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POLITECNICO DI MILANO

Growth scenarios for European regions

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Aims of the presentation

1. To present the conditional quantitative foresights methodology

2. To present our tool for conditional quantitative foresight: the MASST3 model.

3. As an example, to present after crisis scenarios for Europe, developed on the basis of the MASST3 model.

- In particular, to present “reactions to the crisis” scenarios, by:

  - highlighting the structural adjustments (or reactions to the crisis), that will form a reference scenario;

  - assuming two different scenarios based on alternative ways in which the structural adjustments will take place.

QUANTITATIVE FORESIGHTS

Methodology for building conditional quantitative foresights

- The methodology for building conditional quantitative foresight is made of the following steps:

  - starting from a ‘seminal idea’ about the **driving forces** believed to characterize future economic-territorial development;
  - the basic characteristics of a scenario are built, together with the relevant **conditional elements**, the most likely bifurcations in the driving forces **(qualitative assumptions**);
  - these conditional elements are plugged **into the econometric model,** as assumed values of the independent variables of the model **(quantitative assumptions: levers of the model**);
  - identifying the magnitude of the most likely effects on European regions through a simulation procedure (**conditional quantitative foresights**).

Conditional elements: integrated scenarios

- A Scenario is an **integrated vision** of the different driving forces that are expected to have effects on future trajectories. Therefore:

  - **individual driving forces must be related to each other**, and cross feed-back effects must be underlined, i.e. **the assumptions have to be highly consistent**: this overall coherence has to be reflected in the **label** given to the scenario;

  - one has **to assume an "if.... then.." logic**, keeping assumptions carefully separated from effects;

  - the **assumptions on the driving forces should be as differentiated as possible**, sometimes even opposite to each other, so as to yield differentiated images.

THE MASST3 MODEL

The MASST3 model (1)

- An updated version of the MASST model has recently been produced, called MASST3.

- **This is the result of a 10+ years of research in this group.**

- In the new generation of the MASST model, a set of relevant improvements have been introduced, with the aim to improve it by accounting for relevant issues previously left outside its scope.

- In particular, updated elements regard:
  - **public expenditure growth rate;**
  - **urban performance (population), in search for an equilibrum city size;**
  - **innovation patterns at regional level.**

- Besides, **the MASST3 model has also modelled the current crisis**' effects on regional growth.

The MASST3 model (2): characteristics w.r.t. existing competitors

1. It encompasses macroeconomic elements

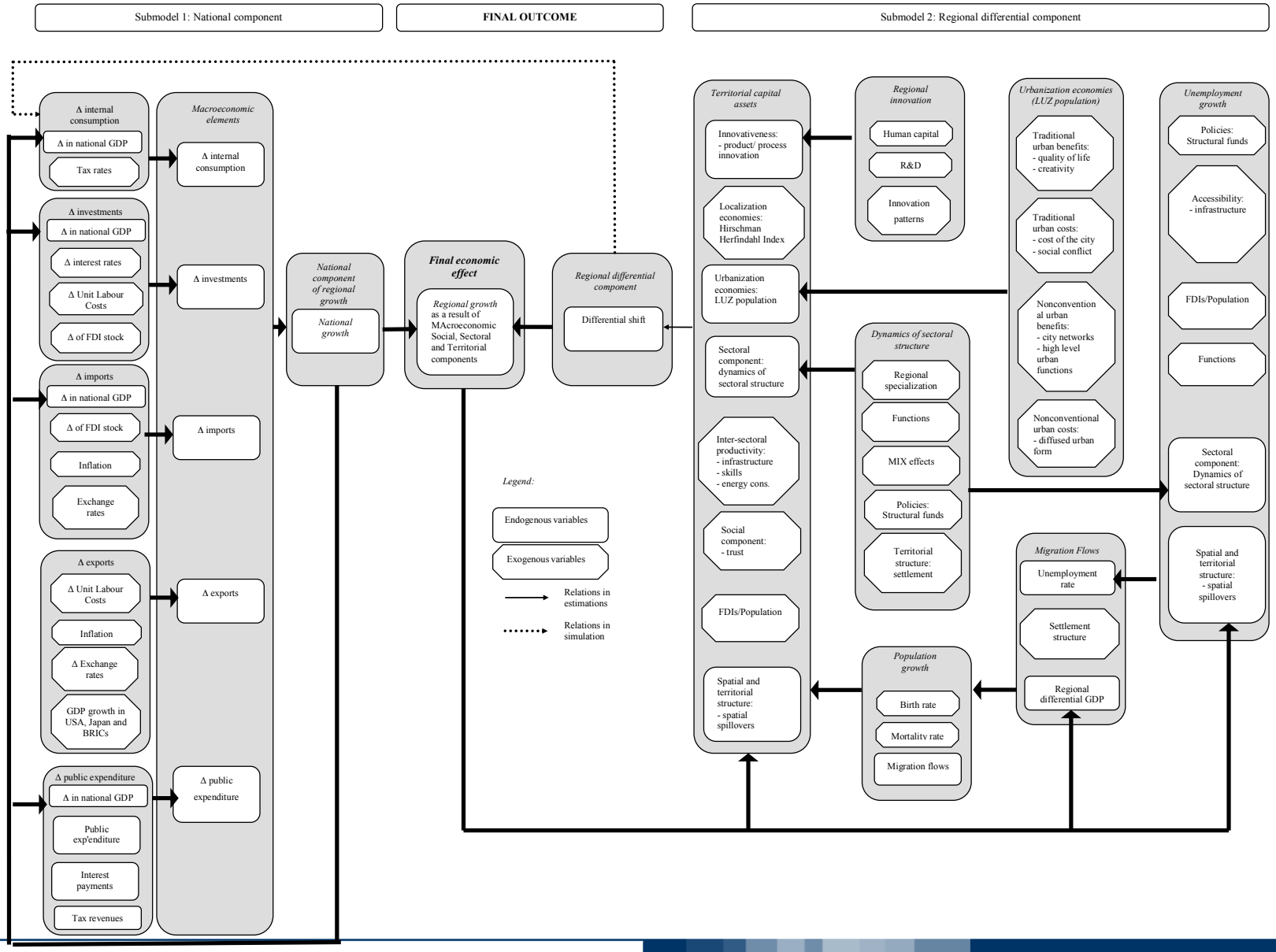
2. It is based on a strong interaction between macroeconomic (demand) and territorial capital (supply) elements

