IV. Forecasting regional growth: the MASST model

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Abstract

Nowadays, forecasting regional growth is not possible without taking into account the recent economic dynamics at national and supranational level. In fact, the particular focus of the European Union on sovereign debts and deficits imposed by the economic slowdown, the macroeconomic trends that emerged as a result of the crisis and, last but not least, new politically sensible decisions concerning the future of the European Union play a role in explaining the remarkable industrial and geographic heterogeneity in the response to the crisis and the persistence of some of the contraction-induced effects in some countries and regions. All this introduces complexity in the way regional economic growth can be modelled for forecasting purposes. The MASST model is a regional econometric growth model built to simulate regional growth scenarios in the medium and long run (typically, over a 15–20-year time horizon), taking into consideration also macroeconomic aspects; in its estimation step, in fact, it explains regional growth as the result of national macroeconomic trends and regional growth assets at the same time. This paper aims to present the model and its interpretative power by merging national macroeconomic trends and the long-term regional structure. Particular emphasis will be given to the outcomes of two recent simulations for Polish regions.

Introduction

The recent economic contraction has drawn the attention to the impact of macroeconomic trends on regional growth. In particular, EU countries entered the crisis in 2007/2008 with large differences in terms of outstanding debt, levels of deficits, tax rates, trends in productivity growth and, consequently, different chances for recovery and growth. A huge debate focused on the role of austerity measures in prolonging the contraction

especially in the countries on the southern tip of the continent (Spain, Italy, Greece and Portugal).

Moreover, the impact of the recent substantial financial crisis on public debt in some EU countries has been severe. While prior to the crisis most EU countries witnessed a decrease in debt/GDP ratios, following the criteria of the Maastricht Treaty, the recent slump has reversed this process, following the resurgence of Keynesian public expenditure. After a decade of financial stability induced by the creation of the euro, international markets started associating positive chances of default with some EU countries, mostly located in the south. Some of these countries (e.g. Spain and Portugal) agreed to austerity measures to counterbalance this debt crisis. Other states partially defaulted on their debt (Greece); many others (e.g. Italy) now suffer from positive risk premiums with respect to more solvable countries (chiefly Germany[70]), which translates into unproductive extra public expenditure just to service their debt.

These macroeconomic elements play a major role for the development of both countries and regions. They may also exert substantial influence on the convergence process at both EU and country level[71]. Such effects have been modelled over time both through standard econometric analyses[72,73], as well as within more complex macroeconometric model simulation exercises. Within the latter branch, a relevant role has been played by the MASST (Macroeconometric, Social, Sectoral, Territorial) model[74]. Now at its fourth generation, the MASST model has over the last twelve years evolved to forecast regional growth taking into

[70] The Technical Appendix shows interest rates on 10-year maturity bonds for euro-denominated debt for Germany, Spain, Greece and Italy between 1993 and 2019. As of 18 June 2019, German Bunds sell for a 2.47 per cent discount with respect to Italian BTPs with the same maturity (-0.29% vs 2.18%, respectively). Source of raw data: Bloomberg.

[71] R. Capello i in., „Spatial heterogeneity in the costs of the economic crisis in Europe: are cities sources of regional resilience?", *Journal of Economic Geography* 2015, vol. 15, no. 5, s. 951–972.

[72] *i.e.*, interpreted through econometric analysis without the use of partial or general equilibrium econometric simulation models, such as MASST.

[73] S.P. Groot i in., „The crisis sensitivity of European countries and regions: stylized facts and spatial heterogeneity", *Cambridge Journal of Regions, Economy and Society* 2011, vol. 4, no. 3, s. 437–456.

[74] R. Capello (red.), „A Forecasting Territorial Model of Regional Growth: the MASST Model", *The Annals of Regional Science* 2007, vol. 41, no. 4, s. 753–787; R. Capello, U. Fratesi, „Modelling regional growth: an advanced MASST model", *Spatial Economic Analysis* 2012, vol. 7, no. 3, s. 293–318; R. Capello i in., „Modeling regional growth between competitiveness and austerity measures: The MASST3 model", *International Regional Science Review* 2017, vol. 40, no. 1, s. 38–74.

consideration structural relations among regional growth asset factors and regional economic growth, complementing in this way other methodologies, like Vector Auto-Regression[75], macroeconomic models (Hermin model[76]), and the Input-Output model[77].

Thanks to its structure, the MASST model takes both the macroeconomic trends and policies, as well as the regional asset endowment into account in the explanation of regional growth. The MASST model is in fact a regional econometric forecasting growth model comprising two main subcomponents, viz. the national and a regional sub-model, where the units of observation are the NUTS 2 regions of EU-28. While national GDP growth is built on aggregate demand-side features, regional differential growth depends mostly on supply-side elements. Both national growth rate and regional differential growth rate feed regional growth.

