fact that, in estimating their equations through a panel, the behaviour of countries within groups was not detected to be statistically significant.

As far as regions are concerned, the group differentiation is in 4 groups, being the product of two main dimensions: the fact that they belong to the Old 15 members of the EU or to the New 12 (including Bulgaria and Romania) and their setting. The second dimension takes into consideration a classification in terms of settlement structure, between rural, urban and agglomerated regions, plus the presence of mega cities inside the regions.[5] In theory, a mega can be present in any type of region, but, since it is generally found in agglomerated regions, whose economic structure is also very similar to the one of mega areas, the classification in the second dimension is the following: on the one side agglomerated regions and non-agglomerated regions with the presence of mega; on the other side, rural and urban regions when they do not have a mega.

Also the speed of adjustment can be differentiated between geographical units, by type of variable and by scenario. In the scenario design process, structural variables (e.g. the birth and death rates) were always assumed to adjust very slowly, for instance with an adjustment coefficient of 0.1. The non structural values are assumed to react more rapidly. In the same way, the adjustment speed of policy variables is generally higher, but can be differentiated according to the assumed efficiency and commitment of public administrations in the implementation of policies; for this reason, the assumed speed of adjustment of national policy variables in the two scenarios of this paper is faster (0.8) when countries are pursuing modernizing/reactive strategies and slower (0.5) when the strategy is defensive/price competitive.

2.2.2. Logic of the Simulation Procedure

Despite the fact that the targets are a mechanism with implicit convergence, the structure of the MASST model assures that the pattern of variables is different for each region and each country at the beginning of the simulation period as well as at the end.

For regional growth, the regional values obtained at the end of the period are different for a number of reasons. The most straightforward is that some targets, those of regional policies, are region-specific. Moreover, regions belonging to the same settlement structure typology but to different countries are affected by different national growth rates. In addition to this, regions of the same typology belonging to the same country are located in different places and hence differently affected by spatial spillovers. Finally, the same typology of settlement structure can be influenced differently by the same variable at the estimate level; for example transport infrastructure affects differently agglomerated regions, or human resources in science and technology urban regions.

As far as national growth is concerned, countries belonging to the same group do not converge exactly to the same growth rate in the long run. This is due to the fact that the MASST model is not simply a top-down distributive model in which the country growth is allocated between regions, but also a generative model where the performance of regions affects the one of the country to which they belong. The regional growth rate is in fact due to the addition of the national growth rate to a differential shift. Both are estimated, and the first component is a function of many economic variables including lagged income growth. The differential shift, instead, is a function of many structural variables, which can improve their value in the simulation period. This would imply that the differential shift within a country could arrive to an average which is larger than 0, and it would be important to make the improvements of regional competitiveness affect national growth. An

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[5] The settlement structure typology has been defined by another ESPON project, number 1.1.1.

assumption is needed, and this is that the potential of growth expressed by the regions influences the performance of countries with a short lag, for instance of 1 year.

Operatively, the generative element in the MASST model is taken into account in the simulation procedure in the following way. In the first year of simulation (2003), a value for national growth is obtained from the national sub-model (point A in Table 1); at the same time a value for the differential shift is obtained from the regional sub-model (point B in the same table). The weighted average of regional shifts can be different from 0, for this reason, being redistributive in the short run, the new value of regional growth is obtained as the sum of the national growth and regional differential components, rescaled so that it is equal to the national value (point C). This represents the ex-post regional growth which is embedded in the national growth and which is equal to:

$$dY^j_{R2003} = dY^i_{N2003} + DIF^j_{R2003} - \sum_{k \in i} \frac{Y^k_{R2002}}{\sum\limits_{k \in i} Y^k_{R2002}} DIF^k_{R2003} \quad , \quad \text{i=1..27, j,k=1..259} \tag{2}$$

The sum of the national growth and regional differential components represents the potential production capacities of the regions (point D in Table 1). This represents the ex-ante regional growth and therefore it contains the generative element of regions on national growth. Being the weighted sum of regional potential growth rates, national potential growth rate is:

$$dPY^i_{N2003} = \sum_{j \in i} \frac{Y^j_{R2002}}{\sum\limits_{j \in i} Y^j_{R2002}} (dY^i_{N2003} + dY^j_{R2003}) = dY^i_{N2003} + \sum_{j \in i} \frac{Y^j_{R2002}}{\sum\limits_{j \in i} Y^j_{R2002}} DIF^j_{R2003} \quad , \tag{3}$$

$$\text{i=1..27, j=1..259}$$

The MASST model assumes that this potential national growth influences the national variables in the following period, through the choices of Investments, Consumption, Imports. In all these cases, the behaviour of economic agents will internalize the potential growth and adapt to this.

For this reason, in each year starting with 2004, the calculation of actual national growth (*dYn*) will take into account the potential national growth (*dPYn*) of the previous year, the same expressed by equation 3.

3. Building the Scenarios

3.1. Driving Forces of Change and Their Possible Combinations

The methodology described above and applied to the present work to provide future territorial scenarios requires first of all the identification of the driving forces of change at work today, in order to foresee their possible bifurcations, their possible alternative trajectories, which give rise to alternative scenarios.

Socio-economic and institutional driving forces at work nowadays are rather profound and will shape the picture of the EU territory in the future, according to their future development. They are of different nature, economic, institutional, social.

Table 1. Logic of the Simulation Procedure*

	year 2003	year 2004 (and following)	
Estimated national growth (dYn)	A_{2003}) Calculation of actual *national growth* (dependent on dYn of 2002 and independent variables targets) with the national model. (output of MASST in 2003).	A_{2004}) Calculation of actual *national growth* (dependent on **dPYn** of 2003 and independent variables targets) with the national model. (output of MASST in 2004).	...
	B_{2003}) Calculation of *regional differential shift* (DIFr, dependent on dYn of 2002 and independent variables targets) with the regional model.	B_{2004}) Calculation of *regional differential shift* (dependent on dYn of 2003 and independent variables targets) with the regional model.	
Estimated regional growth (dYr)	C_{2003}) 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 in 2003).	C_{2004}) 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 in 2004).	
	D_{2003}) Potential regional growth (dPYn) is equal to the *sum of A and B*, non rescaled. Potential national growth is equal to the weighed average of potential regional growth rates.	D_{2004}) Potential regional growth is equal to the *sum of A and B*, non rescaled. Potential national growth is equal to the weighed average of potential regional growth rates.	

* Last year with actual data is 2002.

Economic driving forces

The European economy is at present facing different challenges. The first challenge is the steadily increasing globalisation process; the most sensitive, and accentuated, aspect of globalisation is the emergence of new large economies at world scale, in particular in Latin America (Brazil) and in Asia (India and China), the so-called BRIC countries.

The bifurcation in this driving force is related to the *type of global competition* that will be put in place by these countries. Two main extreme alternative bifurcations are foreseen in this respect, namely:
-   *a modernising strategy*, i.e. a qualitative jump of BRIC countries in the modernising process of their production processes; more qualified input factors (higher quality in human capital, more advanced production technologies), more local knowledge in value added industries, a modern market regulation system would shift the nature of global competition towards a competition based on quality and product innovation rather than price;
-   a reinforcement of the present *price-competitive strategy*, based on low labour and land costs, and therefore on low-cost products in low and medium technology sectors.

A second important driving force is the *European competitive strategies*, different between the old countries of the European Union (now on defined as Old 15) and the new 10 member countries of the EU, together with Bulgaria and Romania (now on defined as New 12).

As for the Old 15, the extreme alternative competitive strategies that can be foreseen are:
- *a reactive strategy*, developed by re-launching value added activities, reinforcing R&S private and public investments, modernising transport infrastructure endowment on the basis of profitability aims and competing on the basis of high quality standards;
- *a defensive strategy*, based on a protectionism approach vis-à-vis the external world, on the expansion towards external markets through devaluation, on a particular attention to internal socio-economic disparities, on a reinforcement of the institutional achievements already at work.

On their turns, the New 12 countries have two alternative strategies to follow:
- *a reconverting strategy*, catching-up with the Old 15 countries, in terms of quality of production processes, input factors, knowledge and output quality. Competitiveness is achieved on the basis of a decisive reconverting process from agricultural to industrial sectors based on internal investments and internal material and non-material resources, giving rise to an endogenous growth. A process of tertiarisation of the economy, especially in core areas, is part of this endogenous development pattern;
- a *cost-competitive strategy*, purely based on the exploitation of low labour cost as an attractive element for foreign direct investments, and therefore on an external resource driven economy. A tendency of these countries to become the "manufacturing belt" of the Old 15 countries is implicit in this strategy.[6]

Another important driving force of the European economy is the *management of public finances*. Two opposite strategies can be followed by the EU members:
- a strict respect of the Maastricht parameters;
- a flexible management of public expenditures, and of the Maastricht parameters.

Institutional driving forces

The main institutional driving force nowadays is the *EU integration strategy*. The European member countries have two main opportunities in this field:
- a widening of the Union to new countries, by having new countries joining the EU, renouncing to a more integrated Union as the present one;
- a deepening of the Union within and between the already existing member countries.