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)

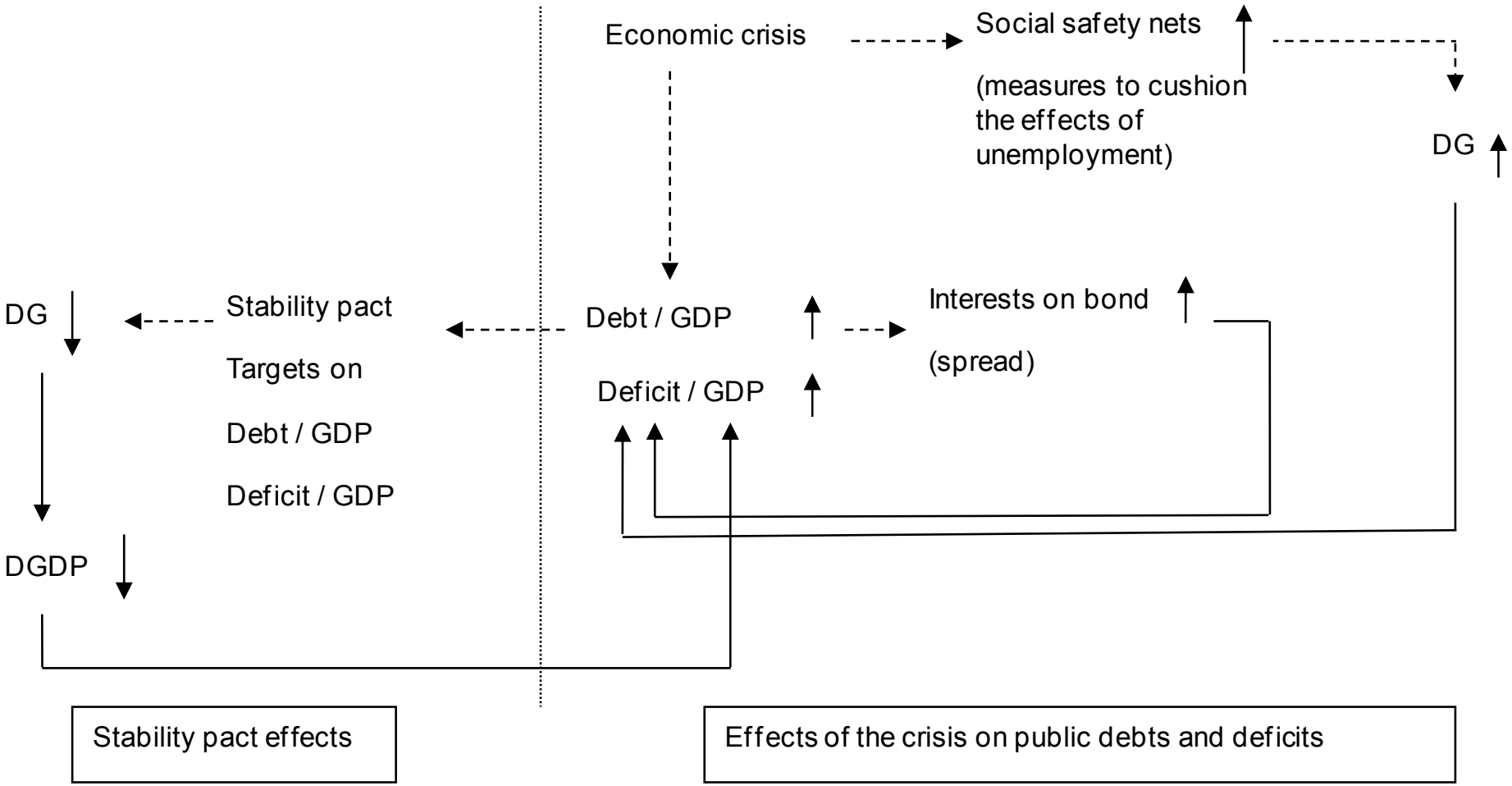
MASST flow chart



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

Permanent income and long-run relationships are assumed and estimated

Public expenditure growth rate



Endogenous public expenditure growth rate

$$\Delta G_{nt} = const + \beta_1 (deficit_{nt} / GDP_{nt} - target) + \beta_2 outgap_{nt} + \beta_3 \Delta GDP_{nt-1}$$

- The output gap is defined as the difference between potential and actual GDP.