This paper aims to: (i) highlight the structure of the MASST model, underlining its specificities; (ii) provide two scenarios for the period 2018–2035[78] with results at both national and regional level, with special reference to Poland and Polish regions.

We proceed as follows: in Section 2 we discuss the conceptual structure of the MASST model. In Sections 3 and 4 we present, respectively, the assumptions of the reference and of the integration scenarios. Finally, Section 5 contains a conclusion.

[75] A. Brandsma i in., „RHOMOLO: A dynamic spatial general equilibrium model for assessing the impact of cohesion policy", *Papers in Regional Science* 2015, vol. 94, no. S1, s. S197–S222; A. Varga, T. Sebestyén, „Does EU Framework Program participation affect regional innovation? The differentiating role of economic development", *International Regional Science Review* 2017, vol. 40, no. 4, s. 405–439.

[76] See: model Hermin; J. Bradley, J. Zaleski, „Ocena wpływu Narodowego Planu Rozwoju Polski na lata 2004–2006 na gospodarkę przy zastosowaniu modelu HERMIN", *Gospodarka Narodowa* 2003, no. 7–8, s. 17–46.

[77] A. Masouman, C. Harvie, „Forecasting, impact analysis and uncertainty propagation in regional integrated models: A case study of Australia", *Environment and Planning B: Urban Analytics and City Science* 2018, online first. DOI: 10.1177/2399808318767128.2018).

[78] These two scenarios were elaborated by the authors as part of the ESPON-ETRF (2018) project.

Modelling regional growth: the structure of the MASST model

The general theory behind the MASST model is deeply rooted in endogenous development theories in which the competitiveness of an economic system depends on the presence of structural elements (like human capital, knowledge, labour force) and on the ability of the economic system to cumulate them over time through endogenous and self-reinforcing processes. Among these sources of competitiveness, a role is given to intangible ones, in particular social capital in the form of trust and sense of belonging, which gives the economic system, ceteris paribus, a competitive edge. Beyond that, the sources of regional competitiveness are enlarged, encompassing the role of innovation and of an equilibrated urban system on regional growth on the basis of new, recently developed conceptual approaches[79].

The MASST model also draws on recent theoretical reflections, starting with neoclassical growth models[80] that implicitly assume that technological progress is characterised by a worldwide global interdependence among economies which depends on their geographical connection with other economies[81]. The inter-regional link is at the basis of a cumulative and self-reinforcing local growth process à la Myrdal-Kaldor-Krugman[82]. In line with endogenous growth theories, the MASST model highlights an endogenous law

[79] R. Camagni et al., „One or infinite optimal city sizes? In search of an equilibrium size for cities", *The Annals of Regional Science* 2013, vol. 51, no. 2, s. 309–341; R. Capello, C. Lenzi (red.), *Territorial patterns of innovation: An inquiry on the knowledge economy in European regions*, Routledge, London (UK) 2013

[80] N.G. Mankiw et al., „A contribution to the empirics of economic growth", *The Quarterly Journal of Economics* 1992, vol. 107, no. 2, s. 407–437.

[81] E. Lòpez-Bazo i in., „Regional externalities and growth: evidence from European regions", *Journal of Regional Science* 2004, vol. 44, no. 1, s. 43–73; C. Ertur, W. Koch, „Growth, technological interdependence and spatial externalities: theory and evidence", *Journal of Applied Econometrics* 2007, vol. 22, no. 6, s. 1033–1062. Recently, Ertur and Koch (2011) have also proposed an extension of the multi-country endogenous (Schumpeterian) growth model that includes technological interdependence between economies in order to take account of the neighbourhood effects on growth and convergence processes. (C. Ertur, W. Koch, „A contribution to the theory and empirics of Schumpeterian growth with worldwide interactions", *Journal of Economic Growth* 2011, vol. 16, no. 3, s. 215).

[82] G. Myrdal, *Rich lands and poor: the road to world prosperity*, Harper & Row, New York 1957; N. Kaldor, „The case for regional policies", *Scottish Journal of Political Economy* 1970, vol. 17, no. 3, s. 337–348; P. Krugman, „Increasing returns and economic geography", *Journal of Political Economy* 1991, vol. 99, no. 3, s. 483–499.

of accumulation for the population expressed in a long-term neoclassical view as a resource for production development which should not be wasted on emigration.

Last but not least, the MASST model refers to growth theories claiming that regions are part of a wider economic system, and that much of their growth still depends on national factors, such as: (i) institutional features such as the efficiency of the legislative, judicial and governmental functions of the state; (ii) organisational factors such as the quality of services of general interest like education, transport, communication, health and security services; (iii) economic factors such as general fiscal pressure, effectiveness of public expenditure, pervasiveness of environmental regulations, efficiency of contract enforcement procedures, sovereign debts and deficits. These last elements were missing in the previous versions of the model; in the new version, public expenditure growth rates at national level become endogenous, making the model define its growth rate according to the public debt/GDP ratio and to the distance of public debt to exogenously given policy targets.

