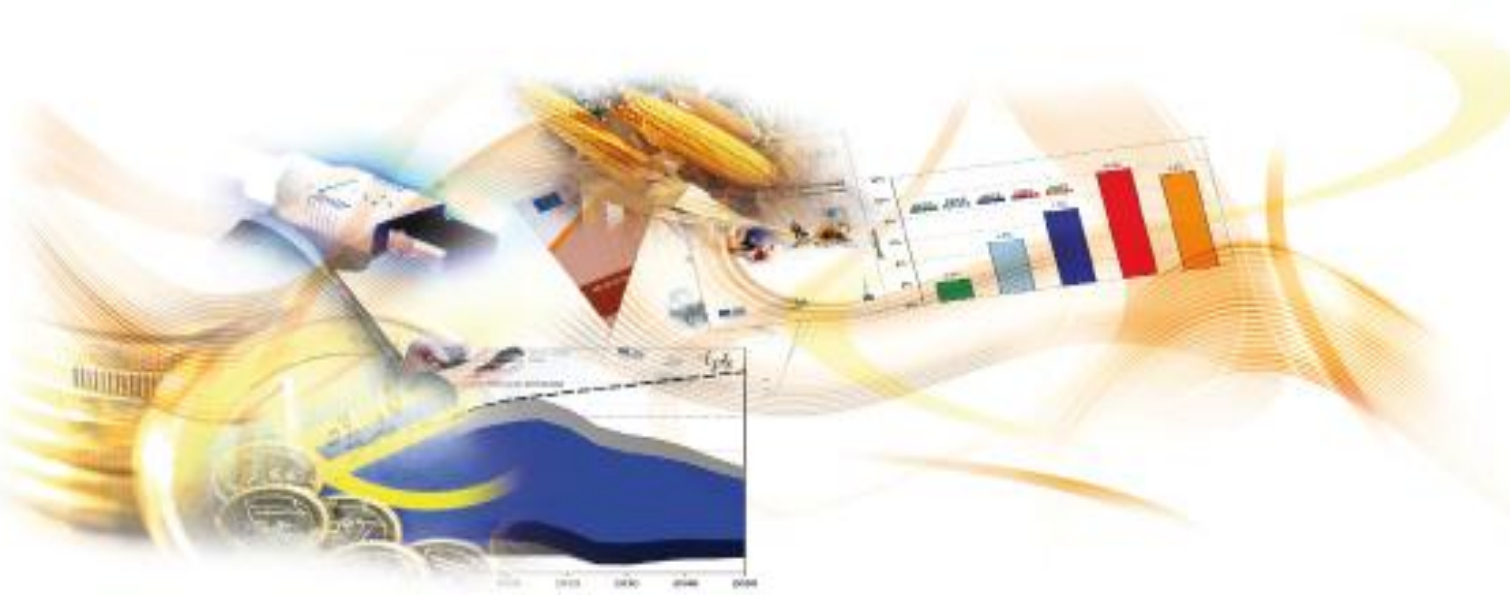
European Commission

JRC TECHNICAL REPORTS



Assessing policy options for the EU Cohesion Policy 2014-2020

Andries Brandsma

Francesco Di Comite

Olga Diukanova

d'Artis Kancs

Jesus Lopez Rodriguez

Damiaan Persyn

Lesley Potters

2015

Report EUR 27396 EN

Joint Research Centre

European Commission
Joint Research Centre
Institute for Prospective Technological Studies

Contact information
Address: Edificio Expo. c/ Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954488318
Fax: +34 954488300

JRC Science Hub
https://ec.europa.eu/jrc

JRC94645

EUR 27396 EN

ISBN 978-92-79-50437-2 (PDF)

ISSN 1831-9424 (online)

doi:10.2791/95488

Luxembourg: Publications Office of the European Union, 2015

Abstract
In this paper, we estimate the impact on GDP of Cohesion Policy 2014-2020 for 267 EU regions running a set of simulations with RHOMOLO, a spatial CGE model tailored for economic analysis at the subnational level. We do so by treating the different parts of Cohesion Policy as exogenous and independent shocks, which are first considered separately and then combined to estimate an overall effect. Our simulation suggests that European regions display significant heterogeneity in their deviations from the baseline due to Cohesion Policy, both in absolute terms and relative to the amounts received.
JEL codes: C68, C82, E16.

Keywords: RHOMOLO; multiregional spatial CGE; Cohesion Policy.

Table of Contents

Assessing policy options for the EU Cohesion Policy 2014-2020*

Andries Brandsma, Francesco Di Comite, Olga Diukanova, d'Artis Kancs, Jesus Lopez Rodriguez, Damiaan Persyn and Lesley Potters

European Commission, DG Joint Research Centre, IPTS institute, Seville (Spain)

In this paper, we estimate the impact on GDP of Cohesion Policy 2014-2020 for 267 EU regions running a set of simulations with RHOMOLO, a spatial CGE model tailored for economic analysis at the subnational level. We do so by treating the different parts of Cohesion Policy as exogenous and independent shocks, which are first considered separately and then combined to estimate an overall effect. Our simulation suggests that European regions display significant heterogeneity in their deviations from the baseline due to Cohesion Policy, both in absolute terms and relative to the amounts received.

Keywords: *RHOMOLO; multiregional spatial CGE; Cohesion Policy*

JEL classification: R13; R58; H54; O32.

*The authors acknowledge helpful comments from Philippe Monfort, participants of the XXXIX conference of Regional Studies in Oviedo, as well as participants of seminars and workshops at the European Commission. The authors are solely responsible for the content of the paper. The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

1 INTRODUCTION

In this paper we present the expected impact of the Cohesion Policy 2014-2020 on EU regions based on simulations using RHOMOLO, a spatial Computable General Equilibrium (CGE) model designed to provide ex-ante policy impact assessment at the regional level (see Brandsma *et al*, 2015). The different budget lines of Cohesion Policy are implemented as exogenous shocks. First separately and then combined into an overall effect. The paper has been organised as follows. First, Section 2 gives a short description of what Cohesion Policy is, to get an idea of its importance and magnitude. Section 3 provides a technical description of RHOMOLO, touching upon its' structure, characteristics and dynamics. Section 4 describes in detail the design of the four main scenarios that have been simulated (Human Capital, R&D, Non-R&D and Infrastructure investments) and Section 5 presents the outcomes of these simulations with respect to the non-policy baseline. Finally, Section 6 concludes.

2 BACKGROUND INFORMATION ON COHESION POLICY

The EU Cohesion Policy, also known as Regional Policy, is one of the oldest and most important policy instruments of the European Union, absorbing roughly one third of the entire EU budget and involving every region of each Member State. It is designed as an investment policy which is expected to kick-start growth, employment, competitiveness, and development on a sustainable basis.

The commitment to develop a common regional policy for development dates back to the Treaty of Rome, which instituted the European Economic Community in 1957, but its actual operationalization evolved substantially over time, following institutional changes and the EU enlargement. Currently, the Cohesion Policy is structured as the combination of three instruments (European Regional Development Fund, European Social Fund and Cohesion Fund) aimed at achieving three main objectives following the strategic guidelines inspired by the Europe 2020 growth strategy: convergence, competitiveness and territorial cooperation.

Each instrument is designed to address a different set of objectives and target different stakeholders:

- The Cohesion Fund is aimed at Member States with a Gross National Income (GNI) per capita of less than 90% of the EU average and supports actions in the framework of the convergence objective. The main activities concerned include trans-European transport networks and environmental sustainability, notably in the fields of energy or transport (e.g., supporting energy efficiency, the use of renewables, public transport, intermodality and so on);
- The ESF (European Social Fund) is meant to support Member States in their labour market policies in the framework of the convergence and competitiveness objectives. The areas covered by the ESF include policies aimed at fostering lifelong learning schemes, reducing search and matching costs in the labour market, promoting social integration, combating discrimination and strengthening human capital by reforming education systems;

- The ERDF (European Regional Development Fund) aims to support Regions in order to strengthen economic and social cohesion and correct imbalances. It deals with the three objectives of Cohesion Policy (convergence, competitiveness and territorial cooperation) by directly financing private investments policies; physical infrastructures (linked to R&D, telecommunications, environment, energy or transport); financial instruments to support regional and local development and cooperation; technical assistance measures.

Cohesion Policy Funds are provided taking into account the principles of additionality, concentration, programming and partnership. Additionality requires that contributions from the Structural Funds must not replace public or equivalent structural expenditure by a Member State in the regions concerned by this principle. Concentration refers to local concentration (the majority of the funds will be located in the poorer regions), concentration in objectives (growth and jobs) and concentration in time (must be spent three years after allocation). Programming means that the funds are used for multi-annual national programmes aligned on EU objectives and priorities. Finally, partnership aims at development through a collective process involving authorities at European, regional and local level, social partners and organisations from civil society.[2]

To give an idea of the potential impact of Cohesion Policy, the combination of the Structural Funds (ESF and ERDF) and the Cohesion Fund amounted to roughly €347 billion or 0.3% of the EU27 GDP in the last programming period 2007-2013, although this can go up to 4% to 5% of GDP due to the principle of concentration in certain targeted countries and regions.

2.1 Cohesion Policy 2014-2020: overall envelope

The European Commission has adopted a draft package of the Cohesion Policy for 2014-2020. The new proposals are focused on the "Europe 2020" objectives mainly targeting growth and jobs. For an ex-ante assessment of its impact, the planned regional investments are introduced into RHOMOLO. Section 4 will explain in detail the design of the simulations and Section 4.4 presents the results. See Table 1 for basic descriptive data on expenditures per type of region and expenditure category.