$$outgap_{nt} = GDP_{pot,nt} - GDP_{nt} = GDP_{nt}^{*} - GDP_{nt}$$

- Positive values for this measure suggest idle production capacity: this implies that the growth of aggregate supply is outpacing the growth of aggregate demand.

$$deficit_{nt} = (G_{nt} + \text{int}onbond_{nt} * debt / GDP_{nt} * GDP_{nt}) - taxrates_{nt} * GDP_{nt}$$

Innovations in the regional differential growth component

- Regional differential shift as the sum of various components (intra-sectoral and inter-sectoral):

$$diff = f(\Delta Eind, \Delta Eter), (inno, urb, spill, unemp, HHI, access, encons, trust, FDI)$$

- Industrial and tertiary employments are the result of intra-sectoral productivity and evolution:

$$\Delta Eind_r = const + \sum_i \alpha_i LQ_{ir} + \sum_i \beta_i \Delta LQ_{ir} + \delta\, prof_r$$

$$\Delta Eter_r = const + \sum_i \alpha_i LQ_{ir} + \sum_i \beta_i \Delta LQ_{ir} + \delta\, prof_r$$

$$const = const_1 + \sum_i E_i / E_{EU} LQ_{ir} \Delta E_{iEU}$$

Inter-sectoral productivity explanatory variables

- Interregional productivity depends on some endogenous variables:
  - **innovation;**
  - **urban externalities within a region;**
  - regional unemployment;
  - growth spillovers.

and on some exogenous variables:

  - level of trust;
  - FDI/population;
  - trasport infrastructure;
  - energy;
  - functional mix;
  - sectoral diversity;
  - structural funds.

Simulation part

To perform a dynamic simulation, it is necessary to move through the following steps:

- Define and describe the initial conditions and values (2012) for the simulation;
- Set the values (**the targets**) for all exogenous variables (at the final year of simulation, i.e. 2030), based on the qualitative assumptions of the scenarios;
- Solve the enlarged system of equations one period at a time.

Targets (1)

- The simulation algorithm computes all output variables following the simple formula:

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

where:

- x_t is the value of the lever variable for a given region/ country in time *t*,
- *T* is the long-run (**target**) value to which the variable converges
- *a* is the speed of adjustment.

- Therefore, the initial values, the targets and the speeds of adjustment have to be known.

Targets (2)

- The values of the targets are chosen according to the qualitative assumptions of the scenario.

- The targets can be differentiated by:
  - New12 / Old 15;
  - country types (virtuous and vicious countries)
  - agglomerated/megas; urban/rural regions
  - regional typologies
  - single regions if available (transport infrastructure; demographic values).

Dependent variables (outputs of the model)

- GDP growth
- Industrial employment growth
- Service employment growth
- Population growth

- All at aggregate (EU27) level, at national level and at regional (NUTS2) level.

Levers of the national part of the model

- Interest rate;
- Interest on bonds;
- Unit labour costs;
- Foreign direct investments;
- Inflation rate;
- US and Japan GDP growth rate;
- BRIC growth rate;
- Debt / GDP
- Stability target deficit/GDP;
- Tax rate.

- **Length of the crisis.**

Levers of the regional part of the model

- Trust
- Energy costs
- Regional FDIs
- Sectoral diversity
- Transport infrastructure
- High-level functions
- R&D expenditure
- Human capital
- Birth rate
- Death rates
- Cohesion policy (structural funds)

Levers at the urban level

- Land rent
- Urban malaise
- Urban amenities
- Urban functions
- City networking
- Sprawl

AFTER-CRISIS SCENARIOS

Recently emerging tendencies, risks and opportunities, and structural adjustments for the EU

New trends	Risks	Opportunities	Structural adjustments of the EU economy
Limited resources for public expenditure in the EU	Lower Keynesian stimulus in EU areas	Revision of public expenditure criteria	Ongoing revision of public expenditure criteria in several EU countries
	Decreasing quality of welfare state (education, healthcare)	Public budgets more strictly under control (less profligate public expenditure)	Reduced amount of public resources
	Job losses		Concentration of the (fewer) public resources in strong areas in CEECs
Process of adjustment to the EU integration	Loss of flexibility in CEECs (no freedom on exchange rates, public expenditure, and other macroeconomic policy tools)	Financial stability and discipline in public accounts	Loss of cost-competitiveness in CEECs
		Integration in a larger market	
Limited innovation budgets due to the fiscal and credit crunch and the growth slowdown	Loss of dynamic efficiency	Schumpeterian selection process of innovative actors	Concentration of innovation resources in strong areas
Reshuffling of productive specialization patterns	Exposure to new competitors from new areas	Increase in economic potential and resilience	Reindustrialization of sectors related to green economy technologies
Geographical reorientation of FDIs	Loss of economic potential for EU countries	Endogenization of investment (less exogenously-driven growth process)	Loss of FDIs inflows into the EU

A reference scenario

•A reference scenario is built in the belief that **the future cannot be a pure extrapolation of the conditions before the crisis**.

•The new adjustment strategies already undergoing in Europe are assumed to remain in the future.

•The main assumptions of the reference scenario are:

- limited public resources;
- concentration of R&D investments in strong areas;
- geographical re-orientation of FDI;
- tendency of Western countries to move towards advanced technological sectors, like renewable energies and green technologies;
- loss of competitiveness of CEECs because of their EU member status;
- decisive way out of the crisis at the end of 2015.

