

The cost of missed EU integration^{1,2}

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Abstract

The 2016 referendum held in the UK about the possibility to quit EU membership as well as a wave of populist movements sweeping all over European Countries seem to suggest that less integration could be an outcome for the European Union. This paper has the aim to measure the cost of a missed integration, by highlighting what GDP growth would be in case of a missed integration. It does so by building a scenario of missed integration and compare it with a reference scenario. Scenarios are based on the Macroeconomics, Social, Sectoral, Territorial (MASST) model, that has recently been updated to its fourth generation, whereby regional economic relations are tested econometrically. The estimated cause-effect chains are then the basis to build new scenarios simulated under complex sets of internally coherent assumptions in a simulation stage. The reference scenario presented is not a simple extrapolation of past trends; the post-crisis period registered structural changes to be taken into account for the future. In the integration scenario, we assume further integration within the EU to take place through the following changes: (i.) higher trade flows among EU countries (“production integration effect”); (ii.) higher decrease in non-tariffs barriers (“proximity effect to larger markets”); (iii.) higher trust within and among countries (“social effect”); (iv.) higher quality of government (“institutional effect”); (v.) stronger cooperation networks among cities (“cooperation effect”); and (vi.) higher exports (“market integration effect”). Results show that a more integrated scenario leads to faster economic growth across all EU countries. Territorial disparities are also initially lower in the case of more integration, although this difference abates over time. Lastly, the gains from integration are not spatially even and some regions gain more than others.

Keywords: Macroeconometric Regional growth models, Scenario simulation, Regional growth, Economic Integration, Quantitative Foresight.

JEL classification codes: R11, R12.

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1. Introduction

The recent economic crisis, the 2016 referendum held in the UK about the possibility to quit EU membership as well as a wave of populist movements sweeping all over European Countries open to a different future for EU regional economies, and call for a possible interpretation of their effects, if they drastically pervade Europe, leading to a “failure” of the integration dream for the European Union.

This paper aims at presenting a scenario exercise of missed integration. The final goal of such exercise is to raise awareness of the costs of such missed integration for Europe as a whole, for its countries, and its regions. The costs will be calculated in terms of missed GDP growth compared with a reference scenario, that cannot simply represent a linear extrapolation of past tendencies. The 2008 crisis brought about structural changes in the economy; consequently, the after-crisis period cannot be compared to the pre-crisis period in the macroeconomic and industrial structures of the economies, as the econometric estimates of macroeconomic and industrial relations show.

The scenarios are built based on the Macroeconomics, Social, Sectoral, Territorial (MASST) model (Capello, 2007; Capello and Fratesi, 2012; Capello et al., 2017), that has recently been updated to its fourth generation (Capello and Caragliu, 2020), whereby regional economic relations are tested econometrically. The estimated cause-effect chains are then the basis to build a new scenario simulated under complex sets of internally coherent assumptions in a simulation stage.

In particular, in the integration scenario, we assume further integration within the EU to take place through the following changes: (i.) higher trade flows among EU countries (“production integration effect”); (ii.) higher decrease in non-tariffs barriers (“proximity effect to larger markets”); (iii.) higher trust within and among countries (“social effect”); (iv.) higher quality of government (“institutional effect”); (v.) stronger cooperation networks among cities (“cooperation effect”); and (vi.) higher exports (“market integration effect”).

Results show that a cost of missed integration does exist. In fact, a more integrated scenario leads to faster economic growth across all EU countries, although two interesting results emerge. The first one is that the gains from integration are not spatially even and some regions gain more than others. Secondly, the gains are not a constant result from integration. Some regions register a lower GDP growth in an integration scenario, a signal of the weakness of their economy, unable to cope with an international competition. This result may also explain (even if not justify) in some cases the tendency towards autarchy and closeness of some parts of Europe.

Another interesting result of the scenario exercise is the change in regional disparities. The empirical analysis shows that regional inequalities initially lower in the case of more integration, although this difference decreases over time.

This chapter is structured as follows. In Section 2 we provide a synthetic description of the methodology for building quantitative scenarios, which represents the basis of the MASST model. Section 3 describes the first scenario: a reference scenario whereby some major structural changes, also described in the section, taking place in the EU economies in the aftermath of the 2007-2008 economic crisis are taken into account. Section 4 presents instead a different scenario, modeling the possible benefits stemming from further integration among EU economies, as a deviation with respect to the results obtained in the reference scenario. Lastly, Section 5 concludes by illustrating some possible future research avenues, mostly related to the need to take an additional (and presently ongoing) further structural change in EU economies, namely the COVID-19 medical emergency which will likely reshape many of the relations modeled in this work.

2. Scenario building methodology and the MASST4 model

The aim of the paper is to provide territorial scenarios on how the future of Europe will look like under the assumption of a more intense degree of integration. Quantitative results obtained through the model are not meant to be forecasts. The aim of a forecast is to obtain precise values of specific economic variables in the

future, on the basis of extrapolations of a system of past socio-economic relations, and since they extrapolate from past tendencies, forecasts yield the best results in a short-term perspective.⁵ However, the aim is not to build foresights either, i.e. an image of the future based on radical breaks, on structural effects which destroy past tendencies like a new technological paradigm, new socio-cultural models, new political regimes. A foresight is a possible, probable and even desirable image of the future based on a structural and radical break with the past, and assuming in general a long-term perspective (usually decades).⁶

The goal is to provide what can be defined as a “*quantitative foresight*” in that it is the result of three major steps.

In the first step, we build a scenario whereby an image of the future is constructed on the assumption that a discontinuity will emerge in the main elements or driving forces that influence and regulate the system. In our case, the main assumption representing a discontinuity is the degree of integration that takes place in regional economies, presented in Sections 3.2 and 4.1, for the reference scenario and the integration scenario assumptions respectively.

In the second step, a theoretical structure linking relations among economic variables modeling the structural relations in the regional economies included in the analyses, thanks to a macroeconometric regional growth forecasting model, called MASST, now in its fourth version (Capello and Caragliu, 2020). This structure, based on a Keynesian set of quasi-identities for the national model, and on various strands of the regional economics literature for the regional component is shown in Figure 1 for the present generation of the model (MASST4).