The total amount of Cohesion Policy is divided over 86 categories of expenditure (see Annex II) that have been merged into five main budget lines for being able to toggle the adequate parameters in the model. The policies under these headers are quite diverse and, as a consequence, the assumptions as to which exogenous parameters of the model are affected, and how, are necessarily quite strong.

Funds designated to *Human Capital* aim at bringing improvements to the labour markets by investing in training and education of employees. As can be seen, the vast majority (68%) of the funds is destined to the Less Developed Regions. The joint human capital expenditures are assumed to translate into an improvement of labour productivity in the model. The full setup of the simulation is discussed in section 4.1.

[2] See http://ec.europa.eu/regional_policy/index_en.cfm for more detailed information about Regional Policy.

Region type[3]	#	GDP 2007	RTDI	Aid to private sector	Infrastructure	Human Capital	Technical Assistance	Total	%
Less Developed Regions	65	1,147,683	25,250	27,127	129,128	38,408	12,162	232,075	68%
Transition Regions	51	1,407,194	5,772	6,218	14,339	10,201	1,585	38,115	11%
More Developed Regions	151	9,120,647	10,916	9,101	24,167	24,196	2,954	71,335	21%
Total	267[4]	11,675,524	41,938	42,447	167,634	72,805	16,701	341,525	100%
% of total CP			12%	12%	49%	21%	5%	100%	

Table 1: Details on Cohesion Policy expenditures (in € millions). The four French regions that are not in RHOMOLO are not taken into account.

Funding for *Research, Technical Development and Innovation* (RTDI) is aimed at supporting firms of in the process from basic research to actual implementation of innovations. The RTDI related expenditures are assumed to affect the research and development capacity of the economy, which is translated into changes in the total factor productivity (TFP) parameter of the model. Section 4.2 discusses these simulations in detail.

The category *Aid to Private Sectors* aims at supporting non-R&D activities, which play an important role in the economic development of countries and regions by positively affecting their TFP growth. These non-R&D innovation activities consist e.g. of technology and know-how acquisitions, such as machinery and other equipment patents, trademarks, designs, etc. In Europe, about 40–60% of the industrial value-added and 50% of all industrial employees are engaged in the non-R&D intensive sector (Som, 2012). Moreover, more than half of all innovating firms in the EU are non-R&D performers (Arundel et al, 2008). Therefore, considering the high shares of funding devoted to the non-R&D activities and the importance of these activities in the promotion of innovation and TFP growth in Europe, it is important to evaluate the ex-ante short and long term effects of the planned regional non-R&D investments across EU regions. More details are provided in Section 4.3.

Cohesion Policy funds aimed at *Infrastructure* mainly support regions in improving connectivity within the region and between other regions, focussing on railways, motorways and airports, as well as environmental and social infrastructure. These policies in general will decrease transport costs, as well as the general cost of firms for doing business with other regions such as communication costs, be it for selling final goods or

[3] Less Developed Regions are defined as having a GDP per capita that is less than 75% of the EU27 average. The GDP per capita of the Transition Regions is between 75% and 90% of the EU27 average and for the More Developed Regions this is above 90%.

[4] The EU27 has a total of 271 NUTS2 regions, but 4 French regions were left out because of their very particular characteristics: Guadalupe, Martinique, Guyana and Réunion. Croatia recently joined the EU, but has not yet been introduced into the model.

sourcing intermediates. These investments will be modelled as decreasing the transport costs. The setup is discussed more in detail in section 4.4.[5]

2.2 Cohesion Policy 2014-2020: time profile

Based on experience from passed Framework Programmes, the *expenditure* period for the funds is from 2014 to 2023, taking into account the N+3 rule[6]. The time profile is shown in Figure 1.

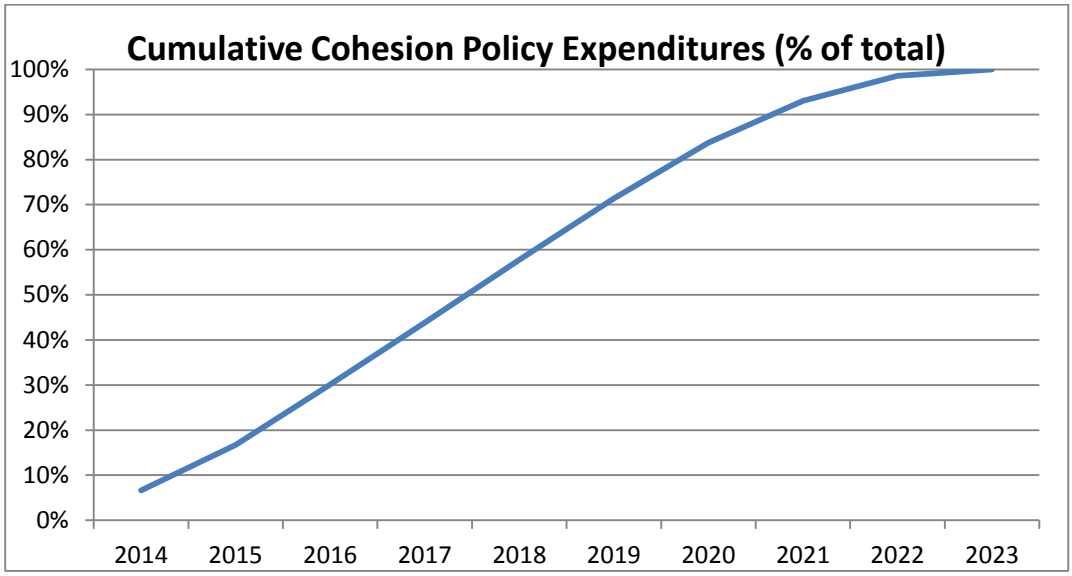


Figure 1: Time Profile of Cohesion Policy expenditures

3 TECHNICAL DESCRIPTION

The RHOMOLO model is calibrated to the regionalised Social Accounting Matrices (SAMs) of the EU member states that were extracted from the World Input-Output Database (WIOD). SAMs for the NUTS2 regions were constructed using the data of regional production by sector, bilateral trade flows among the NUTS2 regions, and trade with the rest of the world (ROW), as described by Potters et al. (2013). The version of the model used for this paper includes 6 NACE[7] Rev. 1.1 industries: Agriculture (AB), Manufacturing (CDE), Construction (F), Transport (GHI), Financial Services (JK) and Non-market Services (LMNOP). An illustration of the SAMs used for RHOMOLO is shown in Annex I.

EU regions are modelled as small open economies that accept EU and non-EU prices as given, which is consistent with the regional scope of the model. In this perspective, EU external relations involve only one non-EU trading partner that is represented by the ROW aggregate.

[5] Notice that, given its size in the overall budget and the difficulty to model it in a consistent way, the category *Technical Assistance* has not been modelled. It mostly concerns technical support given to regions or other local authorities in streamlining bureaucratic procedures and public programming and auditing.

[6] If the funding in question has not been spent by 2020, the Commission can 'decommit' future budget allocations.

[7] See http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:NACE

Interregional trade flows are estimated based on prior information derived from the Dutch PBL dataset (see Thissen et al., 2013). Data on bilateral transport costs per sector are provided externally by the TRANSTOOLS model,[8] a model covering freight and passenger movements around Europe. The costs of different shipments are calculated in terms of share of the value shipped, based on the time needed to reach the destination using alternative modes of transport. Transport costs thus differ by type of good and depend on the distance between the regions and the variety and characteristics of modes of transport connecting them, which also means that they can be asymmetric. The representation of trade and transport flows among the NUTS2 regions gives the model a spatial dimension, indicating that EU regions differ not only in their stocks of production factors but also in geographic location.

Mobility of capital and labour is assumed to occur within regions, but international or intra-regional migration of production factors is not considered in the core model version.

Because of the models' large dimensionality (268 of NUTS2 regions, 6 sectors, 10+ years modelling horizon), a rather simple approach to introduce dynamics has been applied that rests on the assumptions of exogenous growth, which is in line with Solow's model (Solow, 1956). The main advantage is that this type of dynamics does not require a time index in the core equations. All agents of the model have myopic expectations and cannot anticipate future changes in relative prices or make choice between consumption and savings depending on the interest rate. Using a perpetual inventory method (OECD, 2001), the sum of interest rate and depreciation rate are employed to estimate the regions' capital stocks from the value of their operating surplus, as available in the SAMs. The interest rate is set at the level of 5% and the capital depreciation rate at 6% per annum. In order to keep the model baseline "clean" of trade spillovers that change relative prices and induce sectorial changes, we apply a uniform 2% annual growth rate to all regions.

The model solves for the sequence of equilibrium states when all time periods are connected with the equation of capital accumulation: each year in each region a portion of capital stock depreciates and gets augmented by the previous year investments, so that capital stock and investments grow at the same rate with the rest of economy. Values of inventory changes and investments in each region are adjusted in order to achieve consistency among the observed investments, the estimated capital stock and the required replenishment of the capital stock. Therefore, there are no changes in regions' economic structures over the steady-state baseline period. All prices remain constant; only the quantities grow at the same constant rate. As such, we get clearer insights by comparing the after-shock results with the baseline values.

The core model equations are specified in a calibrated share format proposed by Rutherford (1999), programmed in GAMS as a mixed complementarity problem (Mathiesen, 1985) and solved using a PATH solver.

[8] See Burgess et al. (2008) or visit http://energy.jrc.ec.europa.eu/TRANS-TOOLS/TT_model.html

3.1 Market equilibrium

3.1.1 COMPOSITE OF DOMESTIC AND IMPORTED VARIETIES

Domestically produced and imported varieties are combined to form a composite good. Trade and transport margins are applied to imports from other NUTS2 regions (*ttm*) and to domestic sales (*trXZ*). Following this specification, the structure of this good is depicted in Figure 2.