Alternative scenarios

A *scenario of place-based competitiveness,* based on the willingness to achieve **the competitiveness levels of the pre-crisis period**.

Competitiveness depends on the exploitation of a rather diversified and scattered endowment of “territorial capital”, made up of natural and artificial specificities, varied settlement structures, cognitive and relational assets at different degrees of complexity and development.

A *social cohesion scenario,* based on the aim **to limit the social costs that derive from the crisis**, without renouncing to a modernization of the economy

Alternative scenario assumptions

New trend	Reference scenario	Alternative scenarios	
		Place-based competitiveness	Social cohesion
Limited resources for public expenditure in the EU	Ongoing revision of public expenditure criteria in several EU countries	Different public expenditure criteria: concentration in medium-size cities, more oriented towards the private sector	Different public expenditure criteria: concentration in peripheral areas, more oriented towards the public sector
	Reduced amount of public resources	A slightly higher amount of public resources paid by tax increases	A higher amount of public resources only partially paid by tax increases. Increase in public debt
	Concentration of the (fewer) public resources in strong areas in CEECs		
Process of adjustment to the EU integration	Loss of cost-competitiveness in CEECs	Productivity increases will be higher than increases in wages Loss of cost-competitiveness in CEECs	Protection of cost-competitiveness in CEECs
Limited innovation budgets due to the fiscal and credit crunch and the growth slowdown	Concentration of innovation resources in strong areas	Generalized increase in innovation resources, more oriented towards second-rank cities	Generalized increase in innovation resources, more oriented towards peripheral areas
Reshuffling of productive specialization patterns	Reindustrialization of sectors related to green economy technologies	Reindustrialization of the EU thanks also to reduced interest rates	Growth in 'soft' industries (tourism, public administration)
Geographical reorientation of FDIs	Loss of FDIs inflows into the EU	FDI incentives towards second-rank cities	FDI incentives towards peripheral areas

Results by macro aggregates in the reference scenario 2012-2030

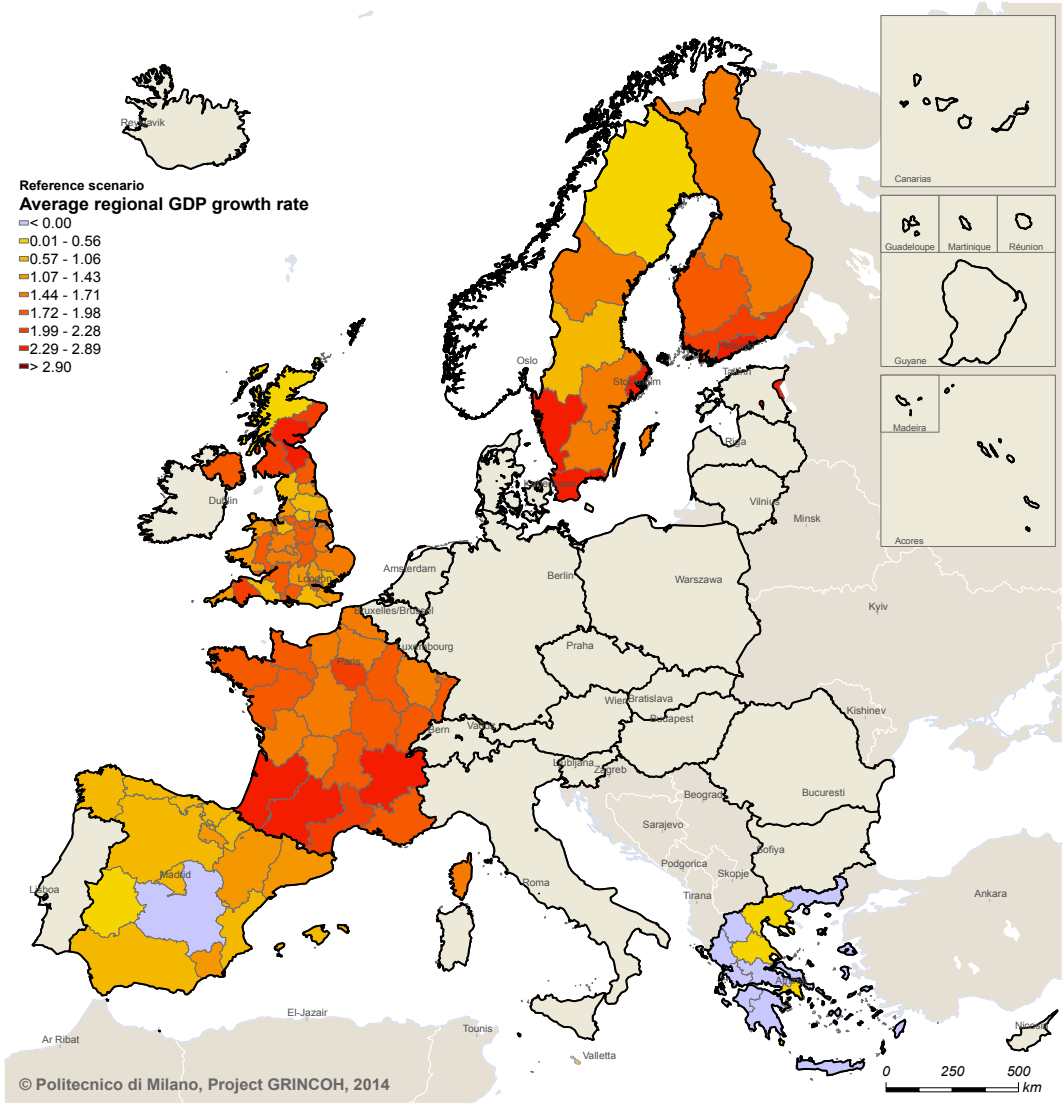
Scenario	*Reference*		
Variable	EU27	Old15	CEECs
GDP growth	1.84	1.83	1.90
Manufacturing employment growth	1.55	1.63	1.25
Service employment growth	1.54	1.45	2.20
Total employment growth	1.54	1.48	1.89

CEECs grow faster than Western countries.