Figure 1 shows that the MASST model is based on the interrelation between a national sub-model, depicted on the left-hand side of the figure, and a regional model, visible on the right-hand side. The link between the two sub-models is based on the regional differential shift, which identifies deviations of regional GDP growth rates with respect to national mean growth rates as defined in Eq. (1.):

$$\Delta Y_r = \Delta Y_N + s; r \in N \tag{1.}$$

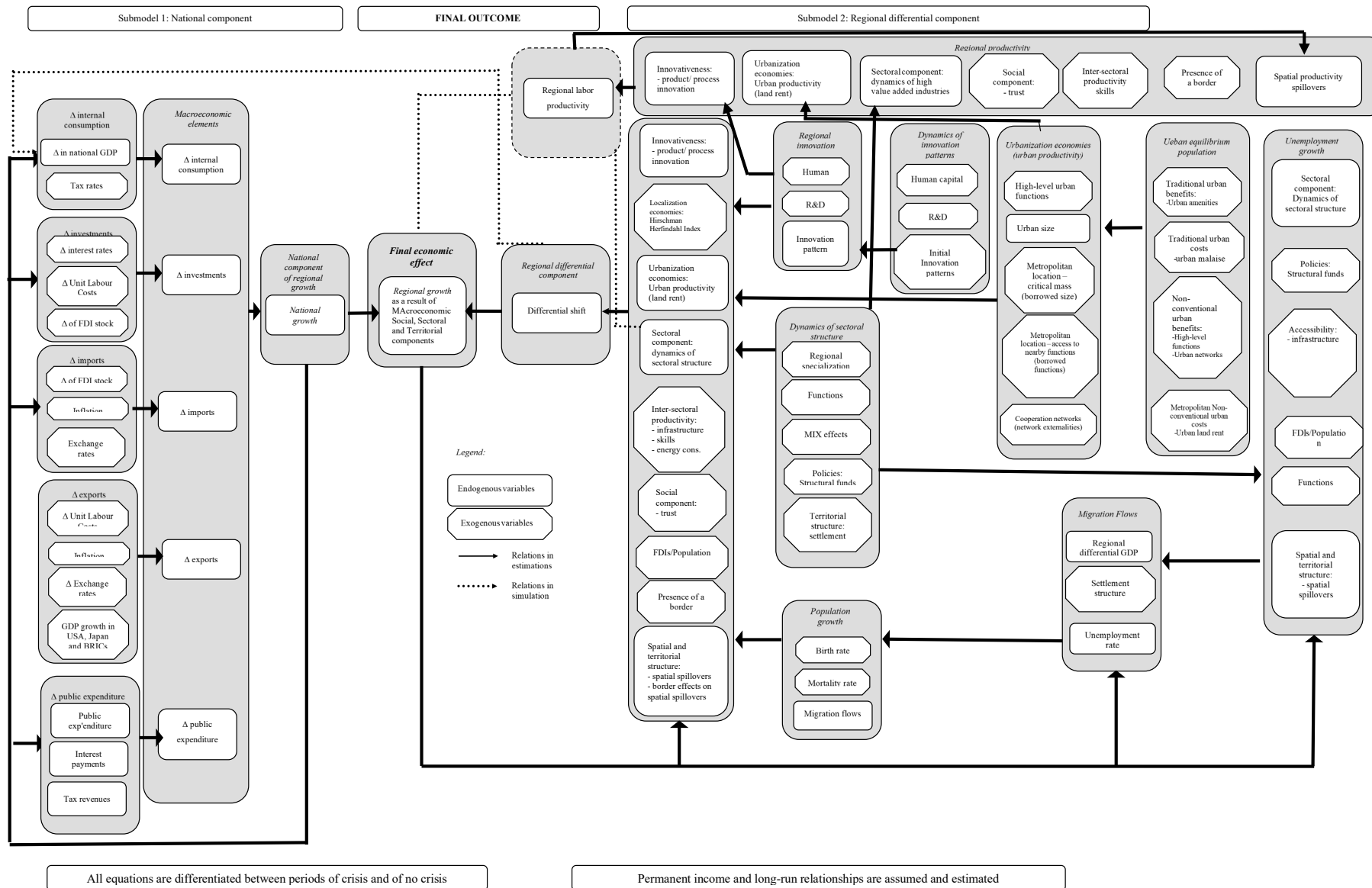
where N represents the Country to which each region r belongs, while ΔY indicates GDP growth, and, lastly, s stands for the regional differential shift.

In the MASST model, growth is explained mostly by national features. National competitiveness stems from institutional (such as government efficiency), organizational (for instance, transport infrastructure), and economic (price competitiveness) characteristics, while at the same resting on competitiveness on international markets. The national model also explains national economic performance as a result of global demand for local products. The capacity of regions to grow depends instead on the local endowment of specific tangible and intangible assets, which we label *territorial capital*. These include static and dynamic features of territorial innovation patterns, static and dynamic agglomeration economies, regional productivity, regional institutions, trust and sense of belonging, and industrial composition. Thus, while the national model is geared towards capturing demand-side elements, the regional sub-model mostly deals with supply-side elements.

⁵ On forecasting methodologies see, among others, Armstrong (1985); Hawkins (2001); Hendry and Clements (2001); and Loomis and Cox (2000).

⁶ On foresight methodologies see, among others, CEC (2004); Miles and Keenan (2000); UNIDO (2004).

Figure 1. Logical scheme of the MASST4 model



Source: Capello and Caragliu (2020)

The relations among national and economic variables are estimated with different econometric techniques depending on the availability of shorter or longer time series for each data vector and the preferred specification chosen on the basis of standard econometric testing for each equation. While the interested reader is referred to Capello and Caragliu (2020) for additional details on the advances presented in the fourth generation of the MASST model, it here suffices to mention that the model presently works on the basis of six national equations, 9 regional equations, and 2 urban equations, with yearly data covering the period 2000 through 2016 for the national sub-model and three period average data for the pre-crisis (2004-2008), crisis (2008-2012) and after-crisis (2012-2015) periods for the regional sub-model. A panel structure for both the national and regional sub-models allows therefore to exploit cross-sectional and time variation across all Countries (27 + the UK) and NUTS2 regions (276) of the European Union.

Lastly, **in the third step of the procedure**, estimated relations are used in a so-called simulation stage, that produces quantitative forecasts for a period ranging between 15 and 20 years. The fourth generation of the model, for instance, produces forecasts for the 2018-2035 period.

This stage is based on dividing model variables in endogenous (i.e., determined within the model on the basis of the equations illustrated in Figure 1) and exogenous, i.e. not explained by the model. The latter represent model levers, i.e. strategic regional and national characteristics for which target values can be decided by the modeler. The choice of targets depends on assumptions that, within the quantitative foresight approach, are based on scenarios, i.e. internally coherent sets of conditions that define possible future growth paths. These scenarios do not need to be more or less likely to happen; on the contrary, extreme conditions are often sought, so as to highlight major bifurcations in future growth patterns, which ultimately allows the model to steer towards a cluster of conditions that target variables are assumed to fully or partially reach within the simulation period.