The MASST model has some distinct features that differentiate it from other forecasting models[83]. It contains an interesting mixture of demand- and supply-side elements that explain regional growth at national and regional level: whilst, in fact, national growth is mostly explained by aggregate demand elements, the model is also intended to capture price competitiveness effects at national level. At regional level, while differential regional growth is mostly explained by territorial capital elements, in line with most advanced regional growth theories, demand elements are captured by the mix of sectors present in the region.

Another important feature of MASST resides in that it allows to simultaneously model competition and cooperation among regions. Competition is related to the generative part of the model, which guarantees higher regional growth rates to more competitive regions; cooperation is assured by interregional linkages inserted in the form of regional growth spillovers in the regional differential shift equation and through classical proximity and accessibility effects, which is kept from the first version of the model[84].

[83] R. Capello, U. Fratesi, op. cit.

[84] See: R. Capello i in., *Modelling regional scenarios for the enlarged Europe: European competitiveness and global strategies*, Springer Science & Business Media 2008.

A final feature of MASST resides in its true territorial nature, where not only regional growth spillover effects are modelled, but also the settlement structure of regions is taken into consideration both in the estimation and in the simulation phase.

Some specificities of the previous MASST model are worth inspecting, before presenting the model, that still hold for the new version. The purpose of the MASST model is to create territorial scenarios under different assumptions about the main driving forces of change that will act in the future. The quantitative results of the model are not precise values of specific economic variables in the future, but – on the basis of a system of past socio-economic relations – they depict the tendencies and relative behavioural paths of regional GDP (and regional employment) in each individual region under certain conditions, i.e. probable states of the system that may become real under certain conditions that are exogenously assumed. Therefore, the model does not work as a short-term forecasting tool, but a long-term quantitative foresight model.

In a scenario-building exercise of this kind, the presence of the MASST model guarantees that the results do not directly derive from the assumed exogenous, context conditions (scenarios), since they are based on the structural relationships that hold together the economic system in an objective way (estimates).

Reference scenario

The MASST model has recently been applied to develop two scenarios: one reference scenario, which serves as a benchmark scenario, and an integrated scenario. Concerning the reference scenario, structural changes occurring during the crisis have to be taken into account. In fact, EU countries have come out of the economic crisis differently from what they looked like in 2007–2008. The productivity slowdown to which much of the slow pre-2007 growth is attributed[85] has not abated during and after the crisis, at least in most western economies[86]. Yet, after-crisis structural relations, especially at the regional level,

[85] G. Cette et al., „The pre-Great Recession slowdown in productivity", *European Economic Review* 2016, no. 88, s. 3–20

[86] J.G. Fernald, „Productivity and Potential Output before, during, and after the Great Recession", *NBER macroeconomics annual* 2015, vol. 29, no. 1, s. 1–51.

have been found to be significantly different than those before, and also after the end of, the crisis[87].

An extrapolative scenario is impossible to be derived on the basis of estimations of the pre-crisis or of the crisis period. For this reason, the MASST model has been developed so as to take into account structural changes. In the most recent version, macroeconomic relations are tested so as to isolate possible inflection points, on the basis of the identified estimates periods (2000–2008; 2008–2012; 2012–2016) that takes into account the most important events associated with the crisis. By the same token, the regional sub-model of MASST introduces similar periodization and tests whether and for which equations the three periods behave differently and in a statistically significant way.

Looking at the data on GDP growth since 2012, we can identify three relatively homogeneous clusters of EU countries. One is made up of four countries (Greece, Italy, Finland and Cyprus) which exited the crisis with stagnant GDP levels. A second cluster, comprising the majority of other EU-15 countries ("Old-15"), resumed growing as fast as during the crisis, which still slowed down their economies in the 2008–2012 period. A third cluster (comprising mostly Central and Eastern European countries, henceforth, CEECs with the exception of Ireland and Luxembourg) managed not to slow their economies during the years 2008–2012 and regained momentum, with some countries growing even faster than before the crisis.

The reason for the differences in GDP rates of these three groups emerge quite evidently in econometric estimates. In the post-crisis period, the reactivity of investment growth to GDP growth triplicates, showing much higher cumulative effects than before the crisis. This is particularly true for the fast- and medium-growth countries. At the same time, investments became more volatile, showing that they are less linked to their long-term trend. This is especially true for low-growth countries (Figure 1).

