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The importance of studying inter-regional spillover effects of European policies: application of the RHOMOLO model for Poland

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Abstract

The European cohesion policy is the EU's main investment policy and targets all regions and cities across the EU to support job creation, business competitiveness, economic growth, and sustainable development. In the 2014–2020 programming period, one third of the EU budget has been allocated to the projects under this policy. This report contains a macroeconomic impact assessment of the European cohesion policy with a focus on Polish regions. The analysis deals in particular with the spillover effects arising from the policy intervention resulting from indirect trade effects and other inter-regional inter-dependencies and interactions. The analysis shows that the policy has a positive long-run impact, lasting years after the end of the programmes. This reflects the fact that cohesion policy supports investments in key engines of growth improving the structure of the Polish economy.

The importance of studying inter-regional spillover effects of European policies: application of the RHOMOLO model for Poland

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1. Introduction

The European Commission plays a key role in developing the overall strategy of the European Union (EU) as well as in designing and implementing its policies. This is carried out mainly by proposing legislation to the European Parliament and the Council of the European Union, by helping the Member States (MS) implementing EU legislation and managing the EU budget. In doing so, the European Commission is also responsible for systematic reporting on the progress in the implementation of EU policies and their evaluation. This is done by publishing periodical reports in accordance with the annual strategic plan and programming cycle. Particular attention is being paid to the effectiveness, efficiency, relevance and coherence of policies, as well as their contribution to EU added value.

There are different types of policy impact assessments/evaluations. *Ex-ante* evaluations are conducted before a decision is issued and prior to implementation, and serve the purpose of supporting policymakers in the selection of different policy designs. Interim and on-going evaluations highlight the areas of progress/delay, which could be tackled during current policy implementation with a view to improving the efficiency/effectiveness of the selected policy strategy. Finally, *ex-post* evaluations take place upon the completion of an intervention, when data on its implementation become available. At the European level, impact assessments (IAs) are carried out with respect to all initiatives which are expected to have significant economic, social or environmental impact. Their findings are always summarised in IA reports, whose quality is checked by the Regulatory Scrutiny Board, an independent body within European institutions. The Board examines and issues opinions and recommendations on all of the Commission's draft impact assessments, major evaluations and fitness checks of existing legislation. After passing this quality check, IA reports are published with the proposals or acts proposed by the Commission and sent to the Parliament and the Council for consideration when deciding whether or not to adopt the proposed law.[1]

Most policy assessments are carried out using different instruments, including economic model simulations, counterfactual analyses and econometric studies (for an analysis of the instruments used between 2009 and 2014 see Petrov et al., 2017). Some recent examples of evaluations of specific EU policies include the following: the IA of the European and Regional Development Fund and the Cohesion Fund (ERDF and CF, respectively; see European Commission, 2018a); the IA of the European Social Fund (ESF; see European Commission, 2018b); the IA of Horizon Europe (European Commission, 2018c); and the *ex-post* evaluation of the European Fund for Strategic Investments (EFSI; see European Commission, 2018d). These four examples have one thing in common: the spatial dynamic computable general equilibrium (CGE) model called RHOMOLO (Lecca et al., 2018) which

[1] IAs are required by the Better regulation guidelines (European Commission, 2015). These guidelines state that evidence should be quantified as much as possible and based on transparent assumptions, uncertainties and methods.

has been used either as the sole analytical tool or in combination with other instruments. Modern macroeconomic models such as RHOMOLO provide coherent and internally consistent frameworks to analyse the channels through which macroeconomic policies affect national and regional economies.

The RHOMOLO model has been developed by the Joint Research Centre (JRC), the European Commission's science and knowledge service, and the Directorate-General for Regional and Urban Policy (DG REGIO). The structure of the model – calibrated based on data for 267 EU NUTS2 regions – makes it a suitable tool for evaluating policies implemented at the regional level, as well as for evaluating the territorial impact of policies implemented at national and European level. Among the said policies, and despite all of them have interesting implications at the regional level in the EU, the one with a more pronounced territorial aspect is the European Structural and Investment Funds (ESIF). ESIF include five different funds, which are all covered by Regulation (EU) No 1303/2013 of the European Parliament and of the Council, the so-called "Common Provisions Regulation". The Structural Funds include: ERDF, providing financial support since 1975 for the development and structural adjustment of regional economies, economic change, enhanced competitiveness, as well as territorial cooperation throughout the EU; and ESF, which was set up in 1958 and seeks to contribute to the adaptability of workers and enterprises, access to employment and participation in the labour market, social inclusion of disadvantaged people, combating all forms of discrimination, and creating partnerships to manage reforms in employment. The other three funds constituting ESIF are CF, which supports exclusively less-developed Member States; the European Agricultural Fund for Rural Development; and the European Maritime and Fisheries Fund. In particular, under the 2014–2020 Multi-annual Financial Framework (MFF), slightly more than €461 billion have been allocated from the Community budget to these funds (the total budget including national funding totalling €645 billion).