This process is regulated by Eq. (2.), which defines the process of adjustment of target variables towards their goals:

$$x_t = x_{t-1} + S(T - x_{t-1}) \quad (2.)$$

where x represents a model lever, t stands for each time period, T is the variable target, and, lastly, S represents the speed of adjustment.

When $T=1$ the adjustment of the variable is instantaneous (i.e. it takes place in the first year). Values of T lower indicate more gradual adjustments, and the choice of S is in itself a lever for the modeler. Typically, faster adjustment speeds are chosen for policy variables, while slower adjustment speeds are selected for structural variables, such as demographic characteristics. In the MASST model, targets can be unique for all regions, as well as selected for groups of regions or even be region-specific.

Results obtained will not be precise estimates of future GDP levels, but rather the main tendencies, major adjustments to change, relative behavioural paths that will be at work, given some conditional assumptions about the influence of the main driving forces.

3. A reference scenario

3.1. Structural changes in EU economies after the 2008 crisis

In the aftermath of the financial crisis starting on Sep. 15, 2008, with Lehman Brothers filing for bankruptcy, several relations founding the structure of both national and regional economies has changed for good. Consequently, the reference scenario cannot be the simple extrapolation of past tendencies, and has to consider

the structural changes that occurred in the 2008 crisis.⁷ This section documents stylized facts that help us understand how the new structure of the MASST4 model was built, in the light of how European economies emerged from the end of the greatest economic contraction of the past two decades.⁸

The variable of interest in the scenario exercise is the GDP growth. Its past trend after 2008 shows the growing divide in terms of aggregate economic performance across three clusters of Countries, witnessing a different reaction to economic crisis by European countries. Countries can statistically be grouped by performing a cluster analysis⁹ (see Table A1 in Annex 1) on the performance of EU Countries across three indicators of aggregate economic activity (unemployment levels, job creation, and real GDP growth) in 2015.

Figure 2 shows 2000-2016 real GDP growth rates in the three Country clusters identified, setting the value of each Country cluster in 2000 as 100. Figure 2 highlights that, rather strikingly, despite identifying clusters with the after-crisis economic performance only, patterns of GDP growth remained fairly stable for more than 15 years. In other words, the crisis exacerbated long-run trends that were already present in EU economies: Countries displaying sluggish GDP growth before the crisis hit (blue line in Figure 2) also tended to be outperformed by Countries with middle (red line) and fast (green line) GDP growth both before, as well as during and after the crisis ended.¹⁰ For the rest of this subsection, we will maintain the same color code so as to better highlight the different performance of these groups of Countries across many different economic indicators.

Not surprisingly, most Countries belonging to the third cluster are located in the Eastern part of Europe, with the exception of Ireland, Luxembourg, and Sweden – all Countries located in the core and Northern part of the Continent. All countries located on the Southern and South-Western tip of the continent have instead been experiencing rather poor economic performances, especially when compared to the prior decades characterized by robust GDP growth. This is in particular true of Greece, Spain, Portugal, Cyprus, and, to a minor extent, Italy. This piece of evidence has prompted many to stress the emergence of a new North-South economic divide within the EU, adding to the traditional Old VS. New Member States one (Iammarino et al., 2017).

Different reasons hide behind such different performance. A first convincing explanation for these diverging trends lies in the different investment behavior in these three groups of Countries. To this aim, Figure 3 shows for the low-growth (Figure 3.a; blue line in Figure 2), medium-growth (Figure 3.b; red line in Figure 2), and fast-growth (Figure 3.c; green line in Figure 2) EU Countries the following indicators:

- in red color, the pre-crisis (1995-2008) investment trend;
- in green color, the after-crisis (2012-2017) investment trend;
- in blue color, raw annual investment rates.

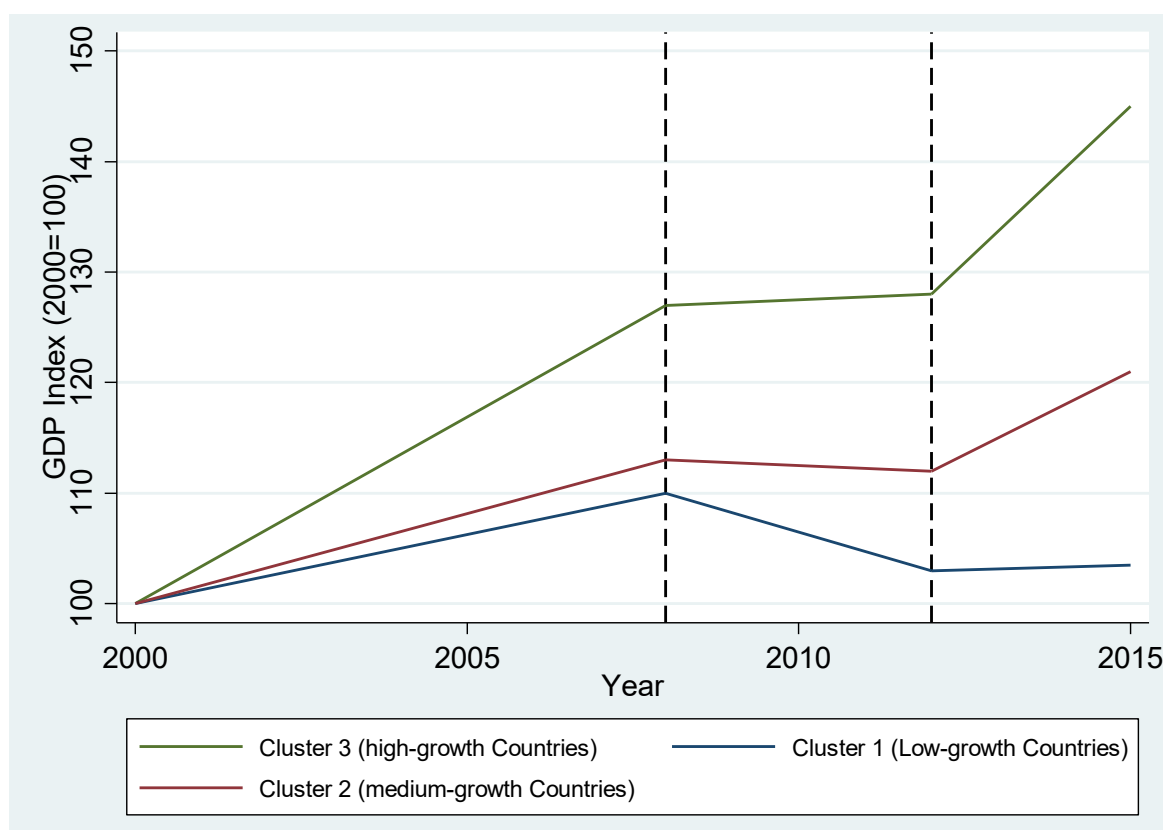
⁷ This work has been carried out before the 2020 COVID-19 pandemic, and therefore does not take its economic consequences into account. However, the aim of the paper remains valid. In fact, under the realistic assumption that the new crisis has to be taken into consideration in both the reference and the integration scenarios, its existence does not affect the relative results.