European infrastructure policy choices

Another important driving force in shaping future EU territory is linked to the solution of major accessibility problems and transport congestions Europe is facing nowadays. The past decade saw not only a worrying increase in traffic congestion in urban areas, but also a new phenomenon of congestion on the major arteries of the trans-European network, increasing the number of bottlenecks. Missing links in the infrastructure, and a lack of interoperability within specific

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[6] This strategy differs from the price-competitive strategy of BRIC countries, in that it mostly lies on attractiveness of FDI through low resource costs, while BRIC country strategies are mainly concerned with an export-driven strategy of low price products.

transport modes and for inter-modal transport systems, are all reasons aggravating this congestion of the network.

The decisions on EU transport policies can be based on two different principles:
- an efficiency principle, oriented towards the development of TEN and TINA projects on the basis of profitability aims;
- a cohesion principle, claiming the selection of TEN and TINA projects on rebalancing infrastructure endowment gaps aims.

Socio-demographic trends

In the socio-demographic sphere, two main driving forces are nowadays at work, which will drastically shape the EU territory, according to the way they will develop.

Compared with major global population trends at world scale, Europe is famously out of line with its *natural population declining or at zero* in the majority of European states. At the same time, as other parts of the world, Europe is experiencing *high levels of in-migration*.

Two may be the alternative trajectories in this field in Europe:
- a drastic increase of in-migration from outside Europe, through a strategy of openness of European countries. In-migration from outside Europe is the sole means by which many national population levels are being maintained; under this assumption, an increase in the natural population growth rate is expected;
- a drastic closure of European borders, with very little possibilities for foreigner people outside Europe to join European countries. The natural population growth rate would in that case be very limited.

Energy source policy

Another crucial driving force in the future will be the strategies developed by European countries in terms of energy production. The two possible (extreme) alternatives in this field are:
- a dependence on conventional energy sources;
- a decisive policy of speeding up the introduction of renewable energy technologies and of more efficient energy technologies.

Technological diffusion strategies

The main *technological upswings taking place regard the transport and the ICTs sectors*. Also in this case, a dichotomy can be foreseen in the technological diffusion strategies that can be put in place:
- a territorially concentrated diffusion of ICTs and transport networks;
- a territorially widespread diffusion of these technologies

Different combinations of all possible bifurcations in the driving forces give rise to different scenarios. It is of straightforward understanding that the number of all possible combinations leads to a very high number of scenarios. It is also of immediate understanding that a random selection of all possible combinations in the trajectories of the driving forces would have no scientific meaning. In the next sub-section we present the logic behind the combinations chosen to build our scenarios.

3.2. The Three Dimensions and the Scenarios Cube

The combinations of the possible trajectories of the driving forces in our scenarios are chosen on the basis of three main dimensions, representing the economic, institutional and political strategies (and reactions) of three main groups of countries, namely:
- the modernising vs. price-competitive strategies of BRIC (BRasil, India and China) countries;
- the reactive vs. defensive strategies of the EU 15 countries;
- the reconverting vs. cost-competitive strategies of the Eastern European countries.

The combinations of the possible trajectories of the driving forces that emerge by reasoning on the basis of the economic, institutional and political strategies and reactions of these three groups of countries to the global world economy give rise to interesting scenarios. The interest lies in the fact that the scenarios results represent the advantages and costs (in terms of growth and disparities) of each strategy chosen by one group of countries, under the assumptions that other groups choose a particular strategy. The results have therefore an economic, institutional, social and political meaning, and interesting policy implications stem from the scenarios.

Figure 2 represents the three dimensions on which all possible combinations of the trajectories of the driving forces are built. Again, the three dimensions give rise to a high number (eight) of possible scenarios. Among them, in this work we present two of them, two opposite ones, and in particular:
- a scenario combined with a reactive strategy of the Old 15, a modernising strategy of BRIC and a reconverting strategy of the New 12, i.e. *a scenario of an competitive Europe in an integrated world (scenario A)*;
- a scenario combined with a combination of opposite strategies, a defensive Old 15, a price-competitive strategy of BRIC and a cost-competitive strategy of New 12, i.e. *a scenario of a defensive Europe in a cost-competitive world (scenario B)*.

Table 2 represents the different combinations of the driving forces that give rise to the two scenarios. A competitive Europe in an integrated world is a scenario in which BRIC countries no longer compete on the basis of price-competitiveness, foreseen as a short-term strategy when the un-sustainable exploitation of low-cost resources (labour and land) in the long run is conceived. High labour quality is interpreted and chosen as a winning strategy, together with an integration between external and internal resources, leading to an increase in endogenous development capacities. High-tech industries are more and more developed, and the Asian and South American Tigers enter decisively into the high-tech product markets. The restructuring process is made also thanks to the attractiveness of the labour market for both internal and foreign high quality human capital; wages and purchasing power of local population increases, opening a huge market of millions of people for European countries. Global competition is based on product innovation, on customised production and on quality.

On their turns, in this scenarios the Old 15 countries put in place a reactive strategy (Fig. 2). They decide to compete on the external world on the basis of an innovation product strategy and through a customised production. Open trade outside Europe is seen as an opportunity of growth, more than a risk.

Table 2. Different Combinations of Driving Forces of Change:
Two Alternative Scenarios

	A competitive Europe in an integrated world	**A defensive Europe in a cost-competitive world**
Driving forces		
Quality of globalisation competition	- A decisive modernisation of BRIC country economies; - global customised production and quality competition; - a decisive increase in wages and therefore in purchasing power in BRIC countries.	- A decisive cost-competitive strategy of BRIC country economies; - global low-cost product competition.
European competitiveness strategies	- Open trade; - a decisive modernisation of Eastern countries economies; - an innovation competitiveness strategy in all Europe; - customised production and quality competition.	- Protectionism of EU15; - a cost-competitive strategy of New 12; - low-cost production competition.
Management of Public Finance	- Virtuous spending of public expenditure; - strict respect of Maastricht parameters.	- High spending of public expenditure; - low respect of Maastricht parameters.
EU integration strategies	- EU widening to Bulgaria and Romania.	- EU deepening.
European infrastructure policy	- Projects' selection on the basis of profitability aims.	- Projects' selection on the basis of a rebalancing of territorial infrastructure endowment gaps.
Socio-demographic trends	- Openess to external in-migration; - greater natural population growth due to greater in-migration from outside Europe; - high unemployment rates due to the restructuring of the economies.	- Closeness to external in-migration; - low natural population growth due to lower in-migration from outside Europe; - low unemployment rate due to public demand increase.
Energy source policy	- Introduction of efficient energy technologies; - diffusion of renewable technologies; - low dependence on traditional energy sources; - decisive increase in energy price for higher oil demand expressed by BRIC countries.	- Persistence on traditional energy source dependence. - Low increase of energy price.
Technological diffusion processes	- Territorially concentrated diffusion of ICTs and high-speed networks.	- Territorially widespread diffusion of ICTs and high speed networks.

Fig. 2. The Scenarios Cube

a) *Scenario a*   b) *Scenario b*
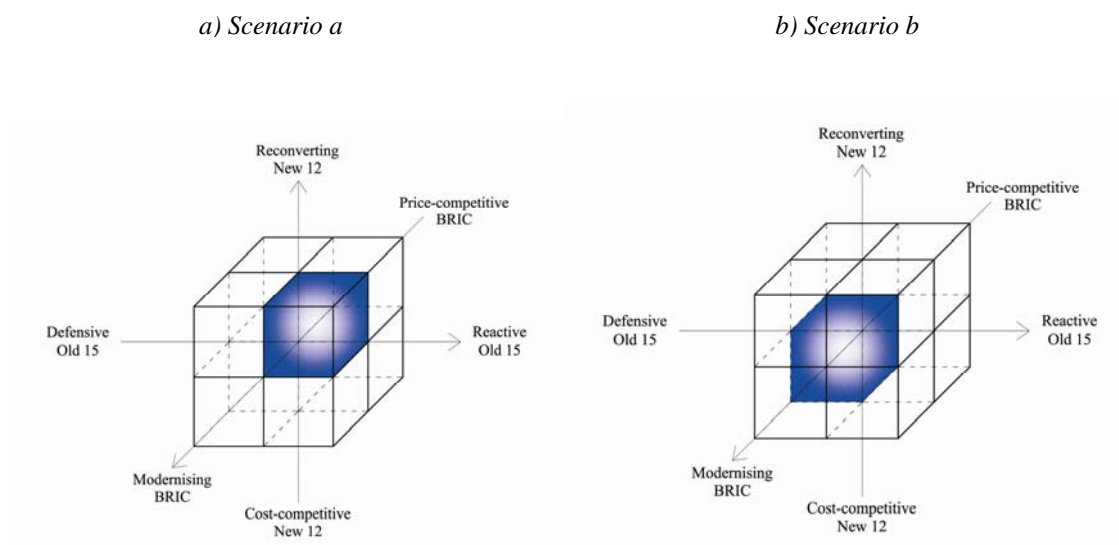
The New 12, on their turn, choose a modernising strategy. They change their productive structure, moving decisively from agriculture and industrial and tertiary activities. Economic growth rates are based on endogenous material and non-material resources and internal productive capacities, and not on an exogenously driven development. Wages increase as an effect of an increase of human capital quality, and so does the individual purchasing power, opening a local market for high-quality products.