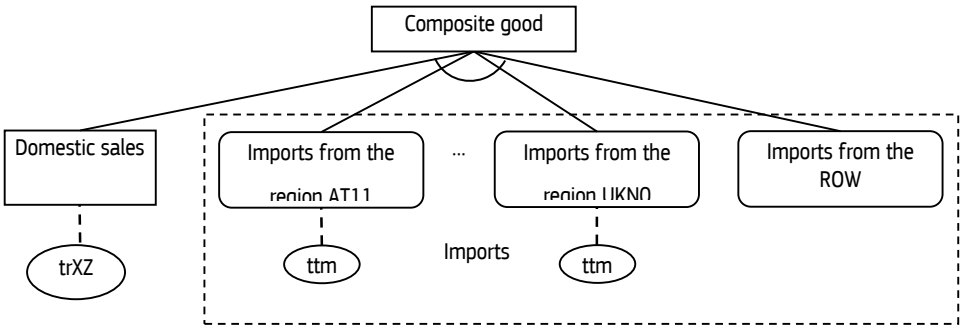


Figure 2 Composite of domestically produced and imported varieties of the same good

Composite goods are consumed by industries, households, government, and the investment sector.

3.1.2 INDUSTRIES' NESTED COST FUNCTION

The lower level of the sector's production function features a combination of labour and capital services, which are then combined with intermediate inputs. Coefficients of factor productivity improvements are assigned to labour (*fpl*) and capital (*fpk*).

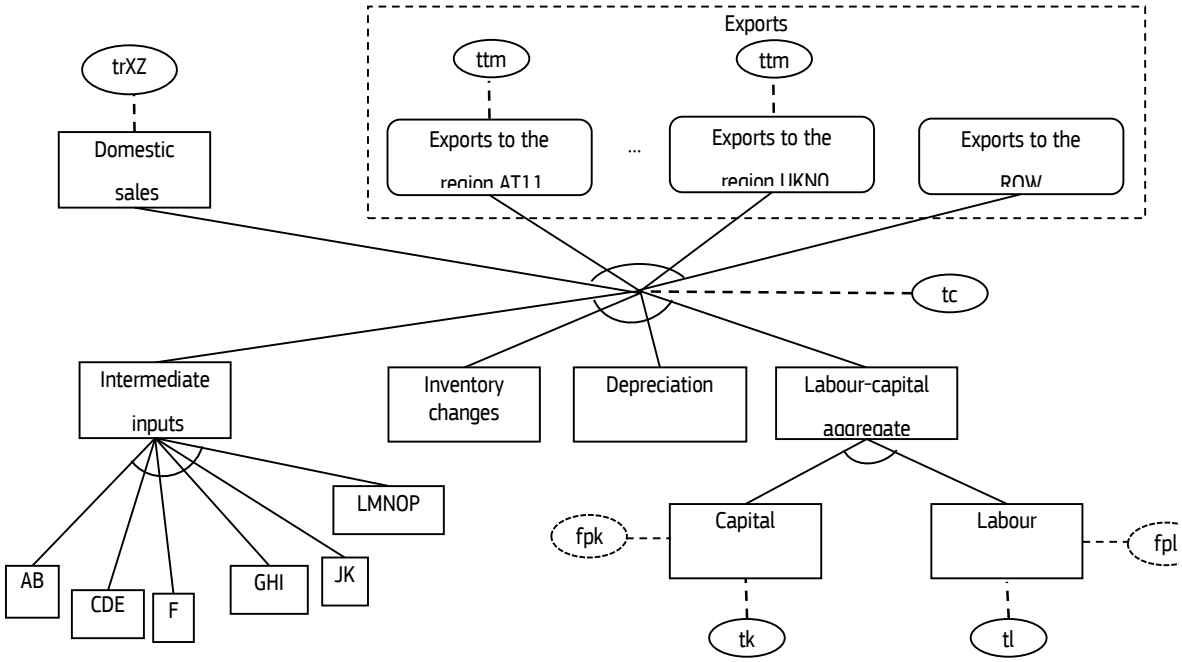


Figure 3 Sector's nested production function

With this specification, producers can maintain the same levels of output using less production factors. The same structure of nested production functions is adopted for all sectors (see Figure 3).

3.1.3 HOUSEHOLD AND PUBLIC UTILITY

The top level of nested household utility function combines the consumption of final goods and savings (see Figure 4). Zero substitutability between consumption and savings is assumed. On the second level of nesting, final goods were combined with the Cobb-Douglas function.

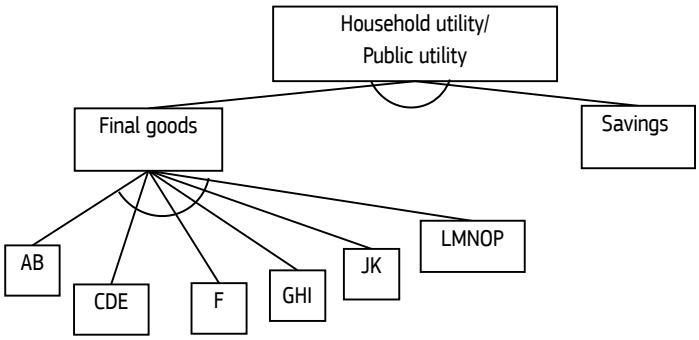


Figure 4: Structure of regional household expenditures and public expenditures

The structure of public utility is identical to that of households, and is described in Figure 4.

3.1.4 INVESTMENT SECTOR

The investment sector combines in fixed proportions the final goods, transfers and inventory changes (see Figure 5). Transfers between investment sector, the EU and ROW are expressed on a net basis. The tax rate on output of regional investment good is defined as a lump-sum transfer to the government.

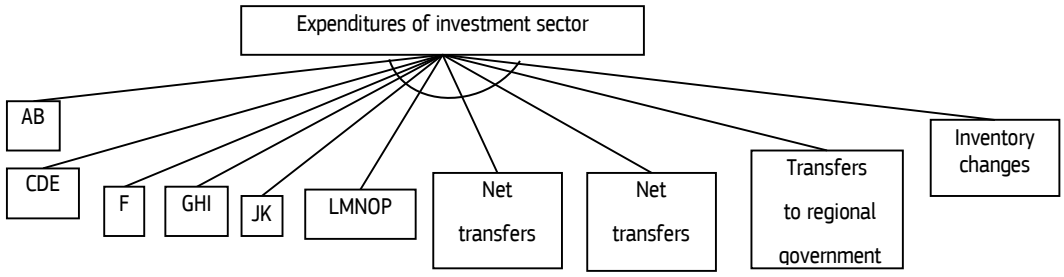


Figure 5: Structure of regional investment demand

3.1.5 INVENTORY CHANGES

Inventory changes combine final goods and transfers (see Figure 6**)**. This entity pays taxes on output, which is defined as lump-sum transfer to the government. Transfers between regional inventory changes, the EU and ROW are expressed on a net basis.

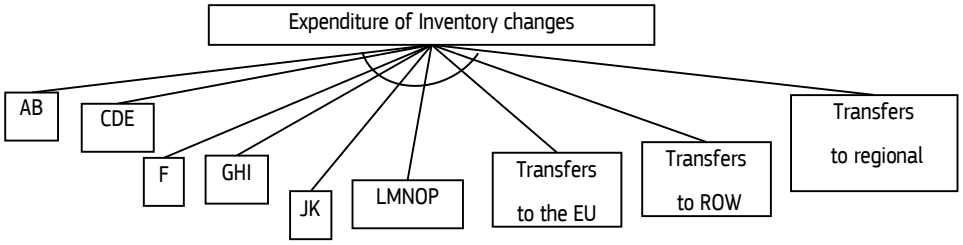


Figure 6 Structure of regional demand of inventory changes

3.2 Market clearing conditions

In order to specify the market clearance conditions, we derived the supply and demand functions of the primary factors, intermediate inputs or final goods by differentiating the profit or cost function by the price of that good (Hotelling's and Shephard's lemmas).

ROW closure

Following a common approach, the ROW closure was specified as equality between the sum of regional exports to the ROW, the sum of regional imports to the ROW plus the balancing constraint. We fix the exchange rate, and use the producer price index as model numéraire.

3.3 Budget balance

Households

According to the information provided in the regional SAMs, households supply labour and capital services, pay taxes from their endowment of labour and capital, receive net transfers from the public sector and also net transfers from abroad. In the current model version, taxes on labour and capital endowment are modelled as lump-sum transfers from the households to the regional government. Disposable income of regional households is fully spent on their consumption of final goods and savings.

Public sector

According to the SAMs, income of regional government consists of taxes on sectors' output, sectors' consumption of labour, capital services, taxes on regional investment good and inventory changes, net transfers abroad and net transfers from regional households. Disposable income of regional governments is fully spent on their consumption of final goods and savings.

4 SCENARIO CONSTRUCTION

4.1 Human capital related policies

The budget line Human Capital of the Cohesion Policy program combines a wide variety of measures. Some measures aim at fostering re-integration of long-run unemployed on the labour market, while others pertain to improving life-long learning or on the job training. To

simulate the effects of cohesion expenditure on human capital in RHOMOLO, this wide variety of measures has to be translated into an exogenous change to the model by assuming that these expenditures lead to an increasing regional labour productivity (the *fpl* parameter), at the cost of a temporary decrease in the local labour supply.

Next, a choice is required as to how efficient the policy is to improve regional labour productivity. For this, we assumed that the relative human capital stock increase in a region induced by Cohesion Policy equals the relative size of the cohesion expenditure with respect to the local expenditure on education, taken from EU KLEMS (Timmer et al., 2007). Next, we turned to the general literature, where it is found broadly that increasing the stock of human capital by 1% leads to an increase of 0.3% in output per worker (Sianesi and Van Reenen, 2003).