⁸ Once again, while precise forecasts are not yet available at the time this is being written, the medical emergency due to the pandemic diffusion of the COVID-19 virus in the first half of 2020, and the ensuing lockdown measures taken in many Countries is likely to cause an even worse contraction of GDP in many EU countries than the 2007/2008 crisis. In fact, the IMF presently foresees a likely contraction of world GDP in 2021 for the first time in decades (World Economic Forum, 2020).

⁹ The cluster analysis has been performed on the basis of the kmeans method setting the target to obtaining three groups of Countries. Dissimilarity across groups has been defined in terms of Euclidean distance (Minkowski with argument 2). Lastly, centers of cluster have been identified with the first k observations from those to be clustered.

¹⁰ Our working definition of the end of the crisis sets it to 2012, the first year in which EU GDP resumed pre-2008 levels. This does not imply that in 2012 all EU Countries achieved this goal; in fact, in purchasing power standard per capita terms, in 2012 Greece, Spain, Croatia, Italy, Cyprus, the Netherlands, Portugal, Slovenia, Finland, and the UK were still off target.

Figure 2. 2000-2016 real GDP growth rates in the three Country clusters identified, 2000=100.



Source: Authors' elaboration on the basis of EUROSTAT data

Figure 3 shows that after-crisis investment trends differ with respect to before the crisis in that Countries with sluggish GDP growth are characterized by similar investment trends, in all such Countries slower than in the other two groups of countries. At the same time, in medium-growth countries investment trends have been steeper, and this effect is even stronger for fast-growth Countries. It is also important to stress that in the aftermath of the crisis, reactivity of investment growth to GDP growth becomes three times as large with respect to the period before the crisis, which likely suggests higher cumulative effects of investment on GDP. Lastly, as investment remained structurally more volatile, this means that it also is less directly linked to its long-term trend, thus making reasonable forecasts ever more complicated.

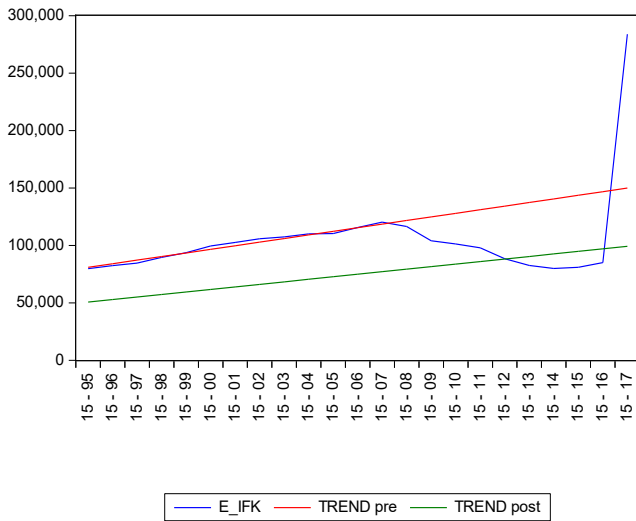
A further implication of the different performance of Country groups in terms of wealth creation (GDP) and investment propensity is also the different level of opening to international trade. This is evidenced in Figure 4, showing the ratio of exports to GDP in Country clusters for the period 2000-2016.

Figure 4 offers a rather staggering picture. While Countries characterized by low GDP growth rates across the 16 years (2000-2016) represented on the graph display a rather poor performance in terms of opening up to international trade, Countries in the fastest growth cluster increased their export to GDP ratio by 45 per cent (an average compound increase of 2.3 per cent per year over the 16 years observed in these analyses). This is in line with evidence presented in classical works such as Dollar and Kraay (2004), suggesting that trade openness is conducive to faster GDP growth rates.

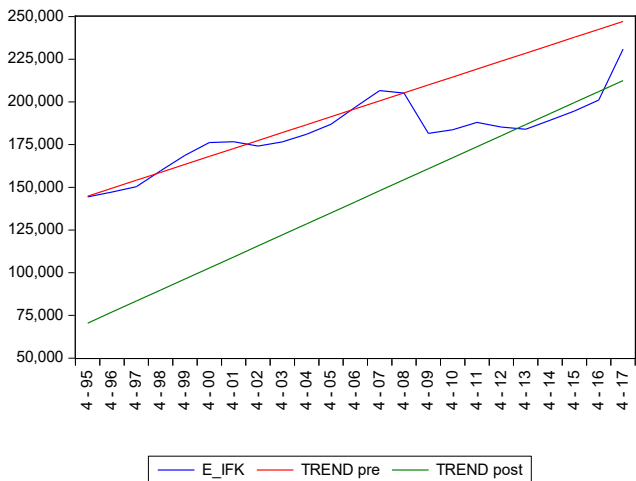
Countries experiencing poor economic performance also offer a similarly sobering picture when analyzing another indicators of economic performance such as innovation expenditure (as proxied by R&D expenditure over GDP; Figure 5). Figure 5 suggests that towards the goal set by the 2020 Agenda for the EU to reach the celebrated 3 per cent of R&D expenditure, only Countries belonging to Cluster 3 (that experiencing fastest growth rates) are getting substantially closer to the target set.

Figure 3. Pre-crisis and after-crisis investment trends

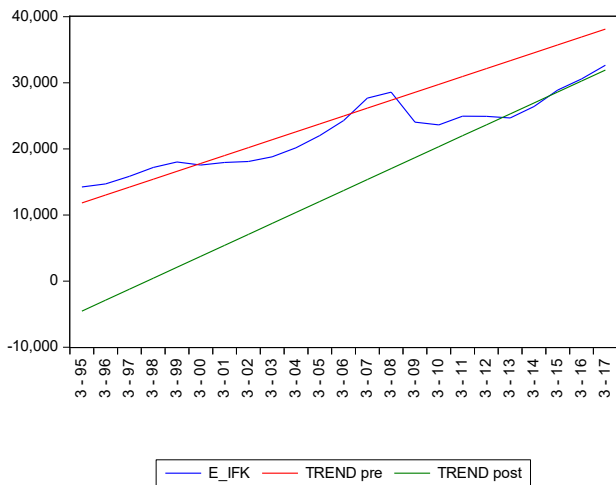
3.a. Pre-crisis and after-crisis investment trends in low-growth Countries
Gross Fixed Investments (E_IFK): trends pre and post crisis cluster 1