CEECs countries increase employment in services more than in manufacturing, entering a new stage of development

Western countries are characterized by a productivity-led growth. In CEECs employment grows as fast as GDP

Average regional GDP growth 2012-2030 – Reference scenario



Southern peripheral countries grow less than Northern countries.

Southern European countries pay for the present difficult conditions on their future evolutionary trajectories.

Eastern European countries still grow more than the EU15, but this is not enough to catch up with the GDP per capita levels of the Western countries within 2030.

Overall intra-national regional disparities increase.

Results by macro aggregates in the reference, regional and social cohesion scenarios in 2030

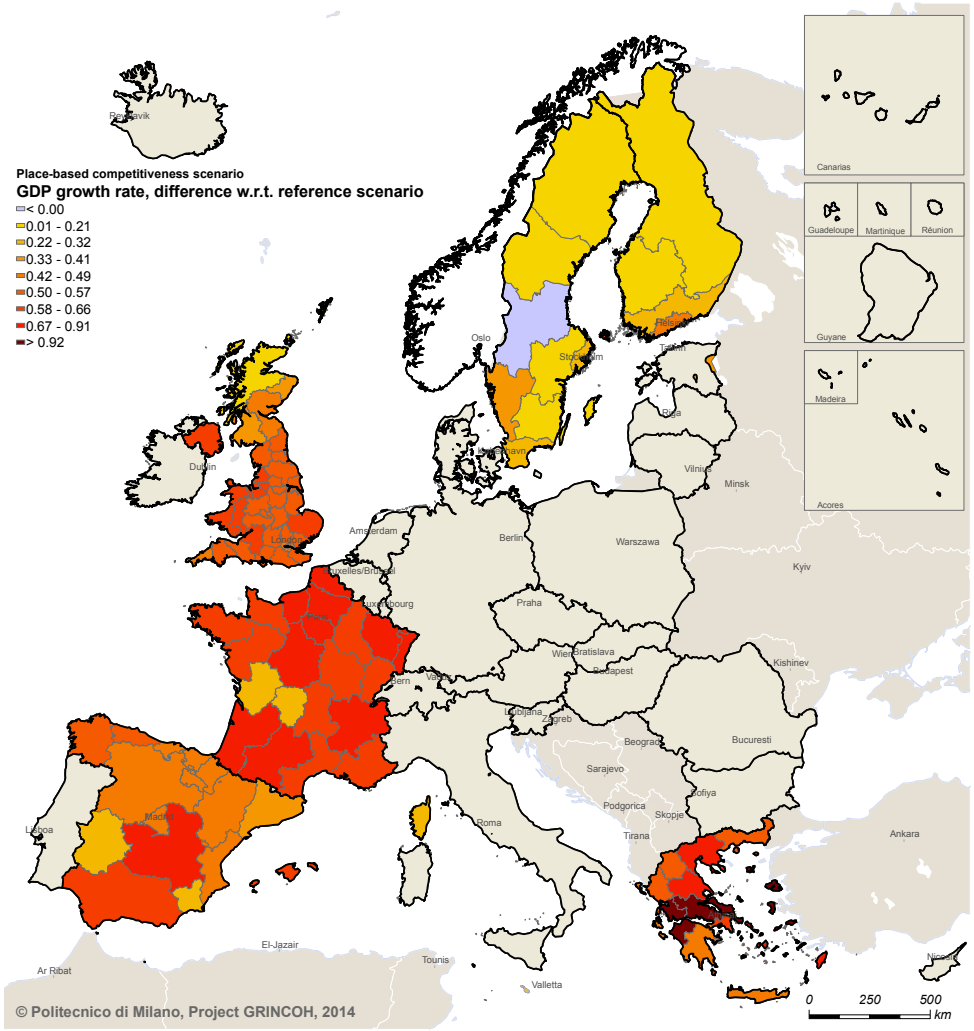
Scenario	*Place-based competitiveness - reference*			*Social cohesion - reference*		
Variable	EU27	Old15	CEECs	EU27	Old15	CEECs
GDP growth	0.39	0.40	0.30	-0.11	-0.12	-0.05
Manufacturing employment growth	0.44	0.48	0.30	-0.57	-0.64	-0.30
Service employment growth	0.35	0.34	0.39	0.05	0.06	-0.02
Total employment growth	0.37	0.37	0.36	-0.07	-0.07	-0.10

The place-based competitiveness scenario is the most expansionary.

In this scenario, Western countries grow mostly because of fast productivity growth.

In the social cohesion scenario, Eastern countries lose less than Western and increase their productivity levels.