In the initial years of the policy implementation, labour supply simultaneously is assumed to decrease and remains subdued during the programming period. After the programming period, labour supply recovers to its original level.

Future work will focus on the stark assumptions made for these simulations. Firstly, the homogeneity of the labour productivity increase between countries for a given percentage increase relative to local education expenditure will be relaxed, as it seems likely that not all countries and regions would benefit equally from an increase in the human capital stock. Secondly, policies will be separated out which may be expected to operate not through increasing labour productivity, but rather e.g. through improving labour market efficiency.

4.2 R&D investments[9]

In the 2014-2023 period, €42 billion have been allocated to lines of expenditure[10] related to the support to RTDI. This is 12% of the grand total of Cohesion Policy funds; 60% of this goes to the less developed regions, a lower percentage than the 70% across all budget lines.

The current version of RHOMOLO uses the TFP to channel the support to RTDI. There is considerable empirical evidence of the effect of R&D on TFP, very well elaborated in Hall et al. (2009). The Cohesion Policy investment is first expressed as an increase in R&D intensity compared to the baseline and subsequently a TFP equation is used to model the increase in TFP resulting from R&D. This is the most standard formulation derived in Hall et al. (2009) which is reproduced here in a distributed lag format, reflecting that it takes time for an investment in R&D to be turned into innovation and consequently a productivity improvement. The TFP equation is as follows:

[9] Notice that, in the next versions of RHOMOLO, the regional R&D sector modelled in this paper will be replaced with a national R&D sector with positive externalities at the regional level.

[10] These lines are 01-09, 11-15, and 74, see Annex II

$$\mathrm{TFP_{reg}} = \gamma * \mathrm{TFP}(-1) + (1-\gamma) * (b_0 + b_1 * \frac{\mathrm{RTDI_{reg,sec}}}{\mathrm{GDP_{reg}}} + b_2 * \frac{\mathrm{RTDI_{reg,sec}}}{\mathrm{GDP_{reg}}} * \mathrm{TFPgap_{reg,reg*}} + b_3 * \mathrm{TFPelsewhere}) + \varepsilon \quad \textbf{(1)}$$

where $\mathrm{TFP_{reg}}$ represents the level of regional TFP at a given point of time that subsequently has an impact on the total output. The term $\frac{\mathrm{RTDI_{reg,sec}}}{\mathrm{GDP_{reg}}}$ is the R&D intensity for each sector in each region. The second explanatory variable is the combined interaction between the average R&D and the gap in TFP with the leading region.

The third term between brackets represents the possible spillovers from TFP increases in other regions and sectors (TFPelsewhere). These spillovers are the key reason why the social return on R&D exceeds the private return, and thereby would justify public investment and support to R&D in the private sector. This is a topic of empirical research taken up by Belderbos and Mohnen (2013), who propose a patent citation-based indicator to measure the presence of intra- and inter-sectoral knowledge spillovers, nationally as well as cross-border. This could possibly at a future stage be transformed into a spatial structure for the spillovers between regions but for the moment b3 is set to zero.

Kancs and Siliverstovs (2015) conclude that R&D rates of return in developed economies are strongly positive and may be as high as 75%, although they are more likely to be in the 20% to 30% range. This estimate is introduced in the model by setting a rate of return. This is close to the estimate used in QUEST III (McMorrow and Röger, 2009).

The empirical evidence on the spillover effect and catching-up is not as strong, but it is likely that the farther away from the technology frontier the greater the potential for catching up, conditional on the ratio of R&D to GDP. This is introduced in the model by a multiplicative term expressing that the higher the R&D intensity the greater the part of the TFP gap that is closed every year. An increase in RTDI expenditure compared to the baseline will set in motion this process, which is assumed to operate with the same distributed time lag and coefficient as the R&D effect on its own. This would approximate a doubling of the rate of return on RTDI for regions which are at $\mathrm{TFP} = 1$ compared to the technology frontier ($\mathrm{TFP} = 2$).[11] The estimates behind this specification are confirmed by the econometric research of Kancs and Siliverstovs (2015).

4.3 Non-R&D subsidies

Innovation can take place through activities which do not require R&D such as the purchase of advanced machinery, patents and licenses, training related to the introduction of new products or processes, etc. These forms of acquiring knowledge and technology are referred to as non-R&D (NR&D) innovation activities. From the policy point of view it is important to analyse the impact of NR&D subsidies since the European Commission devotes an important portion of their budgets to finance them. In the Cohesion Policy

[11] Luxembourg, Brussels and Greater London are excluded from the frontier, because they are financial centres with a very high TFP in the data

2014–2020, around €41 billion are devoted to NR&D activities. The current version of RHOMOLO analyses its impact considering that the main channel of influence of these activities is through their impact on TFP. We employed the our previous estimations of TFP elasticity with respect to the NR&D investments ($\gamma_3 + \gamma_1\overline{Ird}$)[12]. Mathematically, the following expressions have been used to estimate the shifts on TFP due to Non-R&D funds:

$$gTFP_{reg,t} = (\gamma_3 + \gamma_1\overline{Ird})\left(\frac{NR\&D_{t-1,reg}}{GDPbau_{t-1,reg}}\right) \quad (2)$$

$$TFP_{reg,t} = gTFPbau_{reg,t} + gTFP_{reg,t\ 3}) \quad (3)$$

where $gTFP_{reg,t}$ is the annual regional growth rate in TFP in region reg in year t due to NR&D innovation expenditures; $\gamma_3 + \gamma_1 Ird$ is the elasticity of TFP improvements wrt. NR&D investments, $NR\&D_{t-1,reg}$ is the amount of NR&D innovation expenditures assigned in the year $t-1$; $GDPbau_{t-1,reg}$ is the forecasted GDP region reg in the year $t-1$; $gTFPbau_{reg,t}$ is the baseline annual regional TFP growth in the region reg during the year t; $TFP_{reg,t}$is the growth rate induced by the NR&D investments.

DG REGIO provided us not only with the values of allocated funds but also with the planned annual absorption of non-R&D investments for each region during the compliance period of 2014–2023. It should be mentioned, that regional NR&D investments were not distributed homogenously within the period of 2014–2023, but allowed for quite high spikes from one year to the next. Given that the model baseline was projected assuming a steady-state 2% annual growth rate, region's values of TFP growth can double or triple from one year to another.

4.4 Infrastructure investments

In a first step, an aggregate measure of the total Cohesion Policy expenditure on transport infrastructure is derived for each region. For this purpose, all policy instruments directly affecting transport infrastructure are aggregated in one category, INF. We use the aggregation scheme provided by DG REGIO.[13]

In a second step, we attempt to impute the spatial dimension of the transport infrastructure funds based on region-specific expenditures as calculated in the first step by estimating how region-specific expenditure translates into region-pair-specific expenditure. The spatial dimension is important, because transport infrastructure improvement affects not only the region, where the money is spent, but also all other regions with which it trades. We follow the literature and use the following formula to impute a spatial matrix of bilateral transport investments, $ECP^{INF}_{reg,regg}$:

[12] This expression takes values in the range [0.15-0.18].

[13] Note that no weights are applied at this stage of aggregation, although, according to the theoretical literature (European Commission, 2011), the aggregation of different policy measures should account for differences in their expected impact. This will be introduced in future simulations.

$$ECP_{reg,regg}^{INF} = \phi_{reg,regg}\left(\frac{ECP_{reg}^{INF} + ECP_{regg}^{INF}}{2R}\right) \quad \textbf{(4)}$$

where ECP_{reg}^{INF} and ECP_{regg}^{INF} are ECP transport infrastructure expenditures in regions reg and $regg$, respectively, and $\phi_{reg,regg} \equiv \tau_{reg,regg}^{1-\sigma}$ is the freeness of trade, which ranges from zero, when trade is perfectly un-free (bilateral trade costs are prohibitive between reg and $regg$), to unity, when trade is perfectly free and bilateral trade costs are zero (Baldwin et al., 2005). $\tau_{reg,regg}^{1-\sigma}$ denotes bilateral trade costs between pairs of regions as measured by TRANSTOOLS.

The bilateral measure of transport infrastructure investments (4) accounts for both the intensity of the Cohesion Policy expenditure in the regions and for the proximity of the regions. The second term on the RHS in equation (4) calculates the average transport investment for every pair of regions. The first term on the right-hand side introduces a spatial structure (economic geography) in the bilateral measure of transport infrastructure investment by weighting the proximity (integration) of regions. The farther away the trading regions are (trade is more costly), the less weight will be attributed to the transport infrastructure improvements between the two regions. The weighting implies that the further away are the two regions, the lower impact will have a fixed amount of expenditure (1 km of road can be improved much better than 10 km of road with the same amount of funds).

In a third step, we transform $ECP_{reg,regg}^{INF}$, which is a bilateral measure of expenditures, into changes in bilateral trade costs between regions, which are measured as a share of trade value. This is done by pre-multiplying the bilateral measure of transport infrastructure investments ($ECP_{reg,regg}^{INF}$) by an elasticity that measures the effectiveness of transport infrastructure investments. This elasticity of trade costs with respect to the quality of infrastructure is retrieved from studies on TEN-T infrastructure (European Commission, 2009), since no comparable elasticities are available for Cohesion Policy investments in transport infrastructure. As a result, we obtain a transport infrastructure scenario that can be readily implemented in the model.