3.b. Pre-crisis and after-crisis investment trends in medium-growth Countries
Gross Fixed Investments (E_IFK): trends pre and post crisis cluster 2



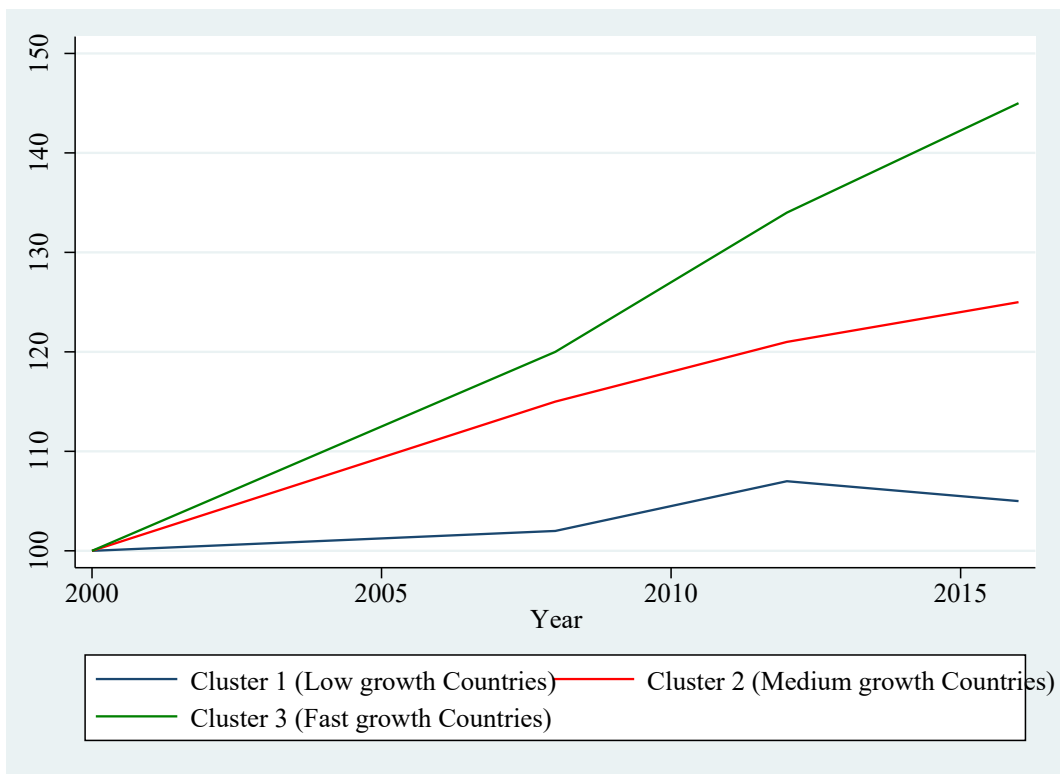
3.c. Pre-crisis and after-crisis investment trends in fast-growth Countries
Gross Fixed Investments (E_IFK): trends pre and post crisis cluster 3



Legend: Red - pre-crisis (1995-2008) trend; Green – After-crisis (2012-2017) trend; Blue – annual investment.

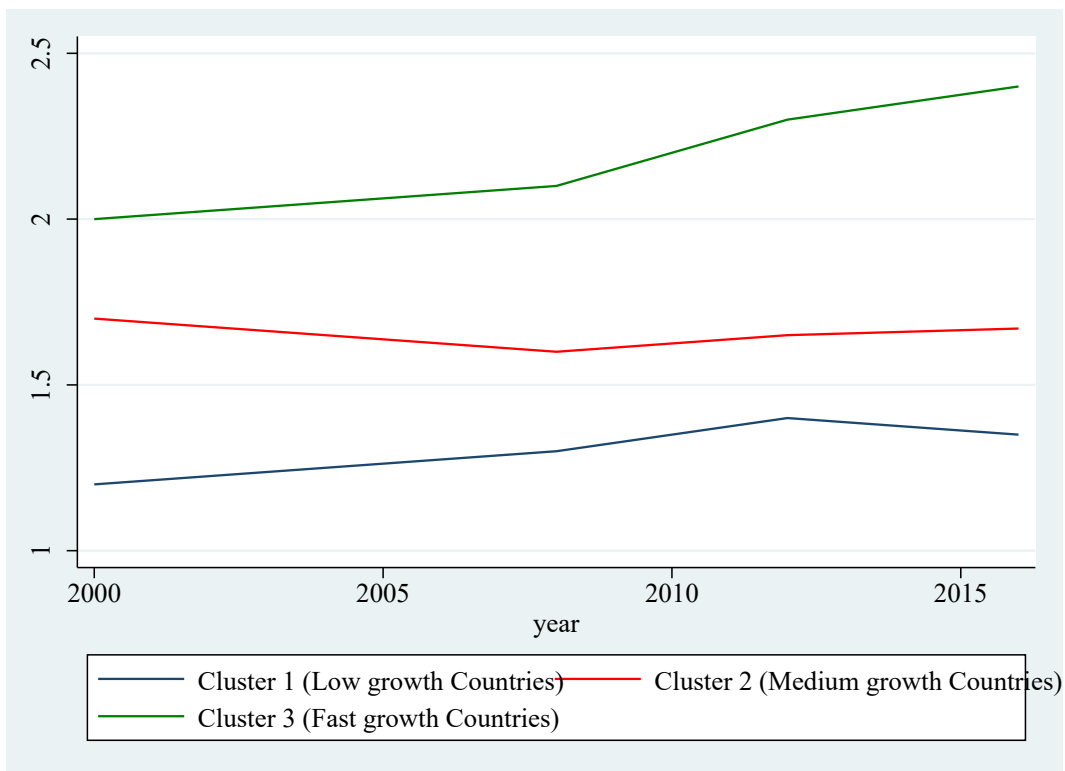
Source: Authors' elaboration on the basis of EUROSTAT data

