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Forecasting regional growth: the MASST model

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MINISTRY OF DEVELOPMENT FUNDS AND REGIONAL POLICY

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Team and history of MASST

Team at Politecnico di Milano

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History

MASST is the result of more than ten years of research in the Politecnico group.

2005 – First version (basic structure)

2010 – Second version (expansion to the sectoral dimension)

2013 – Expansion to the crisis; endogenization of the public expenditure; of urbanization economies; of innovation, differentiated by regions

2017 – Expansion to regional aspect: endogenization of innovation dynamics; refinement of urbanization economies; endogenization of regional productivity; full-fledged panel estimates for the regional sub-model.

Aims of the presentation

This presentation aims at :

- highlighting the main features of the MASST model in its most recent version;

- presenting scenario results built on MASST.

Distinctive characteristics of the MASST model

1. It encompasses macroeconomic elements

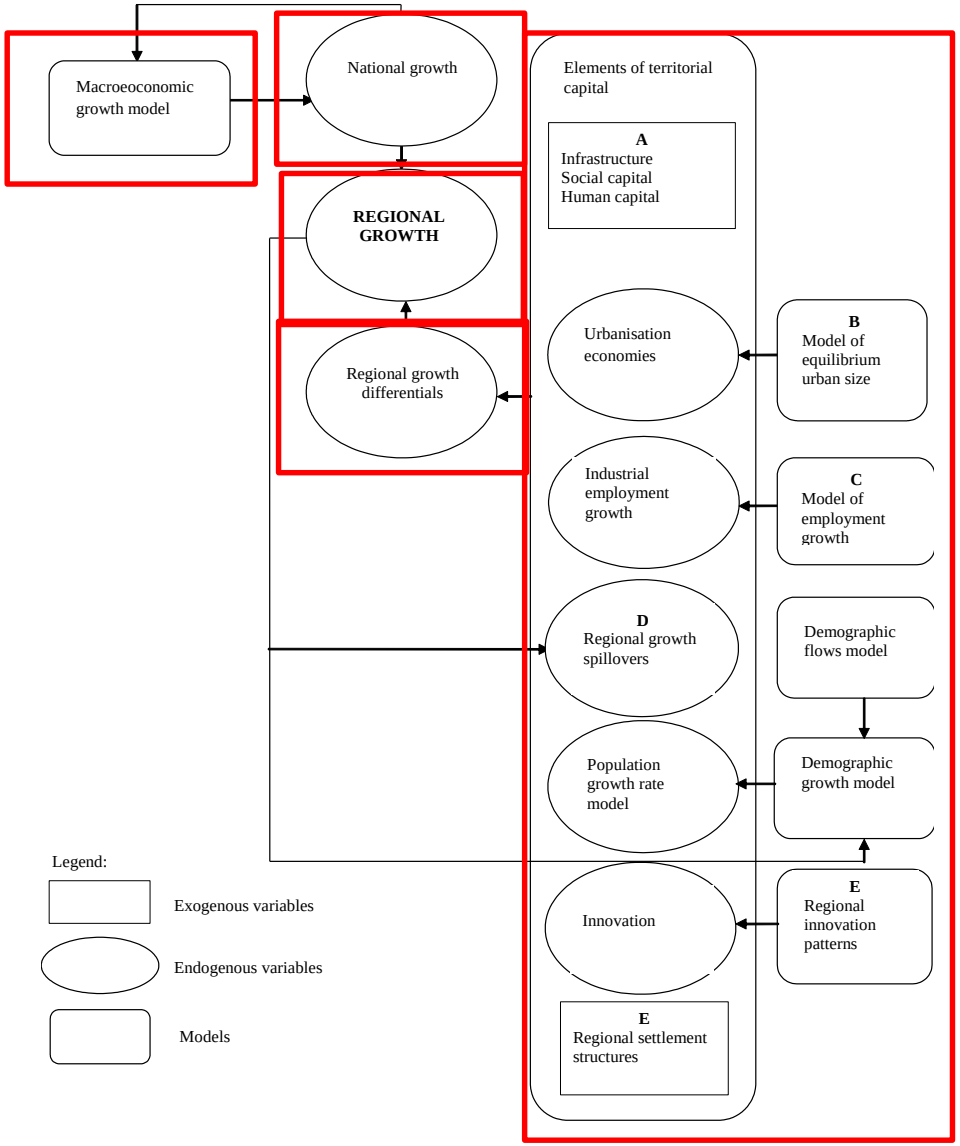
2. It is based on a strong interaction between macroeconomic (demand) and territorial capital (supply) elements