Average regional GDP growth 2012-2030
Place-based competitiveness scenario w.r.t. the baseline

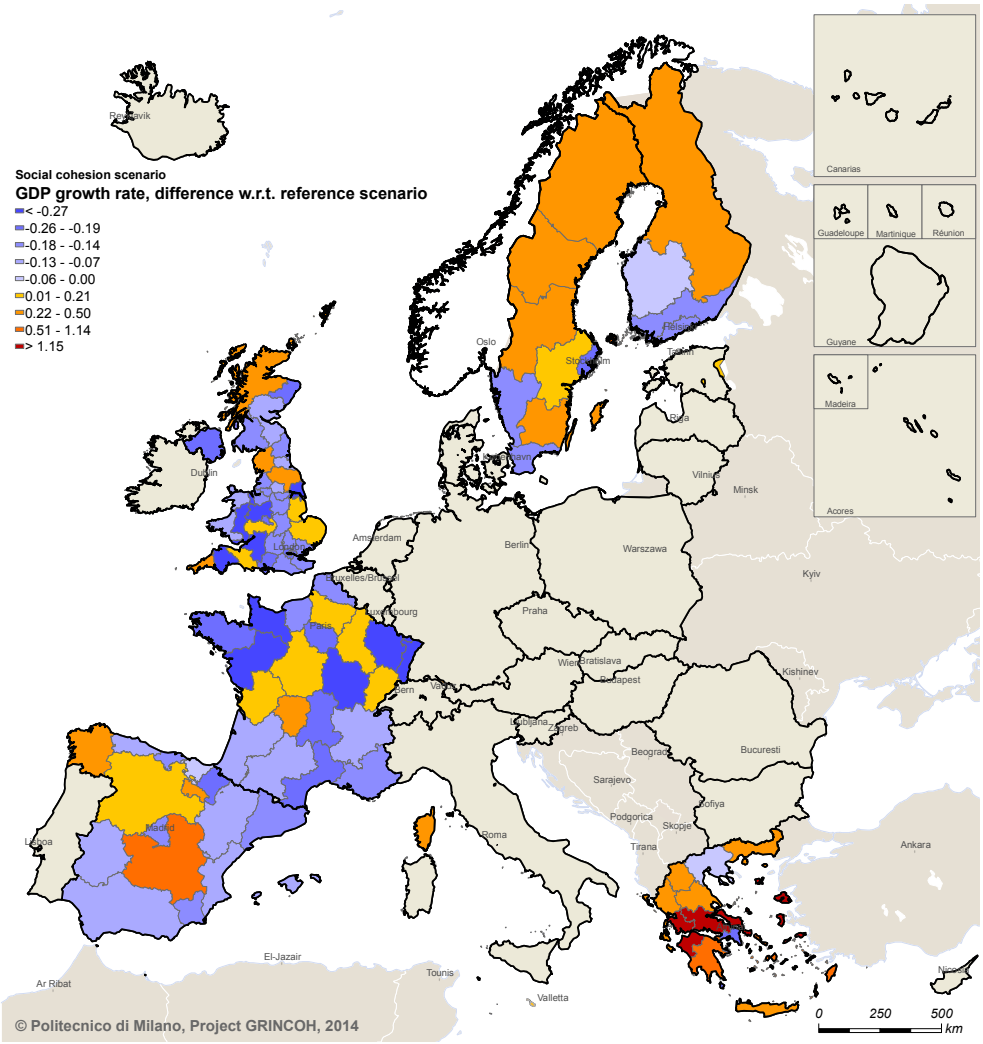


All regions have a relatively higher growth than the reference scenario.

Western regions gain the most, even relatively poorer regions (Greece, Spain, Italy, etc..).

Strong advantages not only to second-rank city regions (also capital regions and rural regions gain).