On the basis of these strategies, the way in which the other driving forces develop is straightforward. A virtuous spending of public expenditure, and a strict respect of Maastricht parameters is part of the reactive strategy of the Old 15; economic growth is mostly based on private investments, and in general on efficiency principles. Public investments are mainly devoted to R&D and value added functions, and the achievement of the goals present in the Lisbon agenda is seriously pursued as a "must" for all European countries. On the basis of the same efficiency principles, the European Union selects the new infrastructure projects. The open mentality is captured also at the institutional level, through the widening of the European Union to Romania and Bulgaria in 2008.

Another consequence of the decisive and vital reaction of both Old 15 and New 12 is an *integration attitude*, seeking for trade openness and for strategies of market penetration in the external world. Open trade and open barriers to in-migration stem from this attitude, the latter with the consequence of increasing the natural population growth rate. Socio-economic costs, such as high unemployment in non-core areas, characterise this scenario, as a result of all restructuring processes taking place in the economies.

In this scenario, efficiency strategies influence also the energy industry and give rise to the introduction of efficient energy technologies, and to an increase in the adoption of renewable energy technologies, with the consequence of a lower dependence on traditional energy sources.

The modernisation of the industry in the BRIC countries causes additional stress on the oil market, by increasing the demand for oil products, with the consequent increase in oil price.

The reactive strategy of the Old 15 countries leads to a territorially concentrated adoption of new technologies, in both the ICTs and the transport sector, following principles of diffusion in areas characterised by high profitability.

A *defensive Europe in a cost-competitive world* is a scenario based on a combination in the development patterns of the driving forces opposite with respect to the previous scenario. The BRIC countries emphasize a price-competitive strategy, producing low-cost products in low-tech manufacturing industries. Competition is in this scenario based on local low-cost resources (land and labour), which allow for low price products.

The Old 15 countries develop a defensive strategy, through a closeness towards the external world and through a protectionist approach of internal markets. The New 12 countries, on their turns, focus also on a cost-competitive strategy, with the aim to attract foreigner direct investments and to become the manufacturing belt of Europe.

These reaction strategies influence the way in which the other driving forces develop. In this framework, the Old 15 countries strategy is oriented towards the solution of European problems, towards an economy where public investment address mainly balanced regional development and territorial cohesion, even at the expenses of a strict respect of the Maastricht parameters. The EU 15 countries' attitude towards competition form outside is seen more as a risk rather than a market opportunity.

Closeness to external world holds in this scenario also for new institutional decisions; the European Union chooses a deepening of the present agreements among member countries, rather than a widening of the number of countries involved in the Union. Closeness also characterises in-migration strategies, which result in lower natural population growth. Unemployment is kept under control and decreases with respect to the baseline scenario thanks mainly to the development of the public sector.

The importance of cohesion aims characterises also the choice of the new TINA and TEN networks, selected on the basis of a rebalancing of territorial infrastructure endowment gap. Persistence on traditional energy sources, which generates a low increase of energy price as in the baseline. New technologies in all sectors, like communications, transport and energy sectors, follow a widespread territorial diffusion process.

In the next sections, the qualitative and quantitative assumptions will be highlighted and the territorial scenario results presented.


4. A Competitive Europe in an Integrated World

4.1. Characteristics of the Scenario: Qualitative and Quantitative Assumptions

This first scenario is built on the combination of the three main components in which the BRIC countries pursue a modernizing economic strategy, the Old 15 EU members react actively to the international challenges and the New 12 EU countries pursue a re-conversion strategy from hard manufacturing to a more technological and service-based economy.

Table 3 presents the qualitative assumptions derived from the patterns of change (i.e. the patterns of development of each single driving force) that each driving force has within the scenario. Each qualitative assumption is translated into quantitative values of the levers in the model. The values chosen are presented in Fig. 3 and 4, respectively for national and regional variables.

Fig. 3. National Variables in the Two Scenarios
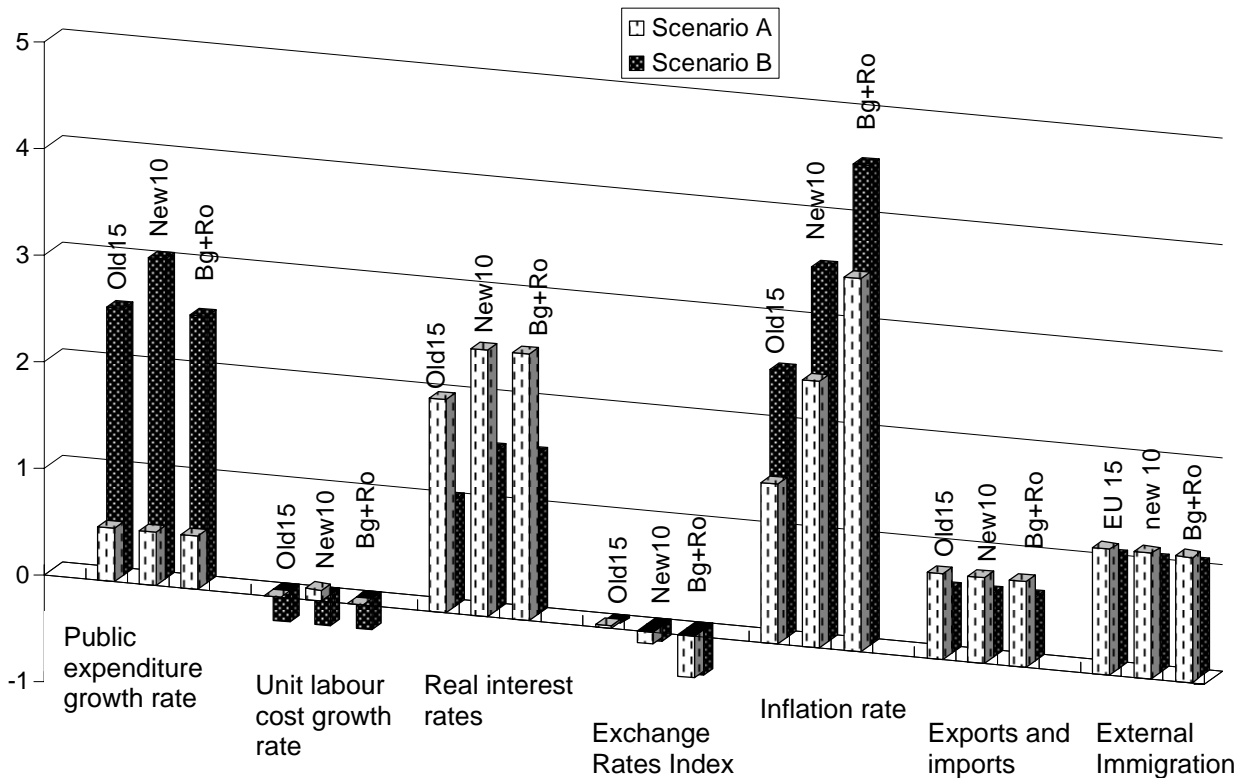
The first driving force concerns a global competition based on advanced high-quality products. This implies an increase of trade and of trade integration worldwide, as an effect of intra-industry trade. The fact that the BRIC countries modernize, has two implications for EU countries: the latter benefit from a *market effect* since they can export advanced products in the wide external market thanks to an increase in the purchasing power in BRIC countries. This first effect is however lowered by an import-substitution effect taking place in BRIC countries, able to produce internally many advanced products previously imported. Our assumption is that the prevailing effect is the market effect. The second implication is that also the imports of EU countries will increase, since the BRIC countries export also advanced products and not only low-price manufactured goods; this second effect is lowered by the tendency in BRIC countries to increase wages losing price-competitiveness.

*Table 3. A Competitive Europe in an Integrated World: Qualitative Assumptions*

a) Economic and institutional driving forces

	Global competition on advanced high quality products	Competitive strategies of both EU 15 and New 12	Strict management of Public Finance	EU widening
Assumptions on the levers	- Greater trade integration; - a greater external market for European countries; - global competitiveness on high quality products.	- increase in salaries more than productivity due to higher share of high quality human capital; - further specialisation in advanced economic activities and full implementation of the Lisbon agenda; - an increase in real interest rates due to a higher world demand of capital accumulation; - a constant transfer from external to endogenous resources, leading to a limited increase in the share of FDI in Eastern countries; - a revaluation of the European currencies, partly counterbalanced by a revaluation of BRIC currencies.	- Strict observation of the Maastricht parameters; - a decrease in inflation rate.	- Widening of the European Union to Bulgaria and Romania. - CAP restructuring process applied also to New Member Countries, i.e.: * same amount of CAP funds between the New 10 and the old EU15 in 2015; after 2008 funds distributed also to Bulgaria and Romania. - structural funds distribution on the basis of the "political agreement" of 50% to EU15 and 50% to the New 10 and after 2008 also to Bulgaria and Romania.

b) Infrastructure, socio-economic and technological driving forces

	European infrastructure Policy with profitability aims	Open barriers to Europe	Development of renewable technologies	Territorially concentrated technological development
Assumptions on the levers	- the development of TINA and TEN infrastructures on profitability aims.	- increasing external in-migration growth rates and an increase of natural population growth i.e.: * an increase in fertility rates and a decrease in mortality rates. * a tendency of in-migration from outside Europe.	- decisive increase of energy price due to the increase in a massive use of energy by population in BRIC countries; - limited conventional energy consumption increase.	- high-speed transport and ICTs network development in concentrated areas, following profitability aims: * concentrated access to ICTs and high-speed trains.