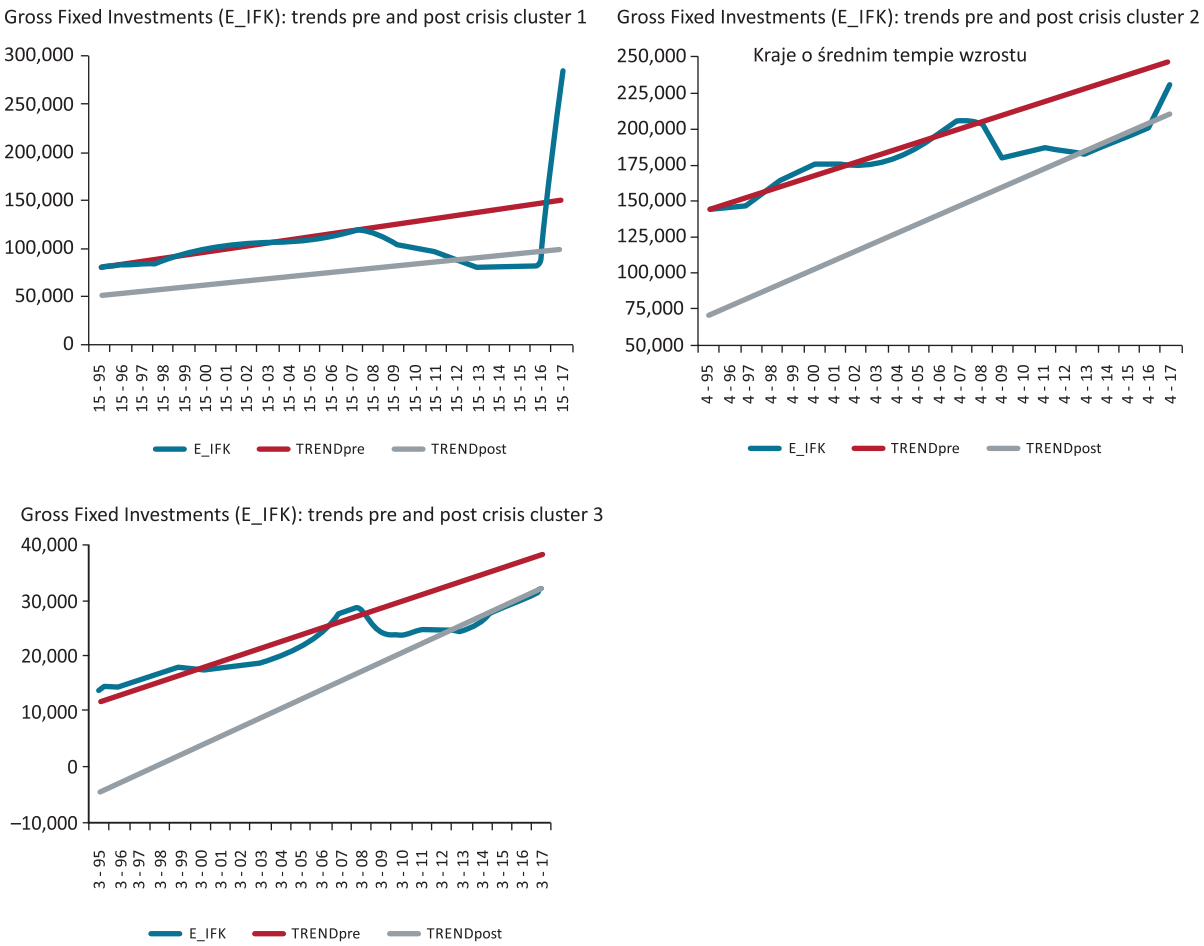
Other structural changes emerge. In its estimation phase, the MASST model shows that in the post-crisis period, after the pre-crisis de-industrialisation process of the European economy, an initial launch of high-tech industry in Europe takes place, under the influence of the new technological paradigm "Industry 4.0". Moreover, an increase in high-value added services is replacing the pre-crisis development of the service sector.

[87] R. Capello i in., „Compensation modes of border effects in cross-border regions", *Journal of Regional Science* 2018, no. 58, s. 759– 785. https://doi.org/10.1111/jors.12386

These structural changes represent the assumptions for a “reference scenario”, complemented by additional elements that come from political and institutional decisions already made or under discussion:

- permanent controls on national deficits and debts, as decided by the European Union;
- some controlled exceptions of public expenditures for low-growing and indebted countries (due to political risks, like the recent Italian elections showed);
- an increase in the risk of protectionism;
- end of the expansionary monetary policy (quantitative easing), as decided by the European Central Bank;
- Brexit taking place in 2019.

Figure 1. Pre- and post-crisis investment trends in the three blocks of countries



Therefore, the reference scenario differs from the baseline scenario, as it extrapolates the structural changes in the future. Run on the basis of such assumptions, the MASST model produces average regional GDP growth rates for the period 2018–2035, as presented in Table 1.