Figure 4. 2000-2016 export/GDP in Country clusters



Source: Authors' elaboration on the basis of EUROSTAT data

Figure 5. 2000-2016 R&D expenditure/GDP in Country clusters



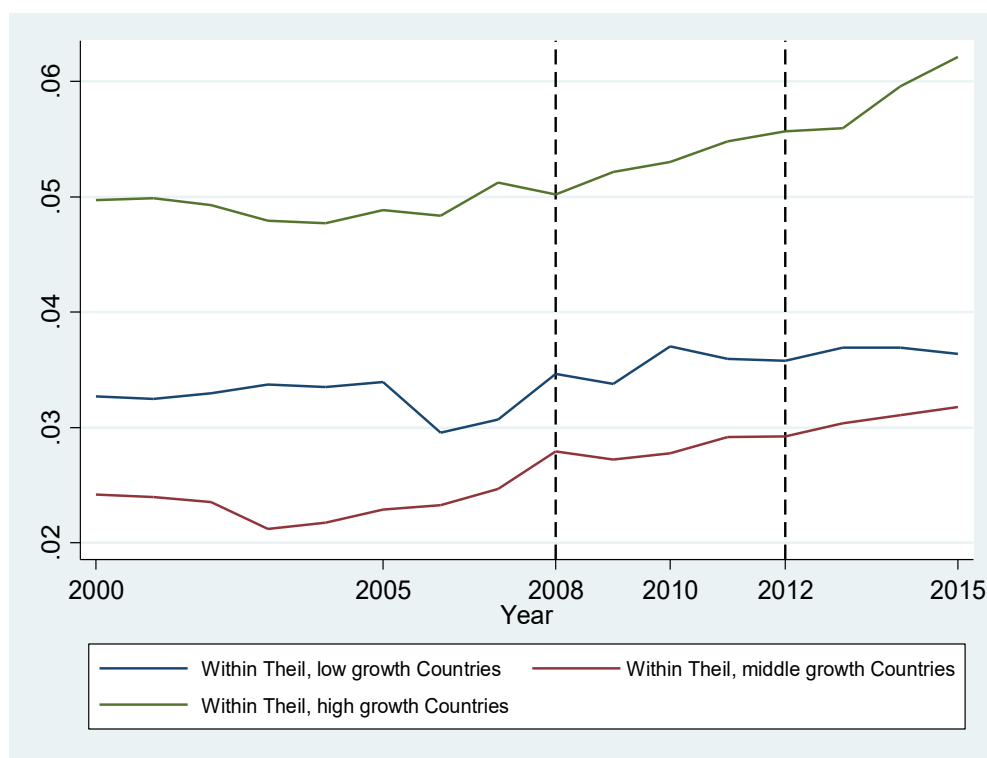
Source: Authors' elaboration on the basis of EUROSTAT data

Additional evidence, discussed more in detail in Capello and Caragliu (2020), of the changes taking place in the aftermath of the crisis include the following major adjustments:

- While before the crisis a process of deindustrialization of the European economy was taking place, an initial launch of high-tech industries in Europe, under the influence of the new technological paradigm “Industry 4.0” followed suit;
- By the same token, an initial shift from a specialization in low-value added services taking place before 2008, an increase in high-value added services took place across many EU Countries as a reaction to the economic contraction.

Not unexpectedly, these staggering differentials in national growth patterns exert a major impact on territorial disparities. To provide evidence of this last statement, we first calculated a Theil index decomposing GDP disparities into overall, within-Countries, and between-Countries disparities for the three groups identified above. While prior to the crisis a major process of within-EU convergence in per capita income levels took place, mainly because of the substantially faster economic performance of New Member States, the crisis imposed a halt to this process (Borsi and Metiu, 2015; Barrios and Strobl, 2009). Yet, as Countries re-emerged from the global contraction at different speeds, so did the process of divergence, with Countries experiencing fastest growth displaying (Figure 6) the most severe increase in within-Countries disparities. On the other end, and precisely because of their less rapid economic growth, Countries in the other two clusters suffered from smaller increases in the within-Country Theil index.

Figure 6. Within countries regional disparities by groups of countries



Source: Authors' elaboration on the basis of EUROSTAT data

While being far from conclusive and not yet taking cause-effect mechanisms into account, the evidence presented so far does suggest that structural relations among economic variables changed as a consequence of the contraction. This last point needs to be taken into account when shaping a reference scenario (Section 3.2) that goes beyond simply extrapolating long-run trends, but rather aiming at capturing the long-run consequences of such structural changes. The simulation exercise will also provide an evidence-based educated guess on the above mentioned goal of identifying cause-effects linkages, thereby shedding light on the most important structural relations in the analyzed economies.

3.2. Reference scenario assumptions

The reference scenario is based on the assumptions that the structural changes previously discussed will remain valid in the medium run future. Thus, in this subsection we discuss the main assumptions made on the most important macroeconomic and territorial trends characterizing the reference scenario.

First, we start by listing a few pre-crisis conditions assumed to be more or less likely to remain valid in the after-crisis period:

- a high reactivity of investment growth to GDP growth, although decreasing in the long term;
- high volatility of investments of the post crisis period will continue;
- free international trade between US and EU is replaced by a risk of protectionist measures between the US and the EU, causing a lower increase in exports with respect to the previous long term trend.

We then include several trends emerging during the crisis that are in their turn likely to continue in the future:

- permanent controls on national deficits and debts;
- some controlled exceptions of public expenditures for low-growing and indebted countries (due to political risks, like several recent elections in Italy, the UK, Spain, and Greece showed);
- low inflation rates;
- expansionary monetary policy (quantitative easing) ending soon, as implied by the European Central Bank.

Moreover, the reference scenario is also based on several assumptions on industrial trends:

- a halt in the deindustrialization of the European economy, with an initial launch of high-tech industry in Europe, under the influence of the new “Industry 4.0” technological paradigm;
- an increase in high value-added services related to the adoption of Industry 4.0 related technologies.

The reference scenario also revolves around a few crucial assumptions on institutional changes:

- Brexit becomes effective in 2020. The way in which the UK leaves the EU is not differentiated in the scenario exercise. What is of interest in this approach is that the UK leaves, and an institutional and trade barrier is put in place between the UK and the rest of the EU countries;
- even though some regional independency requests take place, no regional independence follows;
- there is a redistribution of the European budget in favor of new topics, such as security and migration, thereby decreasing the share of budget devoted to cohesion policies and Common Agricultural Policy (CAP). National shares are set at the levels decided in EC (2018), and maintaining regional shares as in the 2014-2020 programming period.

Lastly, from a territorial perspective, two additional assumptions are further formalized:

- urban amenities in Western countries are assumed to further increase;
- high quality functions are assumed to be upgraded and cooperation among cities fostered.

3.3. Reference scenario results

When inserted into the MASST model in quantitative terms, the above mentioned assumptions provide interesting results, presented in Table 1 for the EU28 as a whole (both with and without the UK as a member state) as well as by the major sub-continental aggregates (EU15 Countries, comprising all Member States joining the EU prior to 2004, and CEECs, joining from 2004 and after).