Fig. 4. Regional Variables in the Two Scenarios
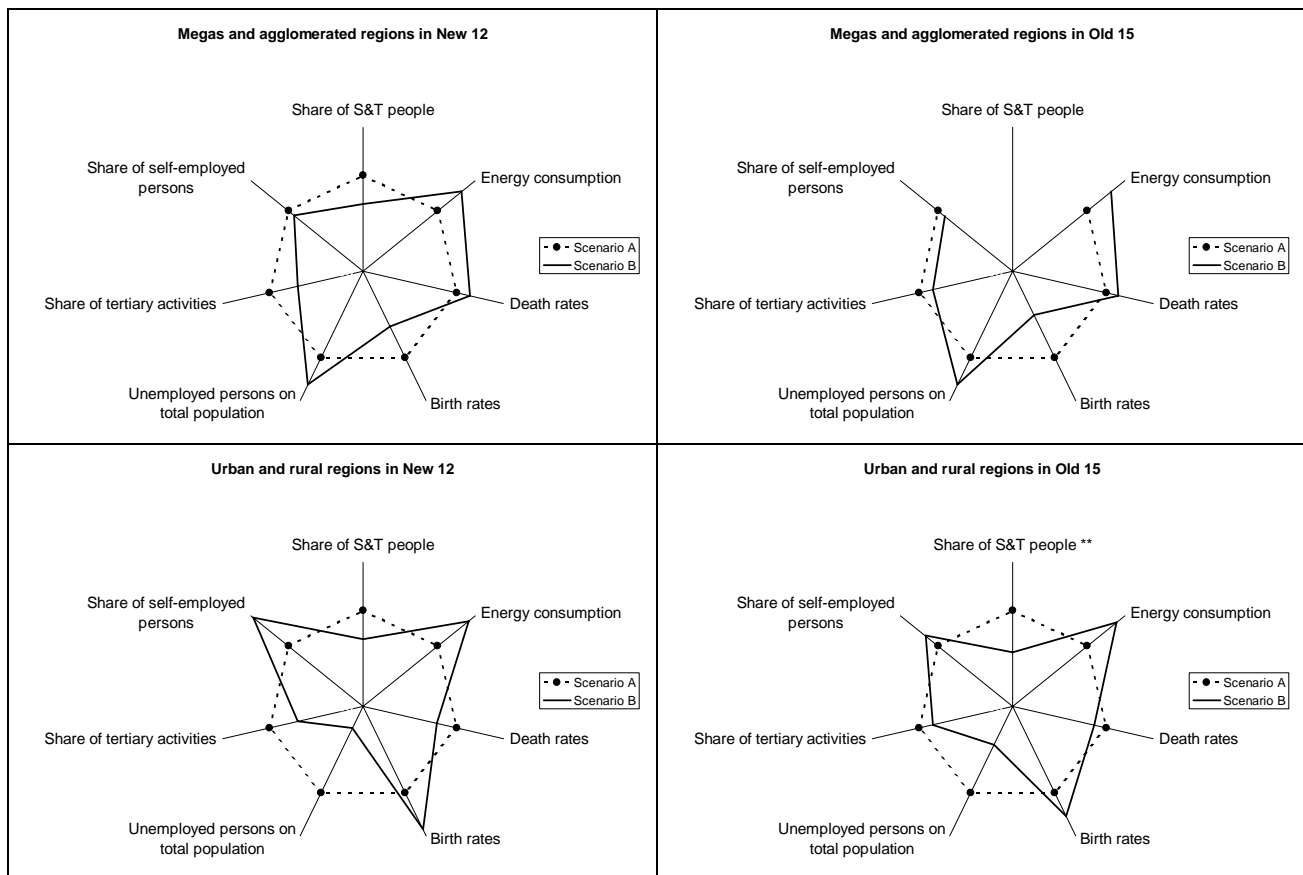
These assumptions are translated in the MASST model by an increase of the exogenous growth component (due to World demand) of exports and imports of 15% with respect to the extrapolation of the present trends but still decreasing of 20% with respect with the past very high speed of integration.

The second emerging pattern is the implementation of competitive strategies by both the Old 15 and the New 12 member states of the EU.

This can only be achieved through a decisive increase of the share of human resources in science and technology, of 30% with respect to the past regional group averages, and an increase in tertiary activities, which is more sizeable in New 12 countries (29% over 15 years in rural and urban regions and 21% in agglomerated and megas, whose starting values are significantly higher) than in Old 15 countries (7% over 15 years), since the latter start with already high values.

The increase of employment in qualified and high-tech jobs implies that wages also rise and hence the unit labour cost do not decrease despite of the increase in productivity. The unit labour cost, in fact, also represents the share of wages on GDP, a share which remains stable in New 12 countries and increases by 0.1% annually in Old 15 countries, due to the higher importance of human resources in the competitive strategies of firms.

The real interest rates in this scenario are higher than in a extrapolative scenario of the present trends, due to a higher demand of financial capital. Interest rates are assumed to remain higher in New 12 countries (2.5%) than in the Old 15 countries (2%), as it was in the past.

The re-conversion strategy adopted by the New 12 member countries implies a shift from external to internal endogenous resources. For this reason the share of FDI on internal investments does not surpass 24%, which is the past average of New 10 countries and to which also Bulgaria and Romania converge.

The reactive and restructuring strategies of the European countries have also effects on the socio-economic situation of regions. In core (mega and agglomerated regions) where the highest investments and restructuring processes take place, unemployment rate is expected to be lower (4% in agglomerated and megas of all 27 countries) and higher in the less competitive and peripheral areas, i.e. 4.5% in urban and rural areas of EU15 and 5% in rural and peripheral areas of New 12. By the same token, the share of self-employment increases with respect to the past of 7% in agglomerated and megas regions of all 27 countries, only slightly increases (+2%) in rural and urban regions of Old 15 and decrease of 9% in the urban and rural areas of the New 12 where it is at present higher than anywhere else.

The third economic driving force of this scenario is the strict management of public finances, due to a decision of countries to be virtuous in their expenditure and of a limited effort in achieving equal socio-economic and spatial development. For this reason, the public expenditure growth rate is limited to 0.5% yearly in all Europe, and inflation rates remain very low, at 1.5% in Old 15 members and at 2.5% and 3.5% respectively in New10 and Bulgaria and Romania where the control of prices is less strict.

All three driving forces have effects on the nominal exchange rates: the fact that European competition is based on quality implies a general positive pressure on the exchange rates, made more important by the strict control of public finances and of inflation, and slightly curbed by the fact that the BRIC countries also tend to re-valuate due to the introduction of products of higher quality and to their increase in exports. This is reflected, for the EU 15, in a small annual re-valuation of 0.02% yearly, whereas the New 10 countries, which have higher inflation, devaluate but of only 0.11% yearly. Bulgaria and Romania, where the control of inflation is assumed to be loser, devaluate more, 0.39% yearly.

The fourth driving force is institutional: in a setting of proactive competitive strategies, the EU implements a strategy based on widening instead of deepening and of increasing internal cohesion. The first result of this is the enlargement of the union to Bulgaria and Romania in 2008.

By 2015, the CAP pillar 1 expenses shift (compulsory) to Pillar 2 by 5% but total Pillar 1 expenses reduce by 33%; Eastern countries will receive the average Old 15 Pillar 2 expenses per a.w.u. of the west, but, since farmers in the East are assumed to decrease in the future of 25% due to modernization processes, support per a.w.u. increases in the East by 33%; Bulgaria and Romania are included from their entrance in the EU.

Structural funds are reduced: from a standard situation in which the total amount is constant and divided equally between Old 15 and New 12 regions, the assistance to Old 15 countries further reduces of 2/3 in the four cohesion countries (Greece, Ireland, Portugal and Spain) and to 0 in the other Old 15. In the East, the reduction is more limited, of 1/3 in all countries and regions. Bulgaria and Romania obtain the same assistance than the other New 12 countries starting from their entrance in the EU.