Table 1. 2018–2035 average yearly GDP growth rate by country and for the EU in the reference scenario

Country	Average GDP growth rate
Austria	1.54
Belgium	1.34
Bulgaria	1.97
Croatia	1.35
Cyprus	1.74
Czech Republic	1.46
Denmark	1.79
Estonia	2.04
Finland	1.19
France	1.60
Germany	1.72
Greece	1.38
Hungary	1.79
Ireland	1.74
Italy	1.60
Latvia	1.81
Lithuania	1.67
Luxembourg	1.60
Malta	1.92
Netherlands	1.45
Poland	1.74
Portugal	1.58
Romania	1.70
Slovakia	2.02

Country	Average GDP growth rate
Slovenia	1.44
Spain	1.37
Sweden	1.50
United Kingdom	1.49
EU-28	1.60
Old-15	1.59
CEECs	1.72

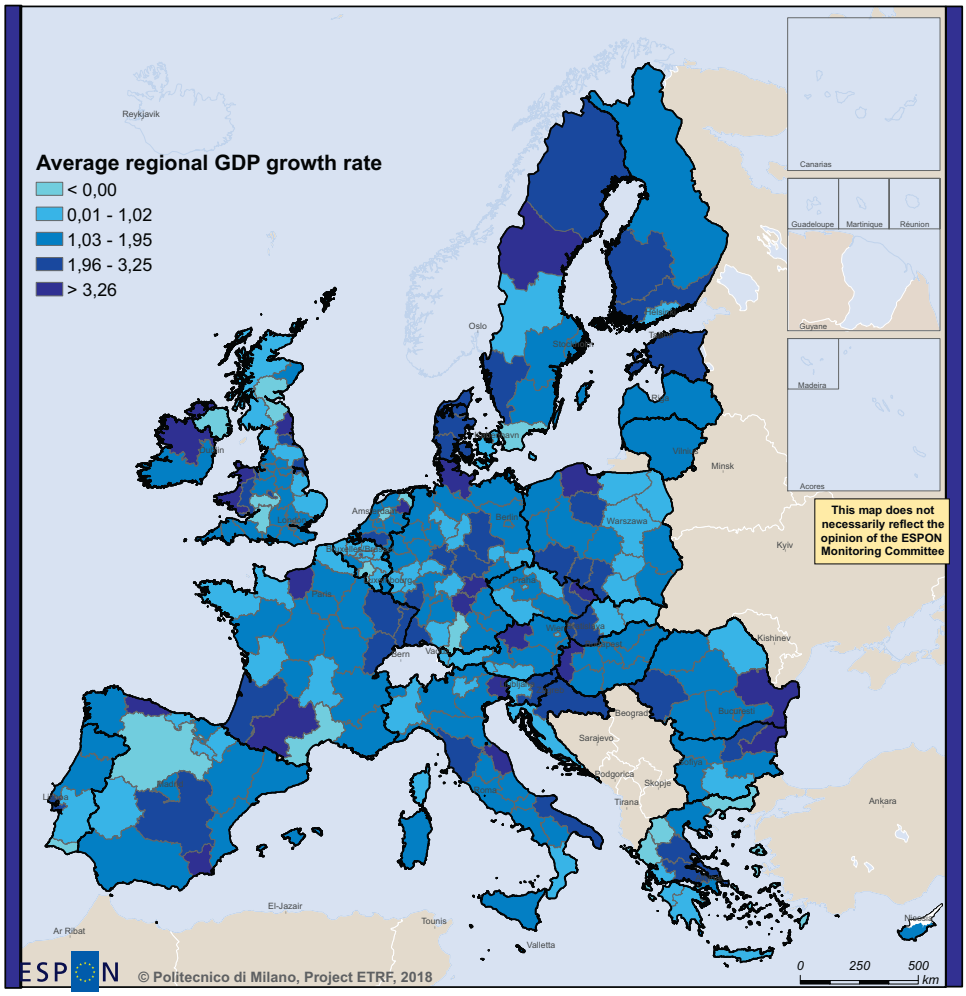
From a macroeconomic perspective, the reference scenario is characterised by a stable relaunch after the crisis, with an average yearly growth rate of 1.6% for EU-28. This result would have been slightly higher (1.61%) had the United Kingdom, for which the projection of economic growth is worse due to the potential negative consequences of Brexit (1.49%), not been taken into account in the simulation. Central and Eastern European countries are developing faster than EU-15 countries (1.72% vs 1.59%), but the difference is much smaller than before the crisis. UE-15 countries are characterised by a slow increase in overall productivity, which in line with the forecasts presented in OECD[88]. Moreover, the difference between Old-15 and New-13 is more consistent in terms of productivity than in terms of employment growth. CEECs are likely to experience a second transition, although a less problematic one with respect to the first one, towards a more equilibrated, endogenous pattern of development. Old-15 countries, instead, are entering a stage of re-launch thanks to an advanced and pervasive use of new technologies and the benefits of what is commonly known as "Industry 4.0". In this scenario, Poland is expected to keep on outperforming EU-28 in both scenarios,[89] although the rest of CEECs will grow slightly faster, but at a smaller pace than other Eastern countries.