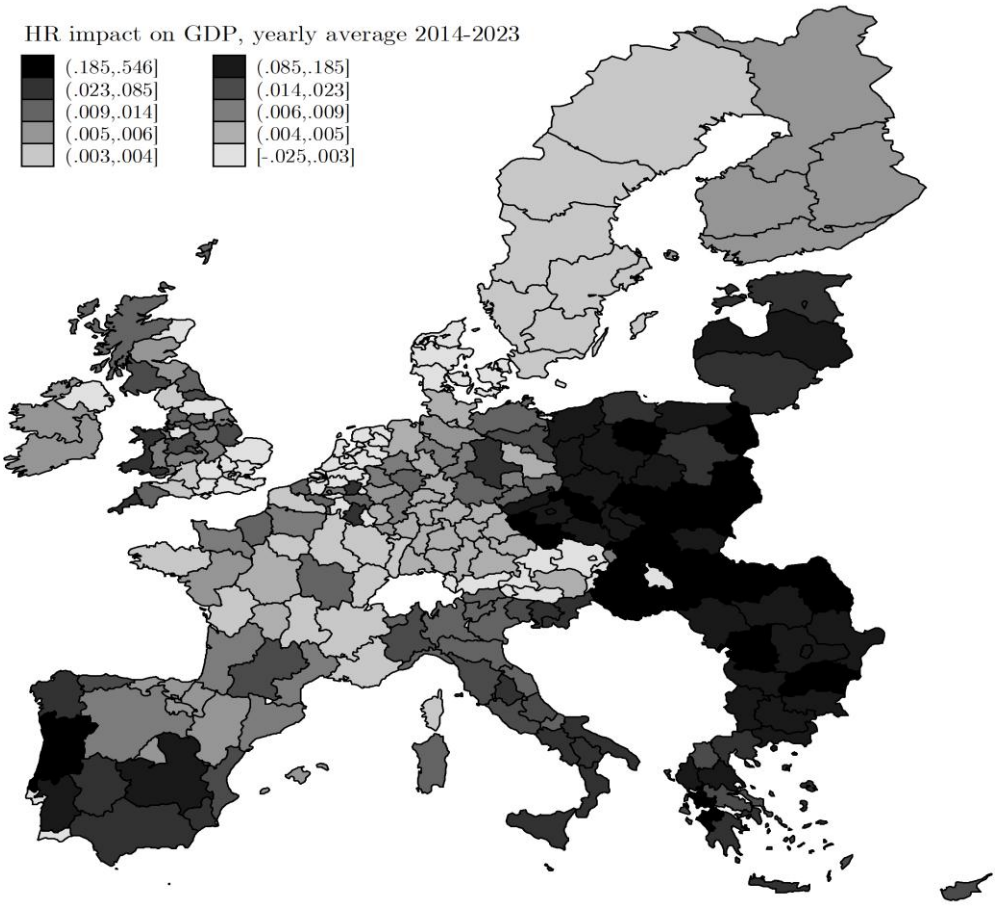
5 SIMULATION RESULTS

Given the high number of interactions and spillovers in RHOMOLO, regional shocks due to Cohesion Policy propagate quickly beyond regional borders. In fact, EU regions are highly interconnected through a dense network of trade in goods and services, flows of physical capital and technology that make the model and the interpretation of its results rather complex. Therefore, in order to fully capture the effects of each expenditure item and the role played by interconnections, we show the simulated impact of each measure in isolation and then their combination. Following the order proposed in the scenario construction (Section 4), we present first human-capital related policies, then R&D investments, followed by non-R&D subsidies and infrastructure investments. Finally, we show the overall impact of Cohesion Policy is obtained by combining the simulations and show the extent of spatial interrelations.

5.1 Interventions in the field of Human Capital

Cohesion Policy expenditures on human capital encompasses a wide variety of measures. It is projected to account for about 20% of total Cohesion Policy expenditures for the 2014-2020 period. To simulate the effects on human capital in RHOMOLO, the Human Capital expenditures are assumed to lead to an increase in labour productivity, however at the cost of a temporal decrease in the regional labour supply. Formally, an expenditure on human capital of 1% relative to local education expenditures is assumed to increase local labour productivity by 0.3%.[14]

Increase in regional labour productivity implies an increase in regional GDP but also an increase in labour demand and wages, which, in the long run, will attract new migrants. The following map displays the impact expected by 2030 of investment in human resources under Cohesion Policy 2014-2020.



Map 1: Impact of interventions in the field of human resources on NUTS 2 regions GDP, yearly average 2014-2023

As Map 1 suggests, the overall effect of investment in human resources is clearly positive, especially in most of the Central and Eastern European Member States. This reflects the distribution of Cohesion Policy support which is much higher for less developed regions compared to the transition and more developed regions.

[14] This elasticity is taken from the literature (Sianesi and Van Reenen 2003).

However, the difference in regional impact also stems from other factors. First, investment in human resources is likely to produce a larger impact on GDP in regions where the level of local expenditure on education is low. These are indeed places where Cohesion Policy support will significantly change the level of public support provided to human resources. Second, RHOMOLO includes six industrial sectors which are more or less intensive in labour. Regions where the industrial fabric incorporates a larger proportion of labour intensive industries (such as for instance manufacturing) are likely to benefit more from an increase in labour productivity.

Finally, investment in human resources also generates spatial spillovers. As for infrastructure investments, the increase of GDP in the regions receiving support also benefits other regions because of the interregional trade links.

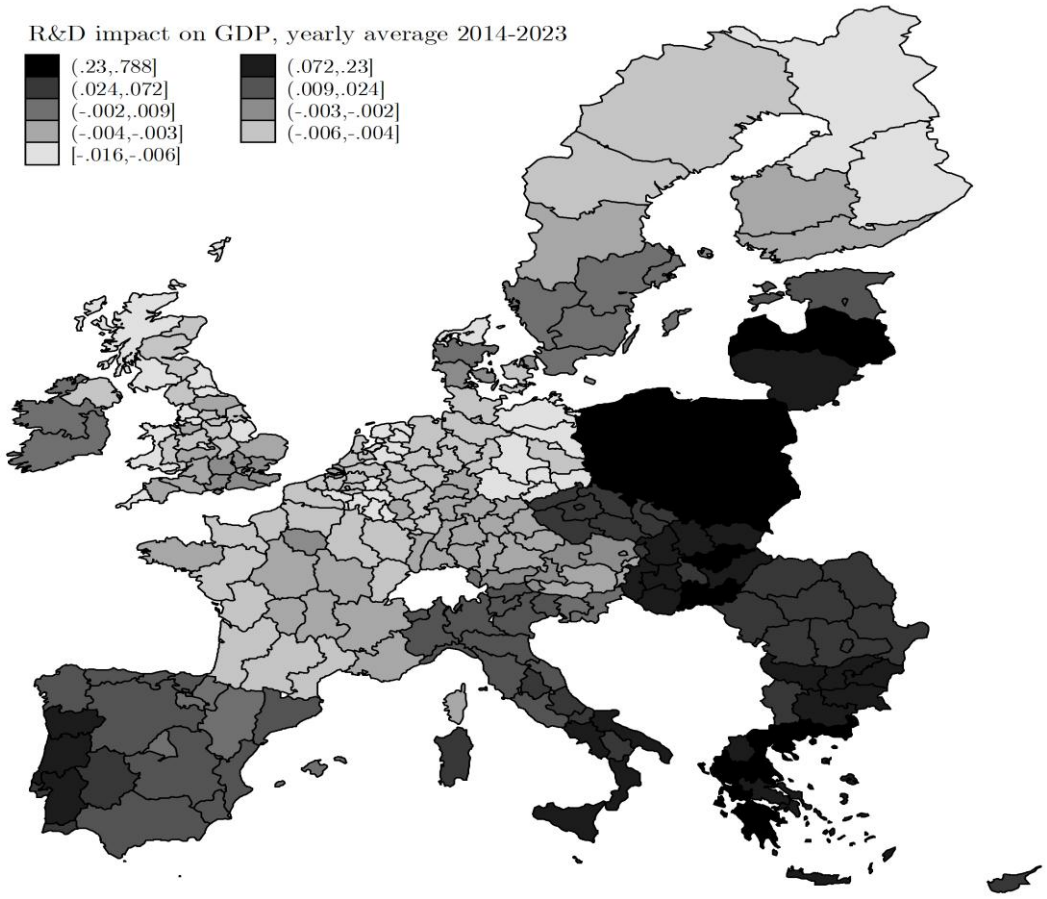
5.2 Interventions in the field of R&D

R&D is another key sector of intervention for Cohesion Policy and accounts for approximately 12% of the total Cohesion Policy budget (or €42 billion) that is to be allocated to lines of expenditure associated with support to research, technological development and innovation (RTDI) during the 2014-2020 programing period. More than 60% of this should be allocated to the less developed regions.

As discussed in Section 4.2, in RHOMOLO, support to RTDI is assumed to increase TFP. An increase in R&D affects GDP in several ways. First, GDP increases due to the fact that, as mentioned above, R&D leads to an increase in factor productivity. This also implies a reduction in the prices of intermediate inputs and hence of production costs which also contributes to increase GDP. Finally, the price of consumption goods also decreases which encourages demand and hence the level of economic activity. As for other fields of intervention, other regions benefit from a rise in GDP due to increased demand from the regions receiving RTDI support.

The model also accounts for spatial spillovers specific to R&D. Formally, it is assumed that the farther away a region from the technology frontier, the greater the potential for absorption and imitation of technological progress produced elsewhere. This not only implies that lagging regions are catching up on more advanced ones in terms of technology but also that an increase in R&D produces a bigger impact on factor productivity in regions where the level of technology is originally low.