The fifth driving force is the development of European infrastructure following profitability aims. Infrastructure is built according to socioeconomic profitability, based on a cost-benefit analysis

appraisal that includes both environmental externalities and indirect territorial impacts. The total investment in infrastructure is less than the total possible, since projects with low profitability will not be built. This implies in the MASST an increase differentiated region by region in the endowment of main roads, motorways, railways and inland waterways, to the general benefit of regions with more demand.[7]

The sixth driving force is consists in an increasing openness of the EU to external in-migration. This is implies an external immigration growth rate 6% higher with respect to a situation in which the present trends are confirmed. Moreover, this openness policy is accompanied by free movement of people within the EU, with consequences also on the natural population changes. It has to be remembered that all existing population forecasts foresee an increase in mortality and a decrease in fertility, due to the process of population aging. This process can only marginally be changed in only 13 years. For this reason, in this scenario the mobility of population and the ample external immigration is assumed to curbe the effects of migration differently in different types of regions: death rates (figure 2) increase of only 18% in Agglomerated and megas regions of New 12, of 25% in agglomerated and megas in Old 15, of 29% in urban and rural in New 12 and of 31% in urban and rural in EU 15.

Specularly, birth rates increase of 5% in agglomerated and megas regions of New 12, remain stable in agglomerated and megas in EU 15, decrease of 15% in Urban and rural in New 12 and of 20% in urban and rural in EU 15.

The seventh driving force is the development of renewable technologies, which is due to the high increase (6% annually) of energy prices, due to the increasing demand from the BRIC countries, both for production and for household consumption. This shift implies that the increase in energy consumption is very limited in Old 15 countries (3% in agglomerated and megas, 4% elsewhere) and more consistent in the New 12, as a result of the increasing levels of individual consumption and of lower efficiency (35% in agglomerated and megas, 37% elsewhere).

The eighth driving force concerns a territorially concentrated technological development: since ICTs and high speed train networks are assumed in this scenario to be developed in the central areas where there is higher demand and are hence more profitable, this implies an advantage for regions with megas and a disadvantage for the rural regions where the population is more dispersed.

4.2. European Regional Performance and Disparities in 2015

The competitive Europe in an integrated world scenario registers a more expansive aggregate growth rate for Europe as a whole with respect to the other scenario, in line with the assumption of greater trade integration and of international trade theories. EU growth rate increases 0.61 percentage points more in this scenario with respect to the symmetric scenario. Despite the revaluation process of European currencies, the "Competitive Europe in an integrated world" scenario is a very expansive scenario: European exports growth rate increases thanks to market effect which prevails on the import-substitution effect that takes place in BRIC countries. European import growth rates increase because BRIC countries compete with high quality products that substitute low-costs products, no longer competitive.

The greatest difference in GDP growth rates between the two scenarios is registered in the EU 15 (0.62 percentage point higher); the aggressive strategy in an integrated world is for the Old 15 a

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[7] The new regional infrastructure endowment under these assumptions has been calculated by MCRIT, Barcelona, partner within ESPON 3.2 project.

winning strategy, entering with success in the vast BRIC market, despite the competition of BRIC countries on high quality products. Within the New 12, the greatest difference in GDP growth rate with respect to scenario B is registered by Bulgaria and Romania (0.43 percentage point higher), given the assumption that in the present scenario they join the EU and are eligible for structural funds. The New 10 countries achieve a growth rate which is 0.18 percentage point higher than in the scenario B (Table 5).

Table 5 – Difference in GDP growth rates in 2015 between the two scenarios

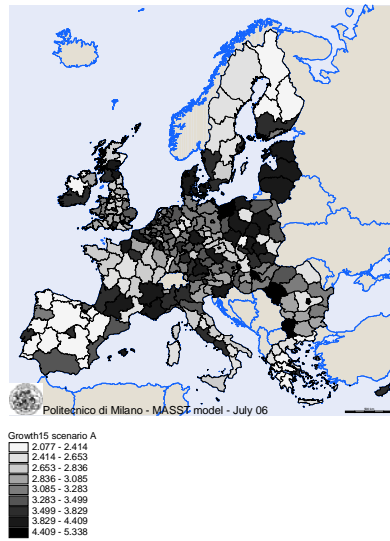|	*Difference in GDP growth rates between scenario A and B*
EU 27	0.61
EU 15	0.62
New 10	0.29
Bulgaria and Romania	0.43

The more expansive GDP growth rate is in reality unevenly distributed in European regions. Map 1 in fact shows:
- *a general greater GDP growth rate in Eastern countries with respect to Western ones*, showing that the catching-up process is supported by a modernising strategy of the New 12;
- *a clear tendency towards a concentrated development in strong areas of each country*. This tendency is confirmed by the Theil index presented in Fig. 3, where the intra-country disparities drastically increase;
- as a consequence*, in Western Europe, *a reinforcement of some regions of the Pentagon area, together with most of southern-east of Great Britain and Northern and Central Italy* countervail *the low relative performance of mainly rural areas* especially of Greece, Central France, Central Spain, Northern Britannic Islands and Northern Scandinavia;
- while the most peripheral regions are those performing lower than the rest of Europe, *within peripheral areas, exceptions are presented by most of the megas*, reinforcing the tendency of a concentrated development. Lisbon and Porto in Portugal, Madrid, Catalonia, Valencia and Bilbao in Spain, Athens in Greece, Paris, Haute Normadie and Nord Pas de Calais in Northern France are all regions with a higher performance than rural areas;
- while the assumptions favour growth in the megas and agglomerated areas, a less intuitive result is *the good performance registered also by the potential megas*, like Cologne, Bonn, Bologna (in Emilia-Romagna), Nice and Marseille (Provence Côte-d'Azur) and Lyon (Rhônes-Alpes), Bratislava and Budapest;
- the trend towards *a concentrated development is clearly evident in Eastern countries*, where all capital regions (with the addition of Timisoara) register a good performance. On the contrary, in these countries*, all rural areas register a low performance*.

Map 2 presents the per capita GDP level achieved in 2015. Some main trends emerge, namely:
- the catching-up process remains incomplete; Eastern countries register a lower per capita GDP in 2015 with respect to the Old 15. This is probably due to the fact that if the modernising strategy supports Eastern countries growth, the same can be said for an aggressive strategy;
- the highest per capita GDP is registered in the Pentagon area, and especially in the south-eastern part of western countries (Austria, Southern Germany) and in the Randstadt-Holland;

Map. 1. GDP Growth Rate – Scenario A   Map. 2. GDP Growth Rate – Scenario B
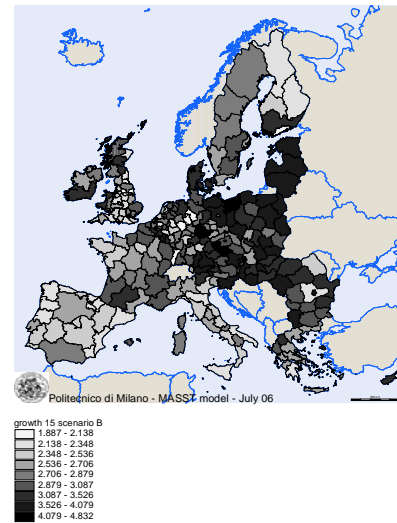
Map. 3. GDP Growth Rate. Difference between Scenario B and A
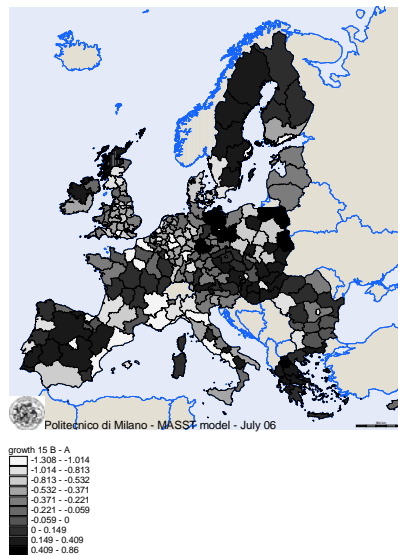
- mega and agglomerated regions register high per capita GDP especially in western countries. Athens, Rome, Milan, Turin, Madrid, Lisbon, Paris, London all Randstadt cities, Berlin, Helsinki, Stockholm, Oslo, Copenhagen, show a high per capita GDP, witnessing that this scenario foresee a concentrated development. The decisive increase in the intra-

country disparities is witnessed also by the increase in the within countries Theil index in Fig. 5;

-   in Eastern countries, a higher level of per capita GDP is registered in mega and agglomerated regions. Budapest, Bucarest, Sophia, Warsaw and the other agglomerated regions in Poland are an example in this respect. As a result of these trends, while intra-national disparities grow, disparities among countries decrease, thanks to strong catching up processes in lagging countries through their national champions (Fig. 3).