3. It models growth overcoming the bottom-up /top-down dichotomy

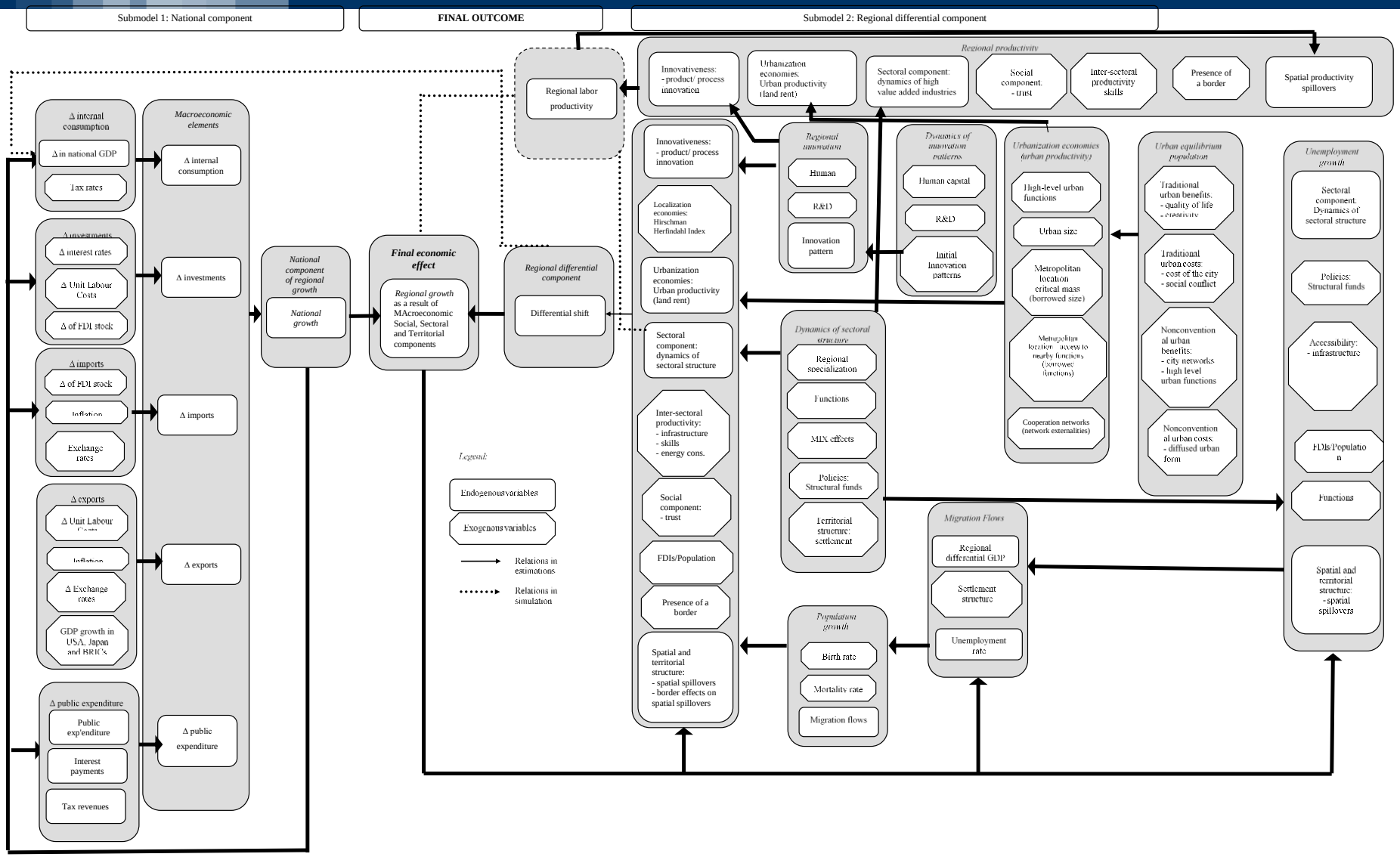
4. It models interregional cooperation as a factor of growth (through growth spillovers)

5. It models at the same time competition among regions (bottom up competitive growth)

A sketch of the MASST structure



MASST4 flow chart



All equations are differentiated between periods of crisis and of no crisis

Permanent income and long-run relationships are assumed and estimated

Characteristics of the MASST model

The MASST model is structured in two stages.