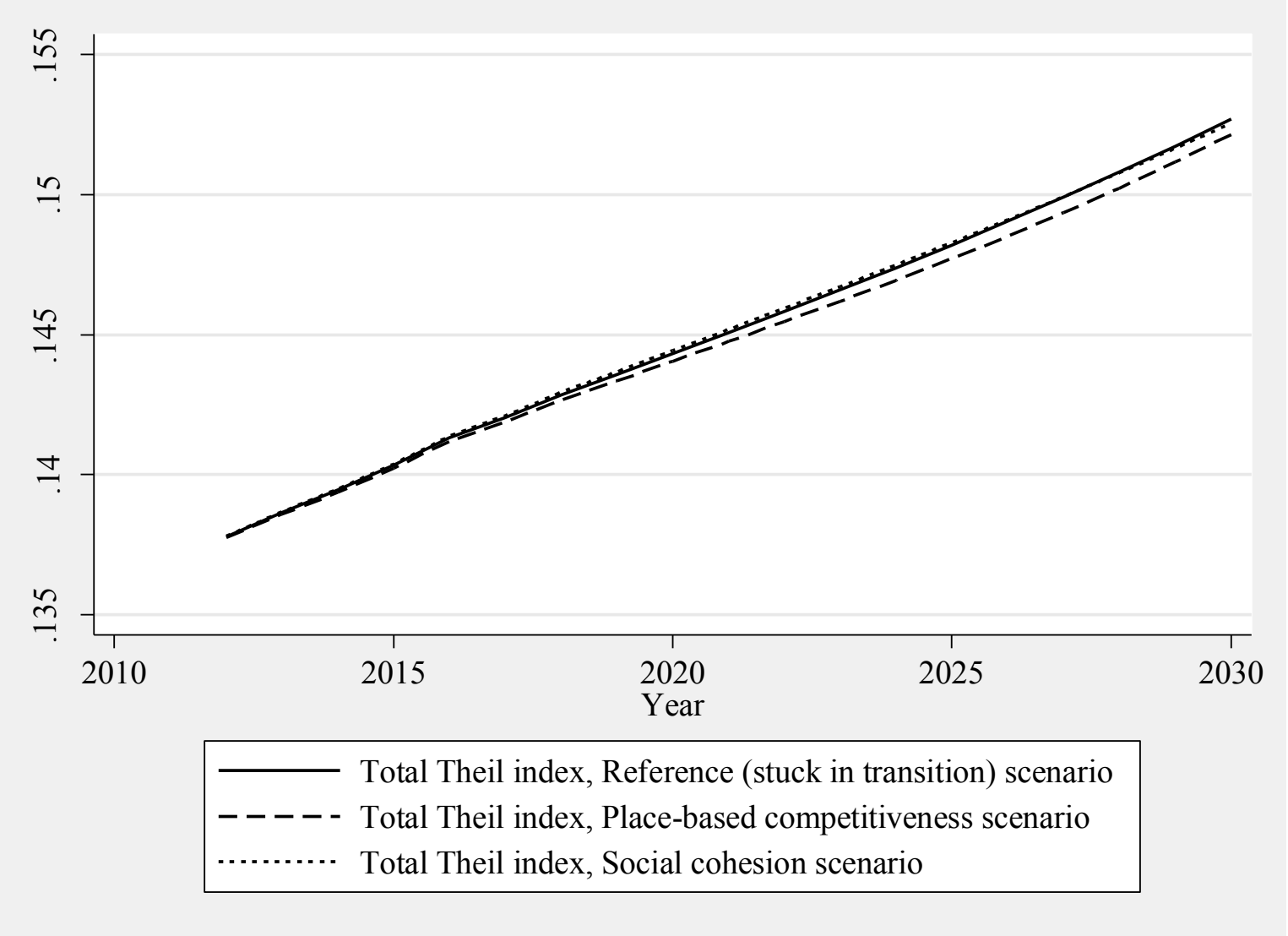
Average regional GDP growth 2012-2030
Social cohesion scenario with respect to the baseline



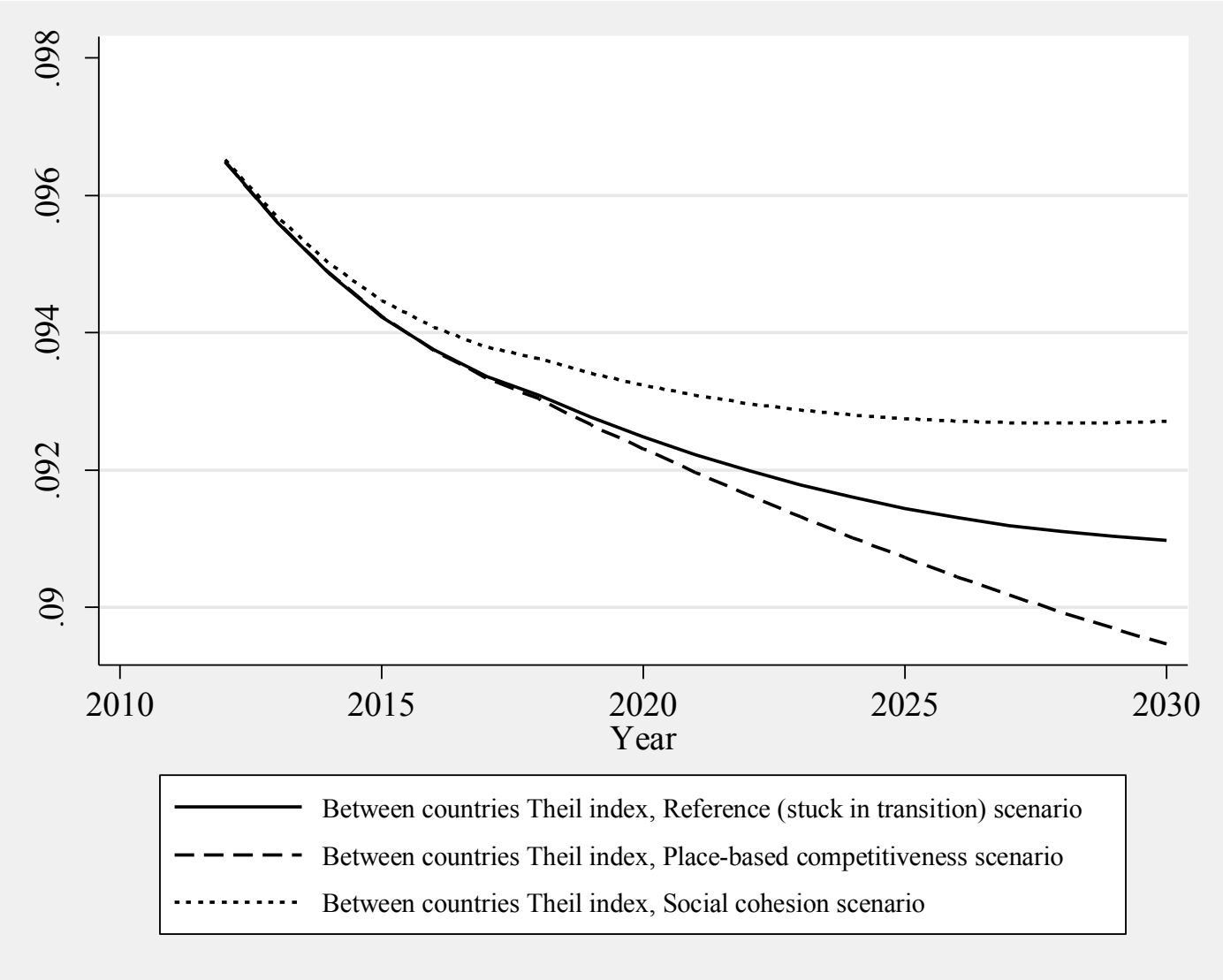
The effects of a less concentrated scenario are evident.