The results of the simulation show positive effects in all regions, with very few exceptions due to the intensification of competition from catching-up regions (see Map 2). Czech, Hungarian, Polish and Portuguese regions benefit the most, with impacts on regional GDP of 1-2% above the baseline in 2020. The impact on GDP in the less developed regions on average is somewhat higher than 1.2% in 2020, after which it levels off to 0.2% of the baseline in 2030. A renewed/continued increase in RTDI would be needed to keep the regional economies on a higher growth path.

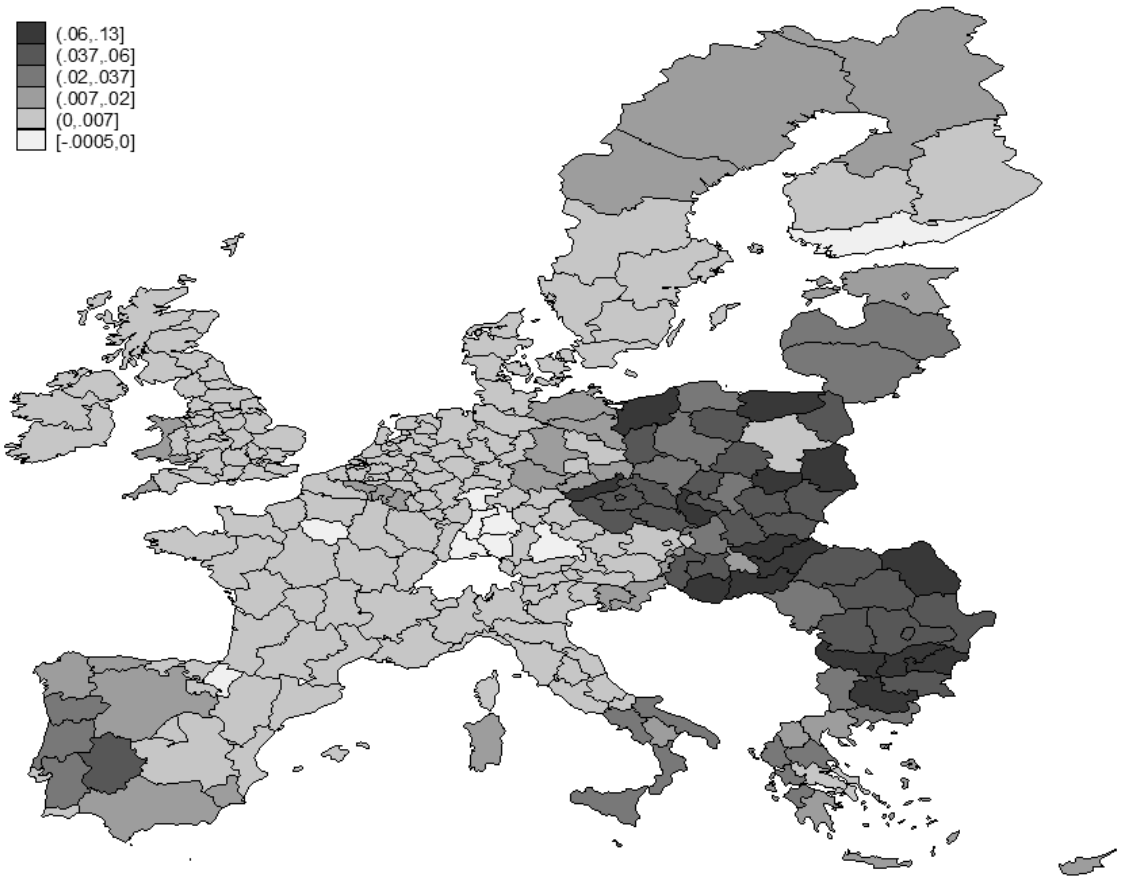


Map 2: Impact of interventions in the field of R&D on NUTS 2 regions GDP, yearly average 2014-2023

In general, the impact is higher in less developed regions than in transition regions. This is explained by the fact that less developed regions receive more support from Cohesion Policy than the two other groups and that R&D investment has a higher impact on TFP in lagging regions in terms of technology.

5.3 Interventions in the field of non-R&D subsidies

As explained in Section 4.3 and described at length in Diukanova and Lopez-Rodriguez (2014), non-R&D subsidies are another key component of the overall Cohesion Policy. Map 3 shows the impact of non-R&D subsidies on GDP across the NUTS2 regions in EU27. The impact on non-R&D subsidies is positive in all regions although their magnitude varies considerably between different types of regions. The most benefited regions are those located in the Eastern parts of Europe and the Southern European periphery (Greece, south of Italy Spain and Portugal). Central European regions only mildly benefit. The results of the simulations are highly correlated with the amount of non-R&D funds received.



Map 3: Impact of interventions in the field of non-R&D on NUTS 2 regions GDP, yearly average 2014-2023

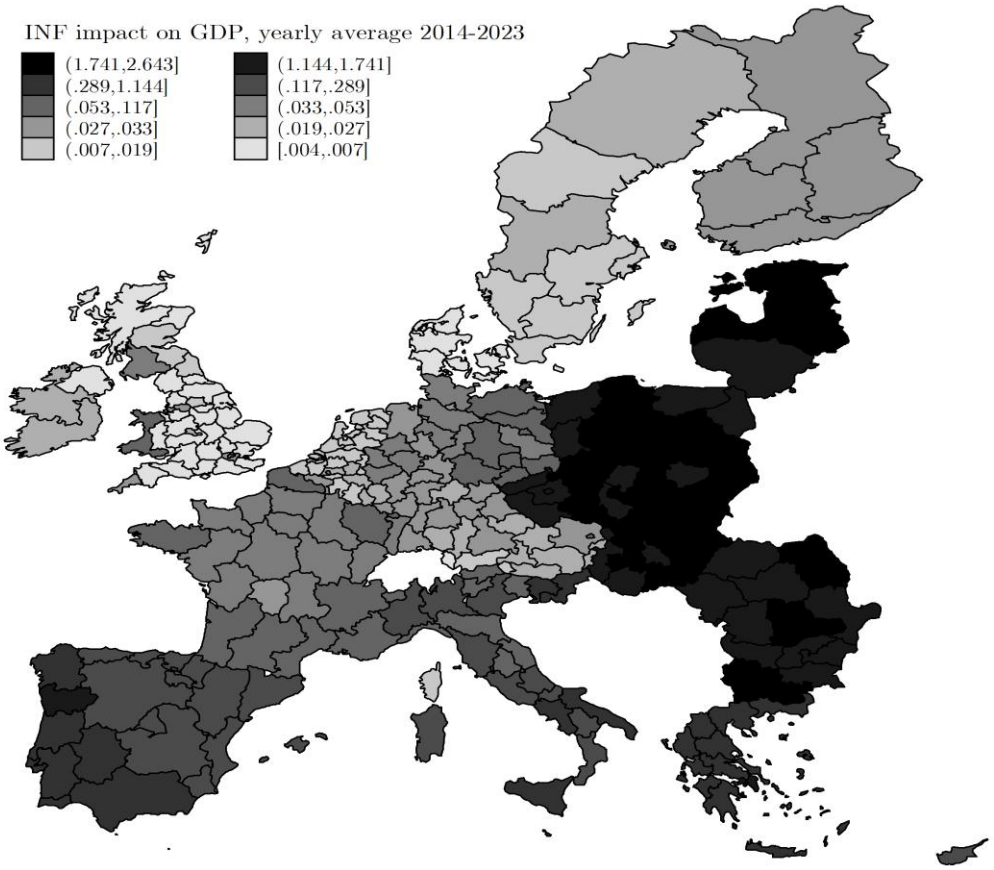
5.4 Interventions in the field of infrastructure

Finally, investment in infrastructure represents an important part of Cohesion Policy funding. For the 2014-2020 period, it is projected that investments in infrastructure will be around €168 billion, about half of all funds available.

However, there are large differences between regions concerning Cohesion Policy expenditure on infrastructure. Indeed, larger amounts are allocated to less developed regions. In addition, the share of infrastructure in the allocation is also higher than in more developed regions. Accordingly, Cohesion Policy expenditures on infrastructure are considerably higher in less developed regions compared to transition and more developed regions.

In order to simulate the impact of Cohesion Policy investment in the field of infrastructure, the corresponding expenditure (in €) needs to be 'translated' into changes in some of the model's parameters. Infrastructure investments are assumed to reduce transport costs between regions and the parameters representing transport costs are adjusted accordingly. Bilateral transport costs can be used to calculate an indicator of each region's accessibility. There are significant differences in transport cost reductions between regions and the largest improvements in accessibility take place in the less developed regions which reflects the expenditure pattern of Cohesion Policy.

Improvement in transport infrastructure means that regions have a better access to the EU markets which increases their exports and hence boosts the level of economic activity. Enhanced accessibility also implies a reduction in the price of imported intermediate goods and of consumption which contributes to reduce firms' production costs and increase real income of households. All these effects lead to an increase in regional GDP as shown in Map 4.