Estimation stage

- First, structural relations between explanatory and dependent variables in various national and regional equations are estimated over a long run time span.

Simulation stage

- Estimated coefficients are employed for simulating likely future growth patterns, given internally coherent sets of assumptions forming regional growth scenarios.

In this sense, the MASST model strikes a balance between quantitative forecasts as in standard VAR models and qualitative foresights as typically done in long run scenario simulation exercises (*quantitative foresight*: Capello et al., 2008).

The new (4th) version of the MASST model (MASST4)

In the fourth generation of the MASST model, three main advances have been introduced:

- The inclusion of **a three-periods (pre-crisis; crisis; after-crisis)** panel structure for both the regional and national sub-models with the aim to **capture structural changes in economic relationships induced by the crisis**.

- The strengthening of the regional part of the model, with the aim to account for the **territorial complexity explained by regional development theories**, in particular:
  - differentiated territorial patterns of innovation;
  - structural urban dynamics;
  - territorial capital assets explaining regional productivity levels.

- The broadening of the model to include major **institutional changes** that have recently taken place (e.g., **Brexit**).

A new database for the MASST4

A major effort has been made in building a comprehensive data base covering:

- the universe of EU NUTS2 regions (in the 2013 version, comprising 276 administrative units)
- with a panel structure covering the period 2000 through 2017 for the national model and
- comprising for the first time a full panel structure for the regional model as well.

A first simulation: a reference scenario (1)

The reference scenario differs from a pure baseline scenario. The latter is meant as a trend scenario; the former is not a simple extrapolation of past trends.

This does not seem meaningful in a context where several strategic factors are changing; a reference scenario takes into account structural changes of the last period.

Assumptions on macroeconomic trends:

A series of pre-crisis conditions are unlikely to be replicated in the post-crisis scenario:

1) **high volatility of investments** of the post crisis period will continue;

2) a normal reactivity of investment growth to GDP growth will be replaced by **a high reactivity of investment growth to GDP growth, although decreasing in the long term**;

3) free international trade between US and EU is replaced by the present risk of protectionist measures between US and EU, which leads to **a lower increase in export with respect to the past long term trend**;

A first simulation: a reference scenario (2)

Instead, some crisis trends are likely to continue in the future, namely:

4) permanent controls on national deficits and debts;

5) some controlled exceptions of public expenditures for low-growing and indebted countries (due to political risks, like the recent Italian elections showed);

6) low inflation rates;

7) expansionary monetary policy (quantitative easing) ends by the end of 2018, as officially stated by the European Central Bank.

<u>Assumptions on industrial trends</u>:

8) 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 technological paradigm «Industry 4.0»;

9) an increase in high-value added services related to the adoption of Industry 4.0 related technologies.

A first simulation: a reference scenario (3)

10) a slow catching-up in R&D expenditure and a slow increase in human capital in Central and Eastern European Countries, following the post-crisis trends.

Assumptions on institutional changes:

11) Brexit becomes effective in 2020;

12) even though some regional independency requests take place, no regional independence follows suit;