Fig. 5 – Theil Index of a Competitive Europe in an Integrated World Scenario
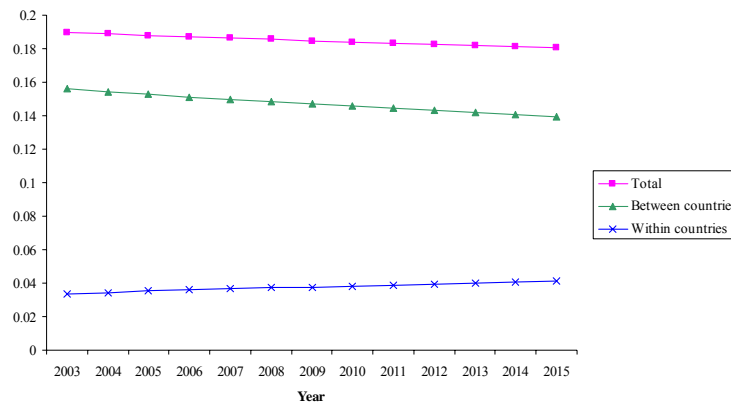
5. A Defensive Europe in a Cost-Competitive World

5.1. Characteristics of the Scenario: Qualitative and Quantitative Assumptions

This second scenario is built on the combination of the three main components in which the BRIC countries continue and accentuate their present price-competitiveness economic strategy, the Old 15 EU members react defensively to the international challenges and the New 12 EU countries compete on prices, becoming the manufacturing belt of Europe and postpone any shift to a more technological and service-based economy.

Table 6 presents the qualitative assumptions derived from the patterns of change (i.e. the pattern of development of each driving force) that prevails in each driving force. The quantitative assumptions are presented in Fig. 3 and 4, respectively for the national and regional variables.

The first prevailing pattern of change concerns a global competition based on the price of products, posing an advantage to countries able to produce at low-costs. This trend, together with the emerging protectionism of Europe, implies a lower increase of trade (Fig. 3) and of trade integration worldwide. The fact that the BRIC countries renounce to modernize their economy in the middle-run, has two implications for EU countries: they will be able to export less, since the BRIC internal market will not grow much; this first effect is however lowered by the fact that the BRIC will not be able to compete with European firms in advanced products and will have to continue to import them; the prevailing effects, however, is the first one. The second implication is that also the imports of EU countries will increase less rapidly, since the BRIC countries will not be able to export also advanced products but only mainly low-price manufactured goods; this second effect is curbed by the fact that the BRIC countries maintain very low wages and will hence remain price-competitive.

Table 6. A Defensive Europe in a Cost-Competitive World: Qualitative Assumptions

a) Economic and institutional driving forces

	Global competition on low-cost products	**Defensive strategies of both EU 15 and New 12**	**Flexible management of Public Finance**	**EU deepening**
Assumptions on the levers	- A greater external market for European countries; - global competitiveness on high quality products.	- Protectionism; - re-gain of cost competitiveness; - low specialisation in advanced economic activities; - a very low decrease in real interest rates; - an increase in the share of FDI in Eastern countries partially limited by the geographical reorientation of part of FDI towards BRIC countries; - a devaluation of the European currencies.	- Flexible observation of the Maastricht parameters; - an increase in inflation rate as the result of the devaluation of the European currencies and of less strict Maastricht parameters.	- Deepening of the European Union: Bulgaria and Romania in 2007. - CAP restructuring process in favour also to New Member Countries, i.e.: * same amount of CAP funds between the New 10 and the old EU15 in 2015. - structural funds restructuring process with the "political agreement" of 50% to EU15 and 50% to the New 10, excluding Romania and Bulgaria.

b) Infrastructure, socio-economic and technological driving forces

	European infrastructure Policy with equity aims	**Closed barriers of Europe**	**Dependence on conventional energy technologies**	**Territorially diffused technological development**
Assumptions on the levers	- The development of TINA and TEN infrastructures with the aim to rebalance the infrastructure endowment gap.	- A decrease in external in-migration growth rates and a consequent decrease of natural population growth i.e.: * a decrease in fertility rates and an increase in mortality rates. * a low in-migration from outside Europe.	- Low increase of energy price; - high conventional energy consumption increase.	- Widespread high-speed transport and ICTs network development: * diffused access to ICTs and high-speed networks.

These assumptions are translated in quantitative assumptions by a decrease of the exogenous growth component (due to World demand) of exports and imports of 40% with respect to the trends of the period 1995-2002, a decrease which is 25% with respect to the extrapolation of present trends.

The second pattern of change is the implementation of defensive strategies by both the Old 15 and the New 12 member states of the EU. The first implication, the protectionism, has already been discussed.

The defensive Europe achieves a far lower (Fig. 4) growth of the share of human resources in science and technology, of 14% in all regions belonging to New 12 countries (whose starting values are low) and of 7% in urban regions of Old 15 countries. The increase in tertiary activities, will be much lower than in the other scenario in New 12 countries (14% over 15 years in rural and urban regions and 7% in agglomerated and megas, whose starting values are significantly higher) and nil in Old 15 countries where it starts with an already high percentage of workforce.

The very low increase of employment in qualified and high-tech jobs, and the pursue of price competitive strategies, implies that wages will rise less than productivity and hence the unit labour cost decreases of 0.3% yearly in all 27 countries.

Real interest rates in this scenario are lower than in the previous, due to the lower demand of capital, especially for investment in new technologies. Also here, in any case, they are assumed to remain higher in New 12 countries (1.5%) than in the Old 15 countries (1%), as in the past (Fig. 3).

The cost-competitive strategy adopted by the New 12 member countries implies that they will increase their efforts to attract foreign capitals, for this reason the share of FDI on investments is of 26%, 2% higher than in the first scenario but not much, since they face the competition of emerging BRIC countries in the attraction of these.

The socio-economic situation of the regions is influenced by these strategies. A higher unemployment rate is registered in the core areas, due to more frictions in the labour market and to less investments in these areas (4.5% in agglomerated and megas of all 27 countries). By the same token, the less competitive and peripheral areas register a lower unemployment rate, i.e. 3.5% in urban and rural areas peripheral areas of all 27 countries.

The same reasoning applies to the share of self-employment; it increases with respect to the past of only 4% in agglomerated and mega regions of all 27 countries, and more (+9%) in rural and urban regions of all Europe, including urban and rural areas of the New 12 where it is now higher than anywhere else.

The third economic pattern of change of this scenario is a more flexible management of public finances, due to a decision of countries to relax the Maastricht parameters in order to achieve more internal cohesion and to help firms in their cost-competitive strategies. For this reason, public expenditure growth rate is of 2.5% yearly in old 15 and Bulgaria and Romania, who experienced a decrease of public expenditure in the estimation period. New 12 members, being out of the Euro, and having the constraints of additionality to much higher expense in structural funds, face a 3% increase in public expenditure.

Consequently, inflation rates are high: at 2.5% in Old 15 members and at 3.5% and 4.5% respectively in New 10 and Bulgaria and Romania where the control of prices is even less strict.

All the previous three patterns of change have devaluation effects on the nominal exchange rates: the fact that European competition is based on prices implies a general negative pressure on the exchange rates, made more important by the lose control of public finances and higher inflation, and only slightly curbed by the fact that the BRIC countries will also tend to de-valuate due to their price competitive strategies.

This is shown, for the EU 15, in a small annual de-valuation of 0.02%, whereas the New 10 countries, due to higher inflation, devaluate of 0.15% yearly. Bulgaria and Romania, where the control of inflation is assumed to be even less strict, devaluate more, 0.43% yearly.

The fourth pattern of change is institutional: in a setting of defensive strategies, the EU implements a strategy based on deepening with the purpose to increase internal cohesion and renounce to widening. The first result of this is the enlargement of the union to Bulgaria and Romania is postponed to 2015, i.e. after the end of the simulation period.

By 2015, the CAP Pillar 1 expenses still shifts (compulsory) to Pillar 2 by 5% but total Pillar 1 expenses increase by 50%; also in this scenario Eastern countries receive the average Old 15 Pillar 2 expenses per a.w.u., but, since farmers in the East are assumed to decrease in the future of 25% due to modernization processes, support per a.w.u. increases in the East by 33%; Bulgaria and Romania are in this scenario excluded from Pillar 2 support because they remain out of the EU.

Structural funds increase by 50%. In order to support cohesion, the total amount is divided 1/3 to Old 15 and 2/3 to New 12 regions; the assistance to Old 15 countries touches all countries, and not only the four cohesion countries. In the East, this scenario implies the triplication of structural funds assistance, but now Bulgaria and Romania are excluded because they do not join the EU.

Infrastructure is built according to territorial criteria, based on assuring a minimum level of accessibility to cities and regions, without regarding the existing traffic or the economic development level. Since less developed regions use to have less resources available to build infrastructure, this policy requires transfers from most developed regions. Priorities are fixed based on reducing territorial gaps, starting by building those projects with higher expectations on traffic (so those that may induce more mobility, relations and development opportunities).[8]

The sixth pattern of change is socio-economic and consists in the closure, as far as possible, of the EU to external in-migration. This implies yearly external immigration growth rates of 6% lower with than in a situation in which the present trends are confirmed, 12% lower than in the scenario A. Moreover, this openness policy is accompanied by lower movement of people within the EU, with consequences also on the natural population changes. Population aging will still take place, but the effects on regional typologies (Fig. 4) will be opposite from the previous, at benefit of rural and urban areas, since the youngsters will not longer have to leave them: death rates will increase of as much as 24% in agglomerated and mega regions of New 12, of 31% in agglomerated and mega in EU 15, of 18% in urban and rural in New 12 and of 24% in urban and rural in EU 15. Specularly, birth rates decrease of 10% in agglomerated and mega regions of New 12, decrease of 20% in agglomerated and mega regions in EU 15, remain stable in urban and rural in New 12 and decrease of 11% in Urban and rural in EU 15.