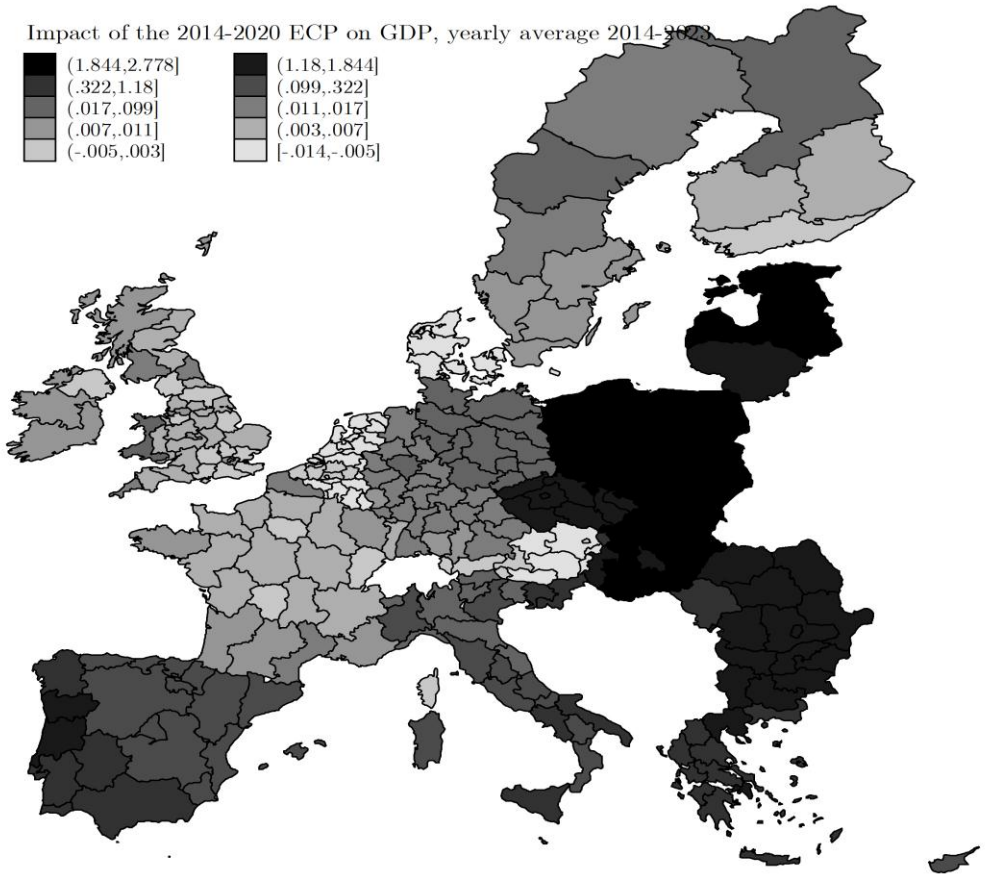
Map 4: Impact of interventions in the field of infrastructure on NUTS 2 regions GDP, yearly average 2014-2023

The largest returns of investment for improving accessibility are found in the less developed regions of the EU, due to the fact that it is in these regions where transport infrastructure is lacking and where improvement in accessibility investment makes thus the biggest difference.

The impact of investment in the field of infrastructure does not only materialise in the regions where the investment takes place. A region benefiting from enhanced accessibility increases its imports of goods from the other regions which in turn also experience an increase in their exports and hence their GDP. The impact of local intervention therefore has a tendency to progressively disseminate in space through the numerous trade links existing between the EU regions.

5.5 Simulating Cohesion Policy 2014-2020

We now turn to the simulation of the full Cohesion Policy package for the period 2014-2020. As mentioned above, RHOMOLO has been calibrated so as to follow the results of QUEST at the national level for each year and each Member State. This amounts to use RHOMOLO to disaggregate the results obtained with QUEST at the NUTS2 level. Map 5 shows the average annual impact for the implementation period (2014-2023). This can be considered as the short run as it corresponds to the period during which both demand side and supply side effects of the interventions are supposed to play.



Map 5: Impact of the 2014-2020 Cohesion Policy programmes on NUTS 2 regions GDP, yearly average 2014-2023

The impact is particularly large for regions located in Eastern and Central Europe. It is the highest in the Polish regions of Śląskie, Podkarpackie, Małopolskie and Lubelskie as well as in Východné Slovensko (Slovakia) where, compared to the baseline scenario with no policy interventions, Cohesion Policy is expected to increase GDP by more than 3% per year on average between 2014 and 2023. A number of regions in Southern Europe also benefit from a large positive impact of Cohesion Policy on their GDP. For instance, between 2014 and 2023 GDP is expected to increase on average by 1.7% per year in Norte (Portugal) and by 1.5% per year in Kentriki Makedonia (Greece).

This mainly reflects the fact that these regions are the main beneficiaries of Cohesion Policy. As resources allocated to these regions are generally high, one can expect to also observe a higher impact in terms of GDP. Such regions are also generally lagging behind in

terms of infrastructure and hence are in a situation where investment in this field is likely to produce a particularly large impact. In addition, Cohesion Policy support in the fields of human resources adds much more to the total amounts dedicated to education in these regions than in regions of more developed Member States. Finally, they are in general relatively more specialised in labour intensive industries, which implies that they particularly benefit from investment in human capital and the increase in labour productivity that follows.

Even if regions located in more developed Member States benefit less from Cohesion Policy interventions, the impact of the policy still remains significant in a number of more developed regions. For instance, GDP is expected to increase on average by 0.11% per year in Lazio (Italy) or by 0.12% per year in West Wales and The Valleys (UK) during the implementation period. The impact is obviously smaller in these regions where the allocation of cohesion funds is more modest and which are already largely endowed in infrastructure and human capital and technology. However, these regions still benefit from their own Cohesion Policy programmes but also from those implemented in other regions, in particular the less developed regions.

6 Conclusions

This paper presented RHOMOLO, the European Commission's spatial CGE model used for ex-ante impact policy assessment of the EUs 267 NUTS2 regions at the 6 NACE Rev. 1.1 industry level, through a simulation of the planned Cohesion Policy for the years 2014-2020. The Cohesion Policy expenditures were grouped into four main categories, covering Research, Technical Development and Innovation (RTDI), Infrastructure, Human Capital, and Aid to Private Sector. These expenditures are assumed to affect a set of parameters including factor productivity and transport costs that determine the model outcome.

A spatial CGE model such as RHOMOLO is essential for capturing the effects of cohesion policy but has its limitations. The cohesion policy expenditures were grouped into four main categories, covering "Research, Technical Development and Innovation", investment in Infrastructure, investment in human capital, and "Aid to private sector". These expenditures are assumed to affect a set of parameters including factor productivity and transport costs, which determine the model outcome.

The main dynamics in RHOMOLO are the long-term effects of capital accumulation that continue even after the funding has ended. As inter-temporal optimisation and forward-looking expectations are not currently included, inter-temporal dynamics of the simulations are not always reliable. Therefore, RHOMOLO has been calibrated to the European Commission's QUEST III model to obtain consistent results for each year and each Member State. What can also be done is to filter the input of the simulations through a module which incorporates more sophisticated dynamics than what we use currently in the model.

7 REFERENCES

Arundel, A., Bordoy, C. and M. Kanerva (2008), "Neglected innovators: how do innovative firms that do not perform R&D innovate?", *Results of an analysis of the Innobarometer 2007 survey,* 215. INNOMetrics Thematic Paper.

Baldwin, R., Forslid, R., Martin, P., Ottaviano, G. and F. Robert-Nicoud (2005), *Economic geography and public policy*. Princeton University Press.

Brandsma, A., Kancs, D. and D. Persyn (2014). "Modelling Migration and Regional Labour Markets: An Application of the New Economic Geography Model RHOMOLO," Journal of Economic Integration, 29 (2), 249-271.

Brandsma, A., Kancs, D., Monfort, P. and A. Rillaers (2015). "RHOMOLO: A regional-based spatial general equilibrium model for assessing the impact of cohesion policy," Papers in Regional Science, 94, doi:10.1111/pirs.12162.

Brandsma, A. and D. Kancs (2015). "RHOMOLO: A Dynamic General Equilibrium Modelling Approach to the Evaluation of the EU's R&D Policies," Regional Studies, 49, http://dx.doi.org/10.1080 /00343404. 2015.1034665.

Burgess, A., Chen, T. M., Snelder, M., Schneekloth, N., Korzhenevych, A., Szimba, E. and R. Christidis (2008), "Final report TRANS-TOOLS (TOOLS for TRansport forecasting And Scenario testing)", *Deliverable* 6*, funded by 6th Framework RTD Programme. TNO Inro, Delft, Netherlands*.

Di Comite, F., Diukanova O. and Kancs, D. (2015). RHOMOLO Model Manual A Dynamic Spatial General Equilibrium Model for EU Regions and Sectors. IPTS Working Papers JRC96776, European Commission, DG Joint Research Centre.

Di Comite, F. and Kancs, D. (2014). Modelling of Agglomeration and Dispersion in RHOMOLO. IPTS Working Papers JRC81349, European Commission, DG Joint Research Centre.

Di Comite, F. and Kancs, D. (2015). Macro-Economic Models for R&D and Innovation Policies: A Comparison of QUEST, RHOMOLO, GEM-E3 and NEMESIS. IPTS Working Papers JRC94323, European Commission, DG Joint Research Centre.

Di Comite, F., Kancs, D. and Torfs, W. (2015). Macroeconomic Modelling of R&D and Innovation Policies: An application of RHOMOLO and QUEST. IPTS Working Papers JRC89558, European Commission, DG Joint Research Centre.

Diukanova O. and J. Lopez-Rodriguez (2014), "Regional effects of non-R&D expenditures of innovation across the EU regions', *mimeo*. European Commission, DG Joint Research Centre.

European Commission, (2009), "Traffic flow: scenario, traffic forecast and analysis of traffic on the TEN-T, taking into consideration the external dimension of the Union", *TENconnect: Final Report*. European Commission, DG for Mobility and Transport.

European Commission, (2011), "Identifying and aggregating elasticities for spill-over effects due to linkages and externalities in the main sectors of investment co-financed by the EU Cohesion Policy"*, Spill-Over Elasticities: Final Report*. European Commission, DG for Regional and Urban Policy.