While it is important to evaluate the economic and social effects of such policies in the regions which receive the funds and are affected by the measures provided for in EU programmes (as in, for example, Di Comite et al., 2018a), we argue that it is essential to understand the system-wide implications of EU policies even when the analysis focuses on specific territories. The intuition behind such statement lies in the fact that almost any intervention, however small and implemented in a specific territory, will probably affect one or more regions outside the targeted one. The reason is that all European regions are interconnected through trade links as well as factor mobility, that is workers (labour) and investments (capital) moving from one region to another without barriers.[2] This Report contains an analysis carried out using the RHOMOLO model to demonstrate the importance of accounting for inter-regional spillover effects when studying European policies.

The remainder of the Report is organised as follows: Section 2 illustrates in a non-technical way the RHOMOLO model and argues for its relevance in support of policy making. Section 3 presents some results pertaining to the *ex-ante* IAs of the 2014–2020 European Regional

[2] Since the Schengen Agreement signed in 1985, the freedom of movement and residence for persons in the EU has been one of the cornerstones of Union citizenship, established by the Treaty of Maastricht in 1992. The gradual phasing-out of internal borders under Schengen agreements was followed by the adoption of Directive 2004/38/EC on the right of EU citizens and their family members to move and reside freely within the EU. As for capital, the European Commission is continuously working on removing of the existing international barriers to the movement of capital (Christensen et al., 2018b).

and Development Fund and Cohesion Fund, and Section 4 does the same but focuses on Polish regions. Section 5 provides a conclusion.

2. Introduction to the RHOMOLO model

The RHOMOLO model was developed by the European Commission's Joint Research Centre (JRC) in collaboration with the Directorate-General for Regional and Urban Policy (DG REGIO) to support EU policymakers by providing sector-, region-, and time-specific simulations on investment policies and structural reforms in the EU and in its Member States. Broadly speaking, general equilibrium models are used to generate insights into the effects of policies and others shocks in the areas of trade, fiscal policy, demography, immigration, labour markets and the environment. More specifically, computable general equilibrium (CGE) models permit to quantify these effects with respect to industries, occupations, regions and socioeconomic groups (Dixon and Jorgenson, 2013). The standard way to specify a CGE model is to use data of a certain region or groups of regions for a certain year (labelled base year) organised in the form of Social Accounting Matrices (SAMs) and perform a calibration exercise resulting in the evaluation of certain model parameters. SAM is a way of organising information regarding an economy to account for all the transactions in the product and resource markets and also include the characteristics of labour force, government policies (taxes and transfers) and other allocations of income. Essentially, a SAM includes more information than a simple IO table (containing information on the production and use of goods and services and the income generated in that production), as it includes information on the secondary distribution of income, detailing the roles of labour and households (Miller and Blair, 2009).

The main distinctive feature of the model lies in its regional dimension, RHOMOLO being calibrated based on data for 267 EU NUTS 2 regions, as well as for a residual region accounting for the rest of the World. The model is unique in its geographical description of EU regions which are interrelated economically via a system of multi-regional IO tables and geographically via the use of big data and satellite information for the purpose of establishing territorial proximity and accessibility (Persyn et al., 2020). As such, the nature of the model makes it a suitable tool to analyse the territorial impact of funding programmes and policies – especially those with a marked geographical focus such as the EU cohesion policy – although over time the scope of the model has been broadened in order to meet the additional requests coming from EU institutions and other external stakeholders.

At the time of writing, several alternative versions of the RHOMOLO model are available depending on the type of analysis to be carried out. Moreover, the model framework allows some degree of flexibility on certain patterns such as the modelling, for example, of some assumptions on the labour market structure (i.e. wage-setting mechanisms, migration dynamics) and on the mobility of production factors. In turn, this makes RHOMOLO a truly flexible tool useful for the evaluation of a number of different types of policies and funding programmes.

Currently, beyond the standard RHOMOLO model version, it is worth mentioning the existence of (a) the RHOMOLO-EIB version used for the evaluation of the so-called Juncker plan (EIB, 2018; Christensen et al., 2019); (b) the RHOMOLO-IO (IO stands for input-output) version used, e.g., for the evaluation of the European Globalisation Adjustment

Fund (European Commission, 2018b) and the impact of Energy Union under the third pillar of the Investment Plan for Europe (Christensen et al., 2018a).

The full mathematical description of the RHOMOLO model is beyond the scope of the present Report and can be found in Lecca et al. (2018). Suffice it to say that the model has a set of ten economic sectors (based on the NACE 2 industry classification[3]) and firms are assumed to maximise profits and produce goods and services according to a certain production function. The remaining agents in the model include utility-maximising households and a government which collects taxes and spends money on public goods and transfers.[4] Capital and labour are factors of production, and trade is fully characterised by taking advantage of a transport module explained by Persyn et al. (2020). The model is flexible in terms of a number of its behavioural parameters, including its labour market assumptions as illustrated in Lecca et al. (2020).