88 OECD, *The future of productivity*, Paris 2017.

89 MASST simulations represent quantitative foresights, rather than standard forecasts. They present likely future growth rates that should not be interpreted as point estimates, but rather as differential growth rates with respect to other regions in the same period. In qualitative terms, though, Poland's performance is still expected to be stronger than the average EU, although its pace is projected to slow down relatively to what happened over the past two decades. As in many other CEECs, Poland is facing a process of major transformation, from an externally-driven fast growth country to a high-income country. This prompts many challenges that may affect its future economic performance.

Figure 2 presents the results at regional level, i.e. annual average GDP growth rates between 2018 and 2035 in EU NUTS 2 regions. The map does not highlight any longer the macro-regional patterns that were present in the recent past (namely the celebrated East-West divide and the North-South differentials that emerged in the early stages of the crisis). Regional growth rates are now converging around the averages and diverging behaviours involve some single regions (like Castilla Leon, Algarve, Languedoc-Roussillon, Croatia, North-Western regions in Greece and the Aegean islands and southern Sweden).

Figure 2. Average annual regional GDP growth rate, reference scenario, 2018–2035



Source: Authors' elaboration

Some dualism is still left in terms of regional GDP growth rates within individual countries, and even more so in terms of per capita GDP levels. The major and more evident cases refer to:

- the eastern part of Poland with respect to the more dynamic western (and particularly south-western) part of the country and to the capital region of Warsaw;
- the eastern and southern part of Greece, with respect to the core, central area;
- the Mediterranean axis in France, less dynamic than the rest,
- some (not all) regions in the Italian Mezzogiorno, like Abruzzo, Calabria and Sicily;
- the eastern part of Denmark, including Copenhagen, less dynamic than the rest of the country;
- some scattered regions in UK.

In general, major cities and their regions, although in good shape, are not necessarily the most dynamic in their respective countries, as could be expected. Major diffusion processes of new technologies and best organisational solutions will be apparently at work in the direction of solid, mid-income regions and medium-size cities.

An integration scenario

A second scenario has been built to verify the effects of a more integrated European economy, with the aim to simulate the costs of the present Eurosceptic attitude. With respect to the reference scenario, five additional assumptions have been included, namely:

- increase in the global value chain among EU countries ("*production integration effect*");
- further elimination of non-tariffs barriers among European countries ("*market integration effect*");
- increase in trust within and among countries ("*social effect*");
- higher quality governance ("*institutional effect*");
- stronger cooperation networks among cities ("*cooperation effect*").

Other assumptions, including Brexit in 2019, remain valid.

The results of running the integration scenario simulation are presented in Table 2 which shows annual average GDP growth for the simulation period (2018–2035) in the integration scenario as a difference with respect to the reference scenario. The results show that, while

on average all macro areas gain from a more integrated scenario, these gains are larger for CEECs than for Old-15 countries. Without UK, the European Union registers a slightly positive sign, witnessing that Brexit does not constitute a loss for the EU.

Table 2. GDP annual average growth rate in the integration w.r.t. reference scenario by country and for the EU

Country	GDP annual average growth rate in the integration w.r.t. reference scenario
Austria	0.21
Belgium	0.37
Bulgaria	0.19
Croatia	0.14
Cyprus	0.20
Czech Republic	0.28
Denmark	0.18
Estonia	0.20
Finland	0.16
France	0.13
Germany	0.17
Greece	0.13
Hungary	0.25
Ireland	0.26
Italy	0.12
Latvia	0.20
Lithuania	0.24
Luxembourg	0.48
Malta	0.39
Netherlands	0.28
Poland	0.17
Portugal	0.12
Romania	0.19
Slovakia	0.27
Slovenia	0.24

Country	GDP annual average growth rate in the integration w.r.t. reference scenario
Spain	0.14
Sweden	0.18
United Kingdom	0.11
EU28	0.24
Old15	0.23
CEECs	0.29
Poland	0.17

Source: Author's elaboration

In general, all countries benefit from an integration process, as broadly argued by international economics theories emphasising the advantages of scale and scope economies obtained through a larger market. UK gains much less than the average, registering a damage from leaving the Single Market. Within Old-15, Luxembourg, Belgium and the Netherlands, located in the core of Europe, gain the most, as expected. However, some exceptions are worth discussing; especially Ireland, a geographically peripheral country, and to some extent Austria, gain more than the average from the economic integration process. Ireland is also an open country, based on multinationals and their embeddedness in international input-output relationships and Global Value Chains. All CEECs benefit from the integration scenario, with the exceptions of Croatia and Poland, which gain relatively less compared to other CEECs.[90]

Figure 3 presents the results of the differences in GDP growth rates between the integration and reference scenario at regional level. A rather diverse picture emerges, with some regions even losing with respect to the reference, probably because of their lower ability to grasp the advantages of sudden integration. Instead of benefiting from a larger market, their non-competitive peripheral local markets suffer from being closer to the core, becoming easier areas to conquer by strong, competitive and centrally located firms.