Kancs D., and Siliverstovs, B. (2016). R&D and Non-linear Productivity Growth. Research Policy, 45, Forthcoming.

Mathiesen, L. (1985), "Computation of economic equilibria by a sequence of linear complementarity problems", in *Economic equilibrium: model formulation and solution,* 144-162. Springer Berlin Heidelberg.

McMorrow, K., & W. Röger (2009), "R&D capital and economic growth: the empirical evidence", *EIB Papers*, 14(1), 94-118.

OECD (2001), *Measuring capital: OECD manual - Measurement of capital stocks, consumption of fixed capital and capital services*. Organisation for Economic Co-operation and Development.

Persyn, D., Torfs, W. and Kancs, d. (2014). Modelling regional labour market dynamics: Participation, employment and migration decisions in a spatial CGE model for the EU. Investigaciones Regionales, 29, 77-90.

Potters, L., Conte, A., Kancs, d. and Thissen, M. (2013). Data Needs for Regional Modelling. IPTS Working Papers JRC80845, European Commission, DG Joint Research Centre.

Rutherford, T. F. (1999), "Applied General Equilibrium modelling with MPSGE as a GAMS subsystem: an overview of the modelling framework and syntax", *Computational Economics*, 14, 1-46.

Sianesi B. and J. Van Reenen (2003), "The returns to education: macroeconomics", *Journal of Economic Surveys*, 17(2), 157-200.

Solow, R. M. (1956), "A contribution to the theory of economic growth", *Quarterly Journal of Economics*, 19, 33-41.

Som, O. (2012), *Innovation without R&D. Heterogeneous innovation patterns of non-R&D-performing firms in the German manufacturing industry*. Springer Gabler, Wiesbaden.

Thissen, M., Diodato, D. and F.G. van Oort (2013), *Integration and convergence in regional Europe: European regional trade flows from 2000 to 2010*. PBL Netherlands Environmental Assessment Agency, The Hague/Bilthoven.

Thissen, M., Di Comite, F., Kancs, d. and Potters, L. (2014). Modelling Inter-Regional Trade Flows: Data and Methodological Issues in RHOMOLO. REGIO Working Papers 02/2014, European Commission, DG Regional and Urban Policy.

Timmer, M., O'Mahony, M. and B. van Ark (2007), "The EU KLEMS growth and productivity accounts: an overview", *EU KLEMS Project report*, 6th Framework Program, European Commission.

ANNEX I: THE REGIONAL SOCIAL ACCOUNTING MATRIX

<table>
<tr><th></th><th>Commodities</th><th>Industries</th><th>Value Added Inputs</th><th colspan="2">Final Demand Sectors</th></tr>
<tr><td>Commodities</td><td></td><td>Intermediate Demand</td><td rowspan="2"></td><td>Final Demand</td><td>Exports</td></tr>
<tr><td>Industries</td><td>Output</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Value Added Inputs</td><td></td><td rowspan="2">Value Added and Taxes</td><td colspan="3" rowspan="2"></td></tr>
<tr><td>Taxes less Subsidies on Products</td></tr>
<tr><td rowspan="2">Final Demand Sectors</td><td></td><td rowspan="2"></td><td>Sources of Value Added</td><td></td><td>Incoming Transfers</td></tr>
<tr><td>Imports</td><td></td><td>Outgoing Transfers</td><td></td></tr>
<tr><td></td><td colspan="5">Trade & Transport Margins</td></tr>
</table>

ANNEX II: CATEGORIES OF COHESION POLICY EXPENDITURES

Categories of Expenditure 2007-'13	
Research and technological development (R&TD), innovation and entrepreneurship	
1	R&TD activities in research centres
2	R&TD infrastructure (including physical plant, instrumentation and high-speed computer networks linking research centres) and centres of competence in a specific technology
3	Technology transfer and improvement of cooperation networks between small and medium-sized businesses (SMEs), between these and other businesses and universities, post-secondary education establishments of all kinds, regional authorities, research centres and scientific and technological poles (scientific /technological parks, technopoles, etc.)
4	Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres)
5	Advanced support services for firms and groups of firms
6	Assistance to SMEs for the promotion of environmentally-friendly products and production processes (introduction of effective environment managing system, adoption and use of pollution prevention technologies, integration of clean technologies into firm production)
7	Investment in firms directly linked to research and innovation (innovative technologies, establishment of new firms by universities, existing R&TD centres and firms, etc.)
8	Other investment in firms
9	Other measures to stimulate research and innovation and entrepreneurship in SMEs
Information society	
10	Telephone infrastructures (including broadband networks)
11	Information and communication technologies (access, security, interoperability, risk-prevention, research, innovation, e-content, etc.)

12	Information and communication technologies (TEN-ICT)
13	Services and applications for the citizen (e-health, e-government, e-learning, e-inclusion, etc.)
14	Services and applications for SMEs (e-commerce, education and training, networking, etc.)
15	Other measures for improving access to and efficient use of ICT by SMEs
Transport	
16	Railways
17	Railways (TEN-T)
20	Motorways
21	Motorways (TEN-T)
26	Multimodal transport
27	Multimodal transport (TEN-T)
28	Intelligent transport systems
29	Airports
30	Ports
32	Inland waterways (TEN-T)
Energy	
34	Electricity (TEN-E)
36	Natural gas (TEN-E)
38	Petroleum products (TEN-E)
39	Renewable energy: wind
40	Renewable energy: solar
41	Renewable energy: biomass
42	Renewable energy: hydroelectric, geothermal and other
43	Energy efficiency, co-generation, energy management
Environmental protection and risk prevention	
52	Promotion of clean urban transport
Increasing the adaptability of workers and firms, enterprises and entrepreneurs	
62	Develop life-long learning systems and strategies in firms Training and services for employees to step up adaptability to change Promoting entrepreneurship and innovation
63	Design and dissemination of innovative and more productive ways of organising work
64	Development of specific services for employment, training and support in connection with restructuring of sectors and firms, and development of systems for anticipating economic changes and future requirements in terms of jobs and skills
Improving access to employment and sustainability	
65	Modernisation and strengthening of labour market institutions
66	Implementing active and preventive measures on the labour market
67	Measures encouraging active ageing and prolonging working lives
68	Support for self-employment and business start-up
69	Measures to improve access to employment and increase sustainable participation and progress of women in employment to

	reduce gender-based segregation in the labour market and to reconcile work and private life, such as facilitating access to childcare and care for dependent persons
70	Specific action to increase participation of migrants in employment and thereby strengthen their social Integration Improving the social inclusion of less-favoured persons
71	Pathways to integration and re-entry into employment for disadvantaged people; combating discrimination in accessing and progressing in the labour market and promoting acceptance of diversity at the workplace
Improving human capital	
72	Design, introduction
73	Measures to increase participation in education and training throughout the life-cycle, including through action to achieve a reduction in early school leaving, gender-based segregation of subjects and increased access to and quality of initial vocational and tertiary education and training
74	Developing human potential in the field of research and innovation, in particular through post-graduate studies and training of researchers, and networking activities between universities, research centres and businesses'
Non-Lisbon	
10	Telephone infrastructures (including broadband networks)
44	Management of household and industrial waste
45	Management and distribution of water (drink water)
46	Water treatment (waste water)
50	Rehabilitation of industrial sites and contaminated ¡and
53	Risk prevention (...)
61	Integrated projects for urban and rural regeneration
75	Education infrastructure
77	Childcare infrastructure
18	: Mobile rail assets
19	Mobile rail assets (TEN-T)
22	National roads
23	Regional/local roads
24	Cycle tracks
25	Urban transport
31	Inland waterways (regional and local•
33	Electricity
35	Natural gas
37	Petroleum products
44	Management of household and industrial waste
45	Management and distribution of water (drink water)
46	Water treatment (waste water)
47	Air quality
48	Integrated prevention and pollution control
49	Mitigation and adaption to climate change

50	Rehabilitation of industrial sites and contaminated land
51	Promotion of biodiversity and nature protection (including Natura 2000)
53	Risk prevention.
54	Other measures to preserve the environment and prevent risks
55	Promotion of natural assets
56	Protection and development of natural heritage
57	Other assistance to improve tourist services
58	Protection and preservation of the cultural heritage
59	Development of cultural infrastructure
60	Other assistance to improve cultural services
61	Integrated projects for urban and rural regeneration
75	Education infrastructure
76	Health infrastructure
77	Childcare infrastructure
78	Housing infrastructure
79	Other social• infrastructure
80	Promoting the partnerships, pacts and initiatives through the networking of relevant stakeholders
81	Mechanisms for improving good policy and programme design, monitoring and evaluation
82	Compensation of any additional costs due to accessibility deficit and territorial fragmentation
83	Specific action addressed to compensate additional costs due to size market factors
84	Support to compensate additional costs due to climate conditions and relief difficulties
85	Preparation, implementation, monitoring and inspection
86	Evaluation and studies; information and communication

European Commission
EUR 27396 EN – Joint Research Centre – Institute for Prospective Technological Studies

Title: **Assessing policy options for the EU Cohesion Policy 2014-2020**

Author(s): Andries Brandsma, Francesco Di Comite, Olga Diukanova, d'Artis Kancs, Jesus Lopez Rodriguez, Damiaan Persyn and Lesley Potters

Luxembourg: Publications Office of the European Union

2015 – 27 pp. – 21.0 x 29.7 cm

EUR – Scientific and Technical Research series – ISSN 1831-9424 (online)

ISBN 978-92-79-50437-2 (PDF)

doi:10.2791/95488

LF-NA-27396-EN-N

JRC Mission

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.

Serving society
Stimulating innovation
Supporting legislation

doi:10.2791/95488

ISBN 978-92-79-50437-2

Publications Office