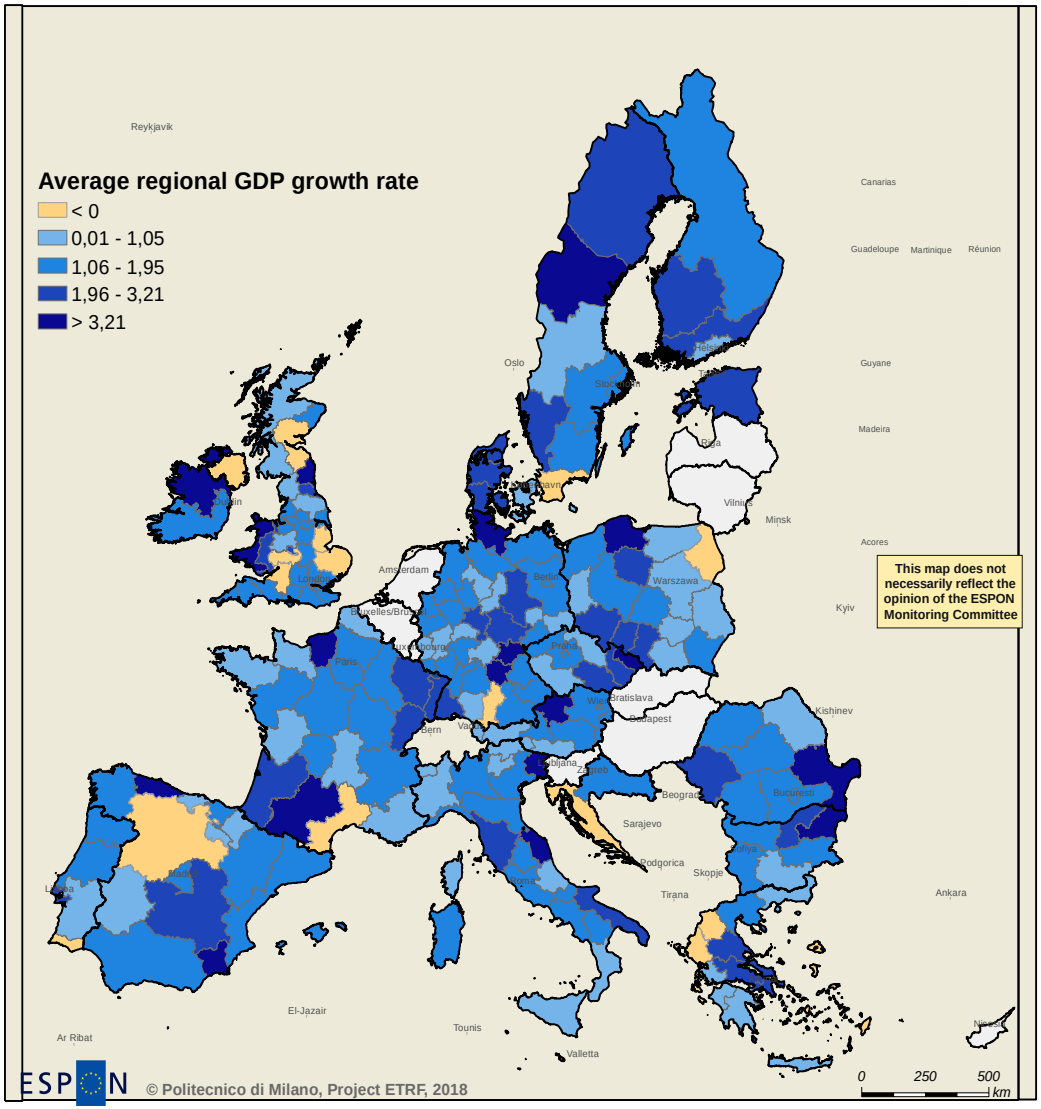
13) redistribution of the European budget in favor of new fields - security and migration - decreasing the share of budget devoted to cohesion policies and CAP, setting national shares to the levels decided in the May 29, 2018 document, and maintaining regional shares as in the 2014-2020 programming period.

Settlement structure-related assumptions

14) increase in urban amenities in Western countries;

15) upgraded quality functions and cooperation among cities.

A first simulation: a reference scenario (4)



GDP growth rates are rather scattered and a rich regional dynamics emerges.

In general, large cities and metro areas, although still performing well, are not necessarily the most dynamic in their countries.

A vast diffusion of new technologies and organizational innovations will be at work in the direction of solid, mid-income regions and medium-size cities.

A slowdown in the process of convergence of CEECs.

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Regional level: NUTS2
Source: Politecnico di Milano, 2018
Origin of data: - © EuroGeographics Association for administrative boundaries

An economic integration scenario (1)

- Scenario whereby **economic integration among European member countries strengthens over the next 18 years**, despite Brexit taking place.
- Breaking down the levers defining this scenario into five building blocks:
  - 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*");
  - an increase in trust within and among countries ("*social effect*");
  - higher quality of government ("*institutional effect*");
  - stronger cooperation networks among cities ("*cooperation effect*").

An economic integration scenario (2)

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

Empirical results (1)

All results are presented against the backdrop of a **reference scenario**, which assumes the persistence over time of the structural breaks that took place during the crisis.