Table 1 suggests that the EU will benefit from a stable relaunch after the great contraction of 2007-2008. More in detail, the model predicts that CEECs still an average growth rate higher than Old 15 Countries (1.75% against 1.58%); however, the difference between the two major blocks of Countries in the EU has consistently

decreased. The acceleration in the rate of economic expansion following the 2007/2008 crisis is in line with the expected impact of various procyclical fiscal policies here included in the reference scenario assumptions and found to be positively associated to GDP growth (Nijkamp and Poot, 2004).

	Average GDP growth rate	Average productivity growth rate	Average total employment growth rate
EU28	1.60	0.29	0.27
EU27 without the UK	1.63	0.30	0.28
United Kingdom	1.40	-0.04	0.16
Old15	1.58	0.15	0.24
CEECs	1.75	0.63	0.38

Table 1. Aggregate results of the reference scenario.

Source: Authors' elaboration on the basis of the MASST4 model

While results at the Country level are left to the interested reader upon request,¹¹ it is here worth focusing on the rich picture emerging from the analysis of regional GDP growth. To this aim, Map 1 shows average regional yearly GDP growth rates between 2018 and 2035 for all 276 NUTS2 regions of the EU. The colors portray positive GDP growth with increasingly darker blue tones and the (admittedly few) regions registering negative GDP growth in yellow.

In general, Map 1 shows that large cities and metro areas, despite maintaining an overall positive economic performance, are not necessarily the most dynamic in their countries. Also, the map shows a vast diffusion of new technologies and organizational innovations especially towards mid-income regions and medium-size cities. Lastly, the reference scenario foresees a slowdown in the process of convergence of CEECs, already suggested in recent works (see e.g. Hagemeyer and Mućk, 2019).

4. An integration scenario

4.1. Scenario assumptions

The integration scenario is based on the general assumption that economic integration among European member countries will strengthen over the next 18 years, despite Brexit taking place.

More in detail, this generic assumption is broken down into five main levers that define this scenario:

- an increase in the integration of global value chains among EU countries (“*production integration effect*”);
- an elimination of non-tariffs barriers among European countries (“*market integration effect*”);
- a decrease in non-tariffs barriers (“*proximity to larger markets effect*”);
- an increase in trust within and among countries (“*social effect*”);
- higher quality of government (“*institutional effect*”);
- stronger cooperation networks among cities (“*cooperation effect*”).

These assumptions are translated into quantitative hypotheses described in Table 2.

¹¹ It here suffices to mention that inside the Old 15 group, the best performance in terms of GDP growth is found for Luxembourg, Belgium, Denmark, The Netherlands and Austria, while among CEECs top performers include Estonia, Slovakia, Bulgaria, Hungary, and Lithuania.

Map 1. Regional results of the reference scenario

Source: Authors' elaboration on the basis of the MASST4 model

Qualitative assumptions	Model levers	Quantitative assumptions (targets in 2035)
higher trade flows among EU countries ("production integration effect");	Trade matrix	Doubling of interregional trade flows intensity
higher decrease in non-tariffs barriers ("proximity to larger markets effect");	Border effects (interaction between border region dummy and FDI effects on regional DIF)	Elimination of the border effect
higher trust within and among countries ("social effect");	Trust	Increase in trust (everywhere, stronger in Old15 Countries and in metro areas)
higher quality of government ("institutional effect");	Quality of Government	Spatially-neutral increase in Quality of Government
stronger cooperation networks among cities ("cooperation effect");	Diffusion and thickness of inter-urban scientific cooperation networks (FP projects co-participation)	Spatially-neutral increase in inter-urban networks

higher exports (“market integration effect”)	Constant in national export equation	Increase in the constant in national export equation
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Table 2. Quantitative assumptions for the integration scenario

4.2. Scenario results

In this section, all results are presented against the backdrop of the reference scenario described in Section 3.

At the aggregate level, Table 3 shows average yearly GDP growth rates simulated by the MASST model within the integration scenario for the period 2018-2035 as a difference with respect to the reference scenario.

Average GDP growth rate	
EU28	0.24
EU27 without UK	0.25
United Kingdom	0.11
Old15	0.23
CEECs	0.29

Table 3. Aggregate GDP growth in the integration scenario, difference w.r.t. the reference scenario.

Source: Authors' elaboration on the basis of the MASST4 model

Table 3 presents two main highlights:

- While in the integration scenario both CEECs and Old15 Countries seem to benefit from a further deepening and broadening of the process of economic integration within the EU, it is important to stress that CEECs are the ones benefitting the most. Within a more integrated EU economy, countries receiving a substantial share of within-Europe Foreign Direct Investment, mostly targeting manufacturing activities, and exploiting thicker and more efficient labor markets, would reap the largest benefits.
- At the same time, while the EU as a whole benefits from a more integrated scenario rather uniformly, as suggested by advocates of free trade,¹² the UK is forecasted as a net loser in this game, its benefit being less than half¹³ the gains obtained by the EU as a whole. In this simulation, the UK is the single Country benefitting the least from the EU's further integration, which is likely due to its severing the several free trade and labor mobility agreements signed with European partners over the last five decades.

At a more disaggregate level, Map 2 shows average yearly GDP growth rates for all EU28 regions in the integration scenario, and again as a difference with respect to the reference scenario. In Map 2, oval shapes identify areas where the increased performance of EU regions can be explained by the proximity to larger market effect; in other words, these regions gain mostly because the removal of interregional trade and administrative barriers allows them to gain access to rich markets.

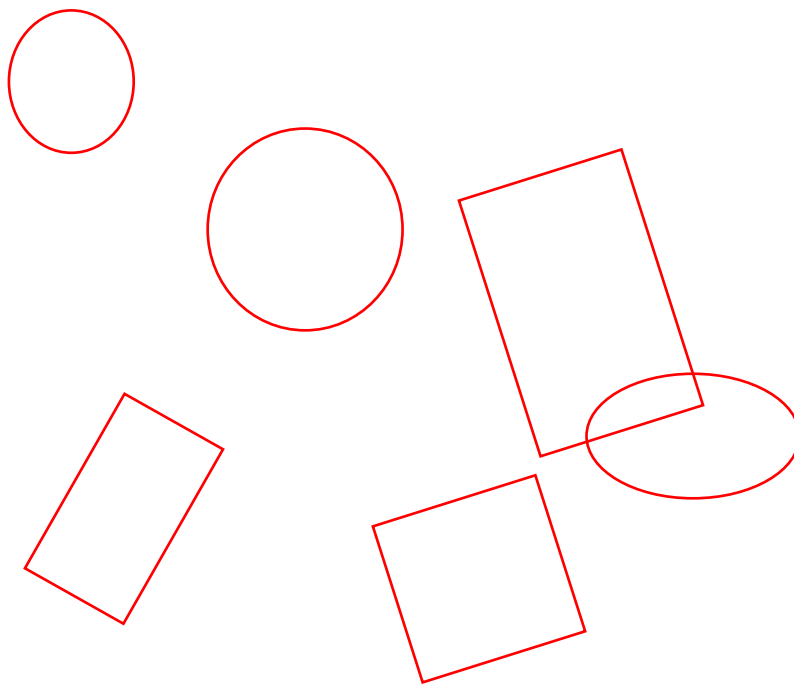
Regions marked with rectangles represent instead areas where a combination of the “*production integration effect*” and the “*proximity to larger market effect*” takes place. With respect to areas gaining mostly from their location in proximity to large markets, these areas also benefit from positive spillovers from areas specialized in manufacturing activities or characterized by high regional productivity levels.