[90] While the interactions among model equations makes it impossible to precisely identify and trace back the source of this relatively less strong impact of the integration scenario for Poland and Croatia, it could be argued that the structure of these economies hampers the full exploitation of a more integrated Europe. More specifically, most levers used in the definition of the integration scenario act through the regional sub-model, and Polish regions appear to be structurally less endowed with the growth-enhancing factors assumed to improve as a consequence of more integration (trust, cooperation networks, and quality of regional institutions) with respect to average EU28 values.

In general, most regions gain. However, the reasons are different, and specific advantages emerge in some areas. In particular:

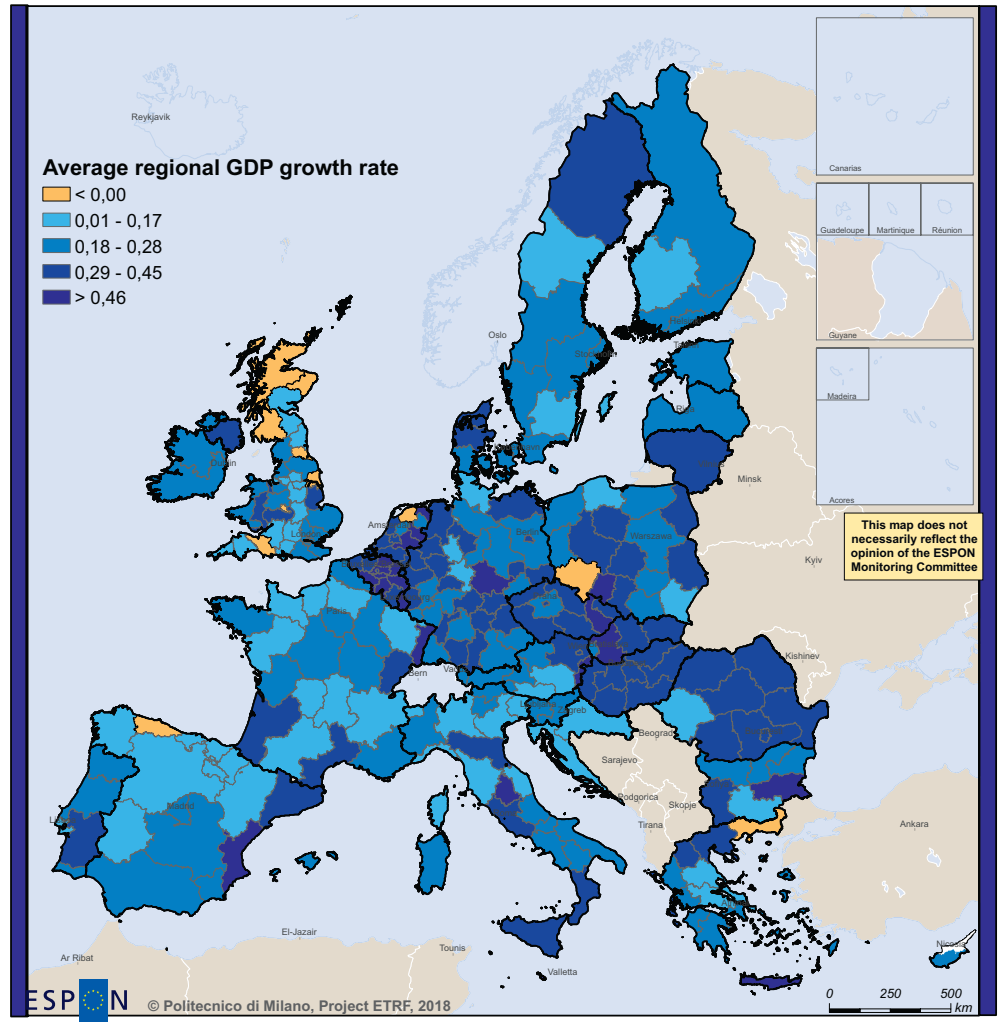
- southern regions in Italy, the Mediterranean regions of Spain and in the Bulgarian areas take advantage from the "production integration effect" and the "proximity to a larger market effect", which combine their impact;
- the southern part of Spain, Ireland and Scandinavian countries gain thanks to a "proximity to a larger market effect";
- the core of Europe, all the Benelux regions and the northern regions of Germany strongly gain, by being in the centre of a larger market.