The seventh pattern of change is the persistent dependence on non-renewable energy technologies, which is due to the lower increase (3% annually) of energy prices, in its turn due to the a demand

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[8] Also in this case, the new regional infrastructure endowment under these assumptions has been calculated by MCRIT, Barcelona, partner within ESPON 3.2 project.

from the BRIC countries which will not grow too rapidly since household consumption does not grow much in those countries.

This increase in energy consumption is hence consistent in Old 15 countries (16% in agglomerated and mega regions, 20% elsewhere) and even more important in the New 12, as a result of the persistence of traditional manufacturing and of lower efficiency productions (62% in agglomerated and mega regions, 60% elsewhere).

The eight pattern of change concerns a territorially diffused technological development: ICTs and high speed train networks are assumed in this scenario to be developed in order to link all regions in the same way. For this reason, central areas, where there is higher pressure on resources, will experience the disadvantages of congestion, on the contrary rural regions will grow more due to the possibility of teleworking.

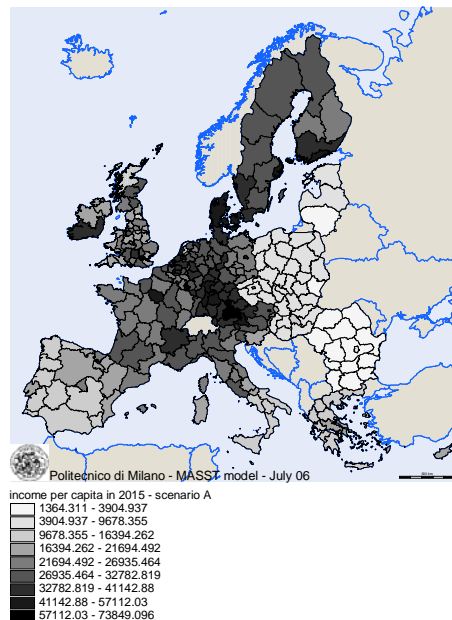*5.2. European Regional Performance and Disparities in 2015*

The defensive Europe in a cost-competitive world scenario is a less expansive scenario than the previous one (Table 4). All countries pay in terms of lower GDP growth rates their defensive and non-innovative strategies. This is especially true for the Old 15.

Map 3 shows the GDP growth rates registered at NUTS 2 level in this scenario. Interesting tendencies emerge from the picture:
 - a *higher performance of the New 12 countries* with respect to the Old 15. The model of development through external resources of the New 12, coupled with the guarantee of a European Old 15 market, is sufficient enough to guarantee a relatively good growth rate even in front of a price-competitive strategy of the BRIC countries;
  - in general, a *low performance of the Old 15 countries*, a tendency witnessed by vast parts of the European territory; most part of Greece, Italy, Spain, the north-western part of France, most of England, and the agglomerated regions of Germany register low GDP growth rates;
  - an *absence of a common performance of a particular typology of regional settlement structure*. Rural and agglomerated regions perform in the west relatively worse than the Eastern countries. This is true in Italy, Spain, Portugal, Greece and Great Britain, witnessing that a defensive strategy in an external price-competitive world is in general a losing strategy;
  - a *low performance also of mega regions*. Milan, Turin, Rome, Madrid, Lisbon, Porto, Paris, London, Amsterdam, Frankfurt, Berlin, register a low GDP growth rate, witnessing that a protectionism strategy with strong price-competitive BRIC countries is of detriment also to the "champions" of Europe;
  - the *barycentre of growth in the Old 15 moves towards South-Eastern Europe*, a tendency witnessed by a greater growth in the ex-DDR, Austria, Hungary, Greece;
  - a *diffused good performance of all regions in Eastern countries*, especially in capital cities and in some important industrial regions (like Timisoara). Interestingly enough, this result is similar to the one of the previous scenario; a defensive and cost-competitiveness strategy is in reality of detriment also for richer and more dynamic areas.

The general lower performance registered at the aggregate level in this scenario with respect to the previous scenario is not equally distributed at regional level. Some regions are in fact able to show relatively higher GDP growth rate in 2015. Map 4 shows the difference in GDP growth rates between scenario B and A. In particular, the following territorial trends emerge with respect to scenario A:

Map. 4. Per capita GDP – Scenario A | Map. 5. Per capita GDP. Difference between scenarios B and A
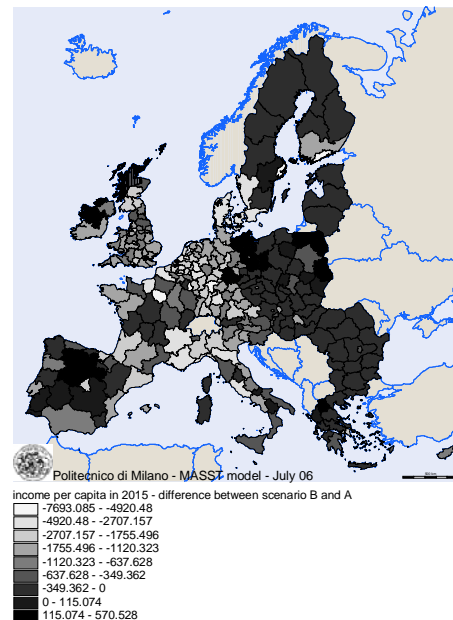

- in general, *a defensive strategy in a price-competitive external world is of detriment for both the Old 15 and the New 12,* the former renouncing to market share outside Europe, the latter to the advantages of a re-structuring process of their economies. The map shows in fact *a very limited fragmentation of relative growth rates*;
- *in Old 15 countries, the relatively lower performance is registered in all strong areas*; all mega, agglomerated and urban regions show relatively lower GDP growth rates than in the other scenario;
- *a relatively better performance in Old 15 is registered by rural areas*. This is true for rural areas of Italy, Greece, Spain, Portugal, France, Ireland, Scandinavian countries, Germany and Austria, witnessing that a protectionism strategy provides positive results for the primary sector;
- a similar tendency characterises Eastern countries, although with some exceptions. *Rural regions of Poland, Hungary, Bulgaria show very good performance rates*. In the Czech Republic, on the contrary, a relatively good, although not top performance, can be found also in urban areas.

By looking at the per capita GDP level achieved in 2015 in this scenario with respect to the previous one, some interesting trends emerge (map 5):

- the *catching up process between Eastern and Western countries is uncomplete*, despite the defensive strategy. Most regions in Eastern countries achieve in fact a lower per capita GDP with respect to the previous scenario. A cost-competitive strategy of Eastern countries when also BRIC countries compete on the basis of low prices is not a winning one;

- a *higher per capita GDP level with respect to the previous scenario emerges in very few regions of both Western and Eastern countries*, especially in the rural regions, in part of Scotland, in central Spain, in part of Greece, in the ex DDR and in Polish rural areas. It is however striking the very limited number of regions getting advantages following this strategy and not the most aggressive one;
- the *less favoured regions* are mainly the agglomerated and mega regions. This is true for all western Countries but not for Eastern countries where even mega and agglomerated regions register a higher GDP per capita than the previous scenario;
- *Eastern countries in general have a more contained relative per capita GDP decrease* with respect to western countries, and this explains the decrease in international disparities shown by the Theil index in Fig. 5. This also means that a defensive strategy is of detriment to Western countries more than a cost-competitive strategy is for Eastern countries.

Fig. 5 – Theil Index in a Defensive Europe in a Cost-Competitive World
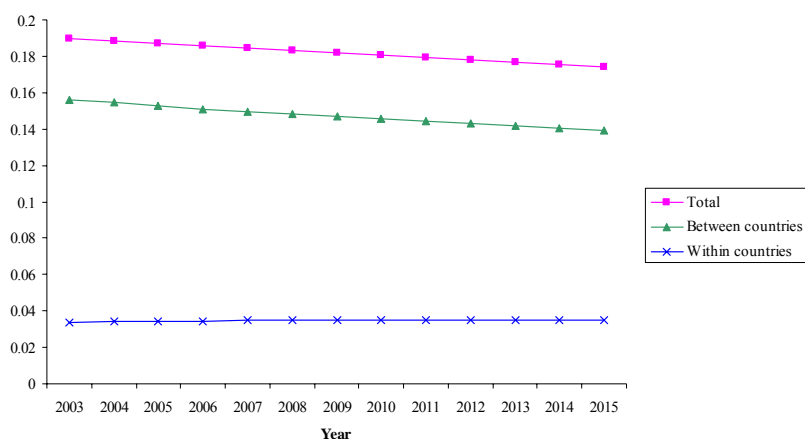
6. Conclusions

The aim of the paper was an ambitious one, dealing with the implementation of territorial scenarios in Europe under different assumptions on the main strategies that can be in the near future be put in place by three main blocks of countries, namely the Old 15, the New 12 countries and the BRIC countries, i.e. the Asian and South American Tigers.