Aggregate results

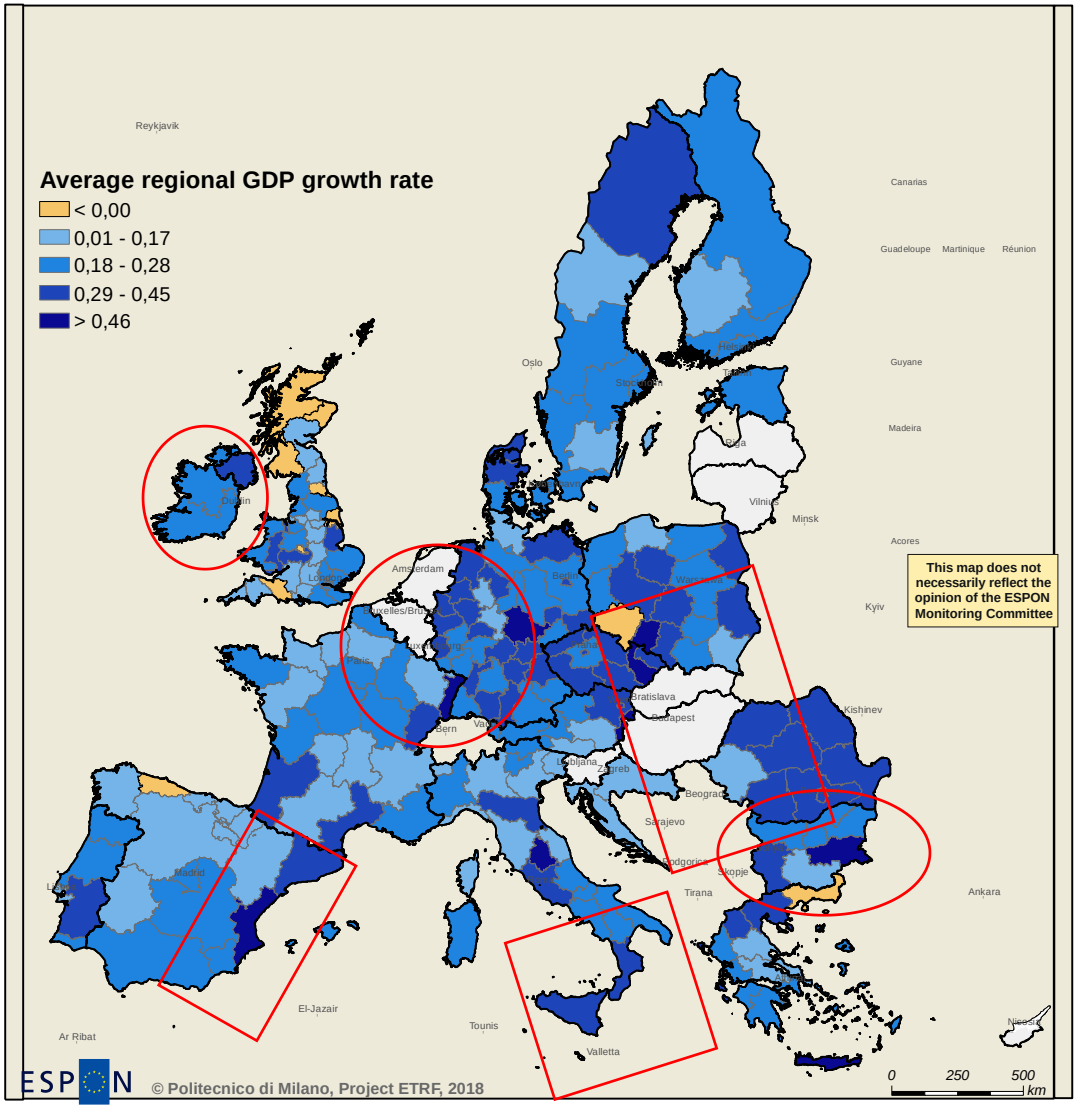
	Average GDP growth rate
EU28	0.24
EU27 without UK	0.25
United Kingdom	0.11
Old15	0.23
CEECs	0.29

Empirical results (2)

National results

country	GDP growth 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
Spain	0.14
Sweden	0.18
United Kingdom	0.11

Empirical results (3)



Regional results

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

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Regional level: NUTS2
Source: Politecnico di Milano, 2018
Origin of data: - © EuroGeographics Association for administrative boundaries

Conclusions (1)

- Results of our two simulations 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)
  - A reference scenario leads to the convergence of regional growth rates 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).
  - An integration scenario leads to a more expansionary economy, with nevertheless remarkable spatial heterogeneity in these effects;
  - An integration further increases the costs of Brexit for the UK;
  - An integration may also cause losses in some regions less endowed with crucial assets;
  - An integration also tends to increase cohesiveness.

Conclusions (2)

- 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.

Conclusions (3)

- 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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