Lastly, Figure 7 shows the results of calculating the Total Theil index for both the reference (continuous line) and integration (dashed line) scenarios.

¹² See Rodrik (2018) for a thorough review of the literature on trade openness

¹³ UK's percentage gain w.r.t. the EU is obtained as the ratio +11%/+25%.

Map 2. Regional results of the reference scenario



Legend:



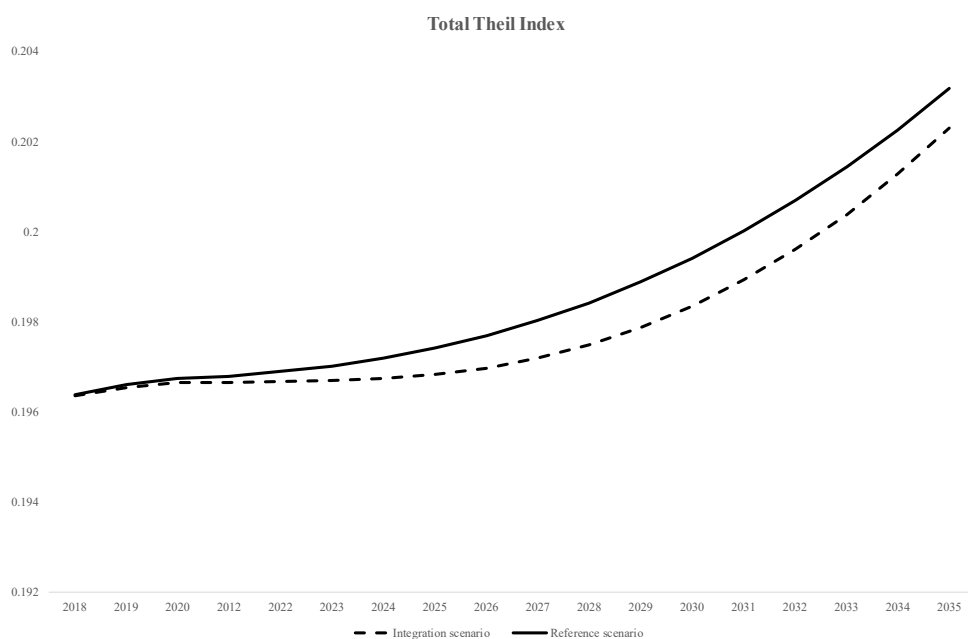
“proximity to larger market effect”



areas where a combination of “production integration effect” and “proximity to larger market effect” takes place

Source: Authors' elaboration on the basis of the MASST4 model

Figure 7. Total Theil index for the reference and integration scenarios, 2018-2035



Source: Authors' elaboration on the basis of the MASST4 model

While both scenarios suggest a likely increase in international income disparities, following the recent re-emergence of divergence in the EU, it also suggests that this trend could be partially offset by fostering further integration in the EU; in fact, the Theil index of the integration scenario remains uniformly lower with respect to the line representing the reference scenario (although the difference slightly decreases as we approach the end of the simulation period). In other words, we find that a scenario where integration is fostered leads EU regions to be on average more competitive, while at the same time enhancing cohesion.

5. Concluding remarks

This paper presented an application of the MASST4 model to the simulation of two scenarios, viz. a reference scenario procrastinating the structural changes induced by the 2007/2008 crisis for the medium run, and an integration scenario, based instead on the assumption that the forthcoming 18 years will witness a further deepening and broadening of the economic integration within the EU.

Our results suggest that a reference scenario leads to a reduction of the macro-regional patterns present in the recent past (e.g. the celebrated East-West divide and the North-South differentials that emerged in the early stages of the crisis), while also prompting the case for a likely club convergence type of regional growth (Fischer and Stirböck, 2006). In fact, in the reference scenario regional growth rates converge around the Country averages, and diverging behaviours involve some regions (like Castilla Leon, Algarve, Languedoc-Roussillon, Croatia, North-Western regions in Greece and the Aegean islands and southern Sweden).

An integration scenario leads instead to a more expansionary economy, with nevertheless remarkable spatial heterogeneity in these effects. While on the one hand integration further increases the costs of Brexit for the UK, on the other it may also cause losses in some regions less endowed with crucial assets.

An integration also tends to increase cohesiveness. This is a rather striking result, that goes against the traditional debate characterizing the alleged trade-off between competitiveness and cohesion (Mancha-Navarro and Garrido-Yserte, 2008). Fostering the emergence of a more integrated EU market leads in fact to a more homogeneous distribution of the benefits thereby obtained, in particular enhancing growth rates in Accession Countries; this in turn allows a faster process of catching-up.

Despite the relevant findings obtained with these two simulations, a major research challenge awaits the MASST model in the months to come. The medical emergency due to the global diffusion of the COVID-19 virus has triggered policy responses that implied severe lockdown measures in most EU Countries. While in the short run this has caused major contractions in consumption patterns, the economic effects of these measures will likely be felt for decades, because public expenditure is going to be financed in by increasing public deficits, with particularly severe consequences in debt-burdened Countries. The MASST model will provide a good toolbox to include all the measures undertaken in EU Countries within an internally coherent logic, thereby allowing a first-hand, evidence-based estimate of the likely territorial effects of the epidemic.

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Annex 1

Table A.1. List of countries belonging to the three clusters

1 (low-growth Countries)	Countries
	Cyprus
	Finland
	Greece
	Italy
2 (medium-growth Countries)	Austria
	Belgium
	Croatia
	Denmark
	France
	Germany
	Netherlands
	Portugal
	Spain
	UK
3 (fast-growth Countries)	Bulgaria
	Czech Republic
	Estonia
	Hungary
	Ireland
	Latvia
	Lithuania
	Luxembourg
	Malta
	Poland
	Romania
	Slovakia
	Sweden
	Slovenia

Source: Authors' elaboration on the basis of EUROSTAT data