It is interesting to see that there are regions that gain less in the integration scenario compared to the reference scenario (Figure 3). Even if this result may sound counter-intuitive, since integration is expected to be a positive push for economic systems, there are a few cases where this does not hold: integration means fiercer competition which calls for a certain degree of competitiveness in an economic system. Some regions in Scotland, in eastern countries and in the Iberian peninsula, still have better growth trajectories under reference scenario assumptions with respect to integration assumptions, demonstrating a limited capacity of their economic system to deal with higher competition. This situation is in line with what happened after the enlargement processes of the EU, when lagging regions strongly suffered from higher integration, something that pushed the Italian politicians to ask (and to obtain) to double cohesion policy funds for a country preparing for single market integration[91]. For what concerns Poland, Mazowieckie will continue its overall good performance, growth will diffuse to other peri-urban areas (for instance, Łódzkie and Kujawsko-Pomorskie). The Pomorskie Voivodeship, which is expected to perform very well in the reference scenario, will instead gain the least in a more integrated scenario. In this scenario, regions bordering Belarus and Ukraine in Poland will benefit greatly.[92]

[91] R. Camagni, „Scienze regionali e Mezzogiorno: concetti, principi e riflessioni normative", w: R. Camagni, A. Hoffmann, F. Latella (red.), *Mezzogiorno e scienze regionali: l'analisi e la programmazione*, Franco Angeli, Milano 1992, vol. 17, s. 23–45.

[92] The negative value for the Dolnośląskie Voivodeship is due to its openness, and, as a consequence, to its being more vulnerable to integration and increased competition. Still, it is worth reminding that this negative value must be interpreted as a difference with respect to the reference scenario. All Polish regions' growth rates remain positive even in the integration scenario.

Figure 3. Average annual regional GDP growth rates, integration scenario compared to reference scenario, 2018–2035



Source: Authors' elaboration

Conclusions

In this paper, we presented the MASST model, with particular reference to the way macroeconomic stability mechanisms and long-run structural trends are modelled. We also synthetically presented the results of two simulations of the model, namely a reference

scenario, taking long-run trends and structural changes into account, and an integration scenario, which instead assumes a step forward in the process of within-EU integration.

The results of these two simulations suggest that (i) more integration leads to a more expansionary economy, with nevertheless remarkable spatial heterogeneity in these effects; (ii) more integration further increases the costs of Brexit for the UK; (iii) more integration may also cause losses in some regions less endowed with crucial assets; and (iv) more integration also tends to increase cohesiveness.

For Polish regions, in both scenarios, the Mazowieckie Voivodeship will grow at a slightly slower pace compared to the past two decades, but only in relative terms. In the reference scenario, the region of Pomorskie will benefit the most. In the integration scenario, instead, regions to the East and West of Poland will be gaining the most.

Poland faces several challenges in dealing with the major changes induced by a more integrated scenario. The country has been successfully enjoying a long period of major economic and social transformations, which made it the most competitive economy among CEECs. Still, the quality of regional production factors will soon have to be raised to the standards of Old-15 countries. This means fostering connectivity both in terms of physical transportation networks, but especially in terms of long-distance cooperation networks; enhancing trust within Polish regions; and improving the quality of regional institutions.

These policies require time and remarkable effort, since they imply a major restructuring of the development model which is currently adopted; however, they will be needed for making Poland's economic performance sustainable in the medium and long run, and for truly distributing its economic growth effects to the widest number of Polish citizens.

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Roberta Capello was born in Milan, Italy. At present, she is a full professor of Regional Economics at the Politecnico of Milan. She holds her first degree in Economics from Università Commerciale Luigi Bocconi, Milan, Italy, and a PhD in Economics from the Free University of Amsterdam, the Netherlands. President of the Regional Science Association International (2009–2010), Member of the European Organising Committee and Treasurer of the European Regional Science Association (ERSA) (2000–2006), and National Secretary of the Italian Section of the International Regional Science Association (1995–1998). Editor-in-chief of Papers in Regional Science (Wiley Blackwell, Oxford) and of the Italian Journal of Regional Science (FrancoAngeli, Milan), as well as Editorial Board member of several international scientific journals (The Korean Spatial Planning and Review, Growth and Change, Revue Géographie, Economie et Société, Annals of Regional Science, Revue d'Economie Régionale et Urbaine; Journal of Regional Science). Carrier prize of the 50° ERSA (European Regional Science Association) anniversary (Jonkoping, 2010), and Laurea honoris causa from the West University of Timisoara, Romania (October, 2012). Fellow at the Regional Science Association International (since 2013). She is the Deputy Director of the ABC Department (2017–2019).

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