Not all peripheral regions gain.

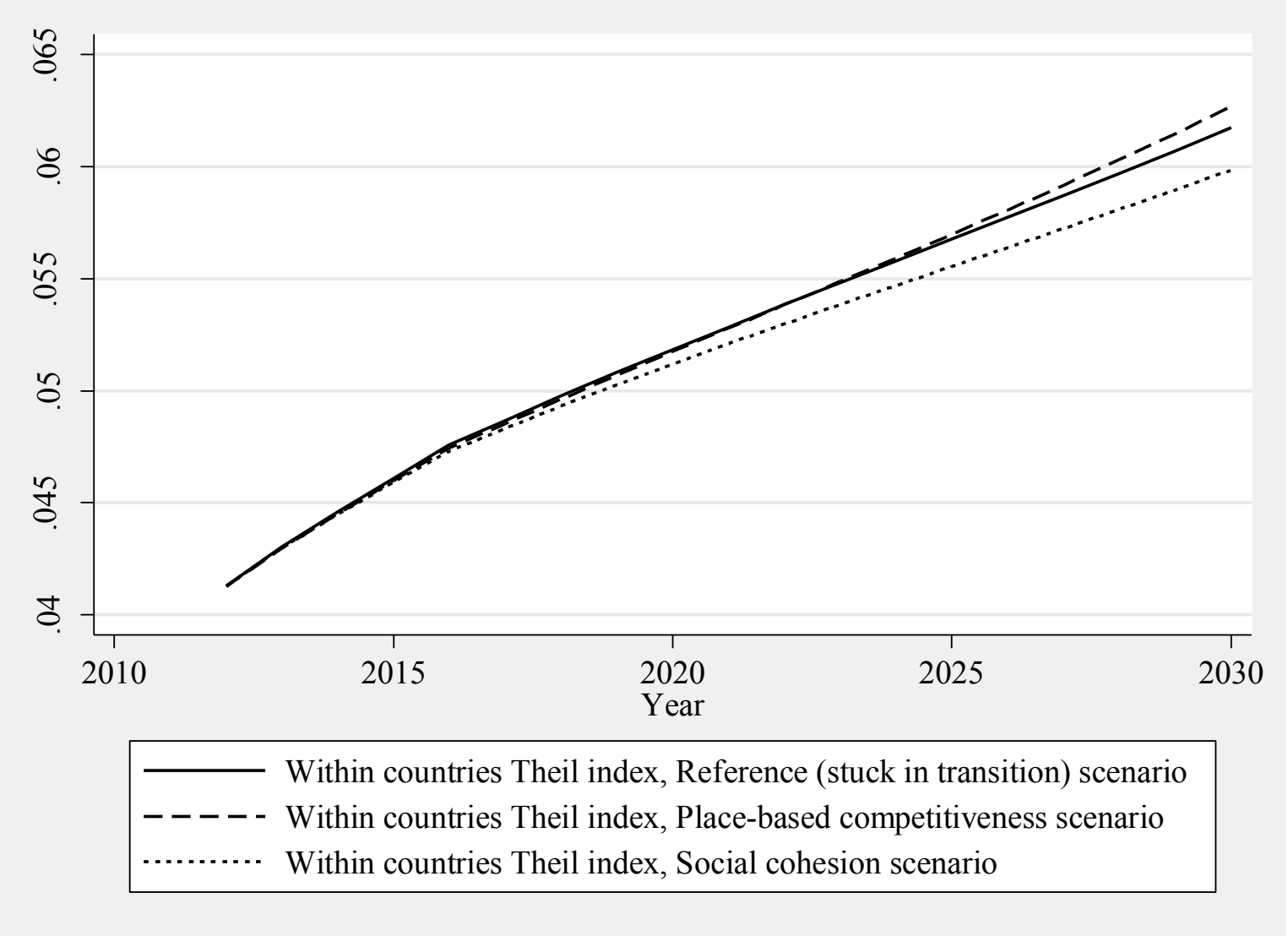
Regional disparities - Total Theil index



Regional disparities - Between Countries Theil index



Regional disparities - Within country Theil index



Conclusions

1. In a complex and integrated economy, scenarios must be guided by a model capable of capturing structural cause-effects relations

2. Macroeconomic elements matter for regional growth (and regional economists tend to overlook this issue)

3. Territorial elements matter for regional growth (and macroeconomists tend to overlook this issue)

4. Scenarios are no easy task; hypotheses must be logically coherent and integrated, with a clear cause-effect logic

5. Counterintuitive results can emerge, such as in the case of the place-based competitiveness scenario, where cohesion is also fostered

THANK YOU VERY MUCH
FOR YOUR ATTENTION!