Two opposite scenarios have been built, based on opposite strategies chosen by the three blocks of countries. Some counterintuitive results emerge that is worth summarising, having indirectly some policy implications involved:
- an aggressive strategy of western countries is a winning one, since the GDP growth rate is higher than in the case of a defensive and protectionist strategy. This is true even if BRIC countries decide to modernise and to restructure their production activities in favour of high-tech and value added industries;
- a cost-competitive strategy put in place by Eastern countries when also BRIC countries pursue a price-competitive strategy is a losing strategy. The average GDP growth rate in New 12 is much lower than in the case they decide to pursue a modernising strategy of their economies. The choice of BRIC to go for a price-competitive strategy generates a direct competition to the New 12 limiting the advantages they can achieve through this strategy;

- a restructuring strategy of Eastern countries gives rise to a higher GDP growth rate than a cost-competitive strategy, and supports a strong catching-up process. However, even this strategy leaves the catching-up process rather incomplete, since the per capita GDP in 2015 remains lower in eastern countries with respect to the Old 15;
- the strategies put in place by BRIC countries radically influence growth opportunities in Europe, more than anything else, since they represent a huge competitive economic system for Europe. For this reason, other possible combinations among the scenario cube can be taken into consideration and other scenario results analysed.

Within all other possible strategy combinations, one is rather appealing, i.e. the combination of an aggressive strategy in the Old 15 and a cost-competitive one the New 12. This combination provides a clear intra-European division of labour which could be of advantage for both blocks of countries, based on value-added activity advantages for the Old 15 and economies of scale of large scale productions for the New 12, when they become the manufacturing belt of Europe. Even in this case, the results are expected to be highly dependent on the strategies put in place by BRIC countries. This is the subject matter of our next paper.
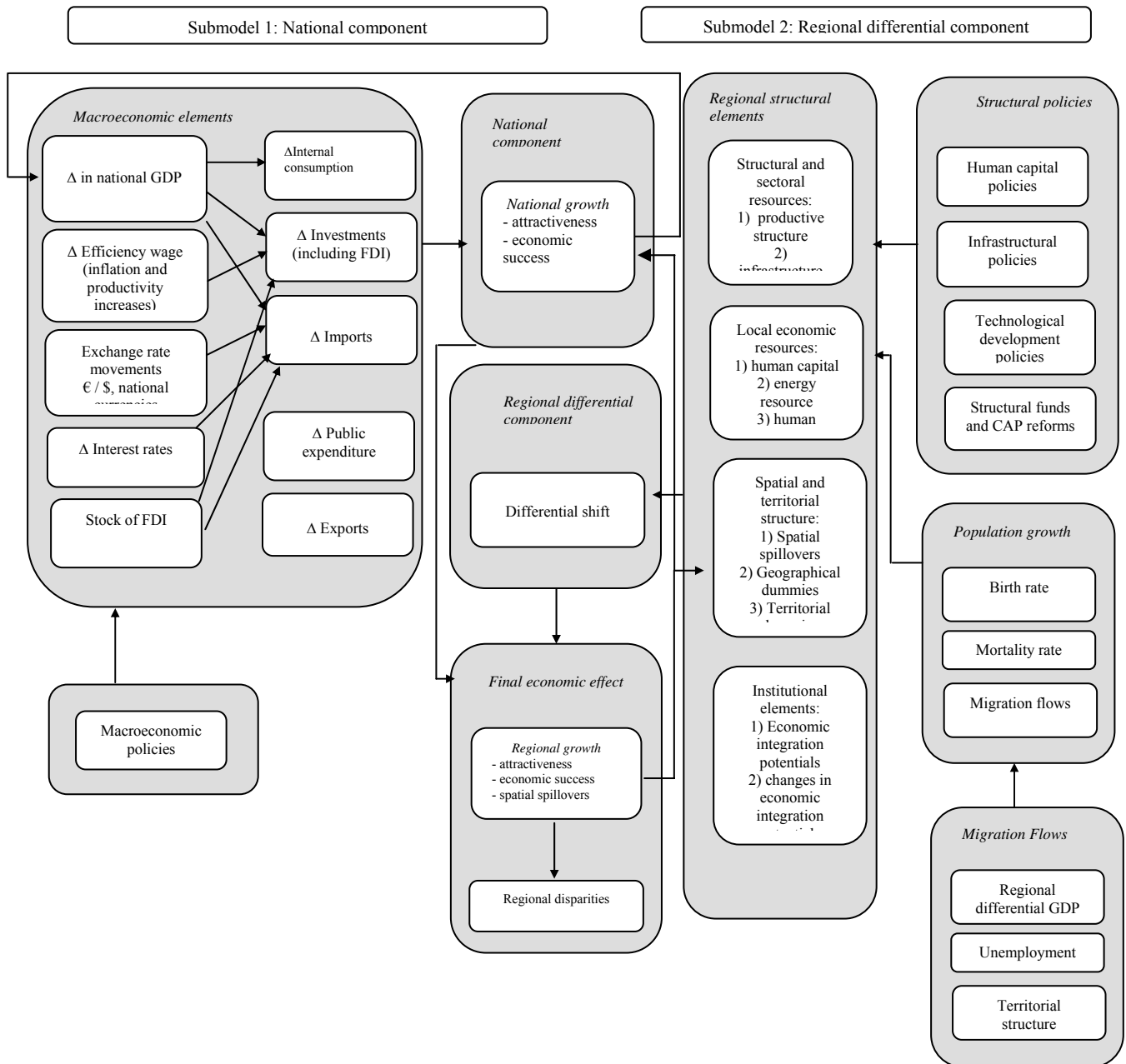
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Appendix 1. Theoretical Approach Behind the MASST Model

Fig. A.1. sketches the relationships system that explains regional growth in our model. A national sub-model contains most macroeconomic elements affecting growth at national level, and mathematically expressed through a block of equations. A regional sub-model explains the relative performance of each region through supply - structural - elements, like the quality and quantity of local material and non-material resources. Spatial and territorial elements are taken into consideration in the specification of the model, in the form of spatial growth spillover variables and settlement structures variables inserted in the model as independent variables explaining growth.

Regional output growth is equal to the *national growth rate* (determined within a national block of equations) plus a regional specific *differential component*. Differently from all other regional models, the MASST model in fact estimates the regional differential component rather than regional growth. This formulation allows to interpret regional growth as the result of national competitiveness and regional performance, an approach which would not be possible if a regional growth would be estimated; in the latter case, in fact, regional dynamics would depend only on local/regional elements, with no space for national aspects.

Fig. A.1. MASST Model Specification

Submodel 1: National component	Submodel 2: Regional differential component

Macroeconomic elements

- Δ in national GDP
- Δ Efficiency wage (inflation and productivity increases)
- Exchange rate movements € / $, national currencies
- Δ Interest rates
- Stock of FDI

- ΔInternal consumption
- Δ Investments (including FDI)
- Δ Imports
- Δ Public expenditure
- Δ Exports

Macroeconomic policies

National component

National growth
- attractiveness
- economic success

Regional differential component

Differential shift

Final economic effect

Regional growth
- attractiveness
- economic success
- spatial spillovers

Regional disparities

Regional structural elements

Structural and sectoral resources:
1) productive structure
2) infrastructure

Local economic resources:
1) human capital
2) energy resource
3) human

Spatial and territorial structure:
1) Spatial spillovers
2) Geographical dummies
3) Territorial

Institutional elements:
1) Economic integration potentials
2) changes in economic integration

Structural policies

- Human capital policies
- Infrastructural policies
- Technological development policies
- Structural funds and CAP reforms

Population growth

- Birth rate
- Mortality rate
- Migration flows

Migration Flows

- Regional differential GDP
- Unemployment
- Territorial structure

Thanks to its technical specifications, the MASST model has the following features:

(a) it 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. Such a

structure allows vertical feedbacks between the regional and national economy to be taken into account;

(b) it is an *integrated model*. In its structure, the model finds a specific place for 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, being the growth rate of a region also dependent on the growth rate of neighbouring regions;

(c) it is a *spatial-territorial model*. The spatial and territorial dimensions have a role in the explanation of regional growth in two ways. First of all, 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;

(d) it is an *endogenous, local competitiveness driven model* in the explanation of regional growth differentials. Regional differential growth is explained by local factors and interregional competitiveness stems from specific locational and local resource endowment of a region;

(e) it is a *macroeconomic (multinational) model*. Short term (macroeconomic) effects are dealt with at national level, and their feedbacks on national economies taken into consideration in explaining local growth;

(f) it is a *recursive 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-defining development pattern;

(g) given the above characteristics, the model is a *multi-layer policy impact assessment model*. The structure of the model allows in fact to measure 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.

The MASST model has been estimated for 27 countries, the EU25 plus Bulgaria and Romania, in a period of time between 1995 and 2002; its regional sub-model has been applied to all 259 NUTS 2 areas of the 27 countries. Two countries of Europe, Switzerland and Norway are at present out of the estimation dataset due to missing data. All independent variables are lagged one year with respect to the dependent variable. The estimation results are presented in Appendix to this paper, and reported carefully in our previous works