The RHOMOLO dataset is a multi-regional IO table for the EU-28 at the NUTS 2 level which results from a complex procedure making use of a number of data sources and procedures, as explained in detail by Thissen et al. (2019). Essentially, the Supply and Use tables for the 28 MS of the EU published by Eurostat are the starting point for the construction of the dataset. The tables are then trade-linked using information on the trade of both goods and services, and then regionalised using information available at the NUTS 2 level. Finally, the inter-regional IO tables for the NUTS 2 regions of EU-28 are created, taking into account a number of issues such as re-exports and the existence of logistic hubs. The model is calibrated based on data for 2013, although the dataset is updated periodically in order to reflect the most recently available economic situation of the EU.[5]

As briefly mentioned above, the results obtained from the use of the RHOMOLO model have been featured in a number of recent European Commission's IAs and are highly visible thanks to official policy documents (for instance, see European Commission, 2018e, in relation with the EFSI) and communications (such as European Commission, 2018f for the Investment Plan for Europe). For transparency and accounting reasons, the analyses supporting such documents are fully illustrated in corresponding research reports. One example is offered by Christensen et al. (2018a) whose main results are also summarised in a non-technical policy brief published in the same year (Christensen et al., 2018b).

Since the aim of this Report is to illustrate real model applications for funding programmes, the next section is devoted to the illustration of the European cohesion policy and the resources mobilised under it during the current programming period (2014–2020). Then, section 4 zooms on Poland to offer some policy insights for its regions based on the results of the RHOMOLO modelling analysis.[6]

[3] As such, this is consistent with the Polish Classification of Activities (PKD 2007).

[4] The high dimensionality of RHOMOLO in terms of regions and sectors implies that the number of (non-linear) equations to be solved simultaneously is very large (in the order of hundreds of thousands). To keep the model manageable from a computation point of view, its dynamics are kept relatively simple. The model is solved in a recursively dynamic mode, where a sequence of static equilibria is linked to each other through the law of motion of state variables. This implies that economic agents are not forward-looking and their decisions are solely based on current and past information.

[5] Data updates in the model depend on the availability of Supply and Use tables at national level (Thissen et al., 2019). There will be a new release with 2014 data before the end of 2020.

[6] For more insights about Poland, please see the book edited by Pokorski et al. (2019) in which the content of this Report is featured in one of the chapters.

3. The European cohesion policy

The European cohesion policy is the EU's main investment policy and it targets all regions and cities in the EU to support job creation, business competitiveness, economic growth and sustainable development. The aim of cohesion policy is to achieve economic and social cohesion, namely to reduce the disparities between EU regions by promoting more balanced and sustainable territorial development. Under the 2014–2020 Multi-Annual Financial Framework (MFF), more than €460 billion of Community funding has been allocated.[7] Around 70% of the resources go to the economic, social and territorial cohesion objective, with more than half of that targeting less developed regions where GDP is less than 75% of the EU average. The implementation of the policy is constantly monitored by European institutions (see, for instance, European Commission, 2018g).

The analysis of the impact of European cohesion policy in Poland follows the approach and methodology used in Di Comite et al. (2018b), where the system-wide effects of structural and cohesion policy funds have been estimated. The model takes into account the fact that the cohesion policy is financed by contributions of each Member State proportionally to its contribution to the overall EU budget. Each Member State's contribution is assumed to be proportional to its GDP and is financed through lump-sum taxes. In turn, increasing taxes adversely affects economic performance and this partly offsets the positive impact of the programmes. In the 2014–2020 programming period, expenditure under cohesion policy has been officially split into 123 categories, but, for the purposes of the present simulation, we have regrouped them into six main groups of policies: transport infrastructure investments (TRANSP); other infrastructure investments (INFR); investments in human capital (HC); investments in research and innovation (RTD); aid to the private sector (AIS); and technical assistance (TA). These six categories of investment are implemented in RHOMOLO through eleven different variables (policy shocks) as described in Table 1.

Financial resources under cohesion policy amount to roughly €77 billion in Poland and around €273 billion in the Rest of the EU (REU) in 2011 prices.[8] The relative allocation of funding across expenditure items is not identical in all regions, but is tailored to the specific needs of each territory. For Poland, in the 2014–2020 programming period, 36% of total investments are allocated to transport infrastructure investments, 26% to other infrastructure investments, 16% to human capital, 15% to research and development, while 5% and 3% are allocated to aid to private sectors and technical assistance, respectively. Each policy category is assumed to generate temporary and structural effects on the regional economies. The temporary effects directly reflect the transfer of resources resulting from the implementation of the cohesion policy package, while the structural effects are introduced with the idea to capture long-lasting changes associated to each policy intervention.

Four types of temporary shocks are covered: government purchases of goods and services from the market, as in the shocks number 1, 3, 4, 5, 6, 10 and 11 in Table 1; public investments, as in shock number 2; production subsidies, as in shock number 8; investment subsidies aimed at reducing the risk premium, as in shocks number 7 and 9.

[7] https://cohesiondata.ec.europa.eu/overview
[8] Simulations for ex-ante impact assessment are performed with original financial allocation at 2011 prices.

There are five main types of structural shocks: reductions in transport costs (shock number 1); increase in TFP (shock number 6); increase in labour productivity combined with a temporary reduction in labour market participation (shocks number 4 and 5).

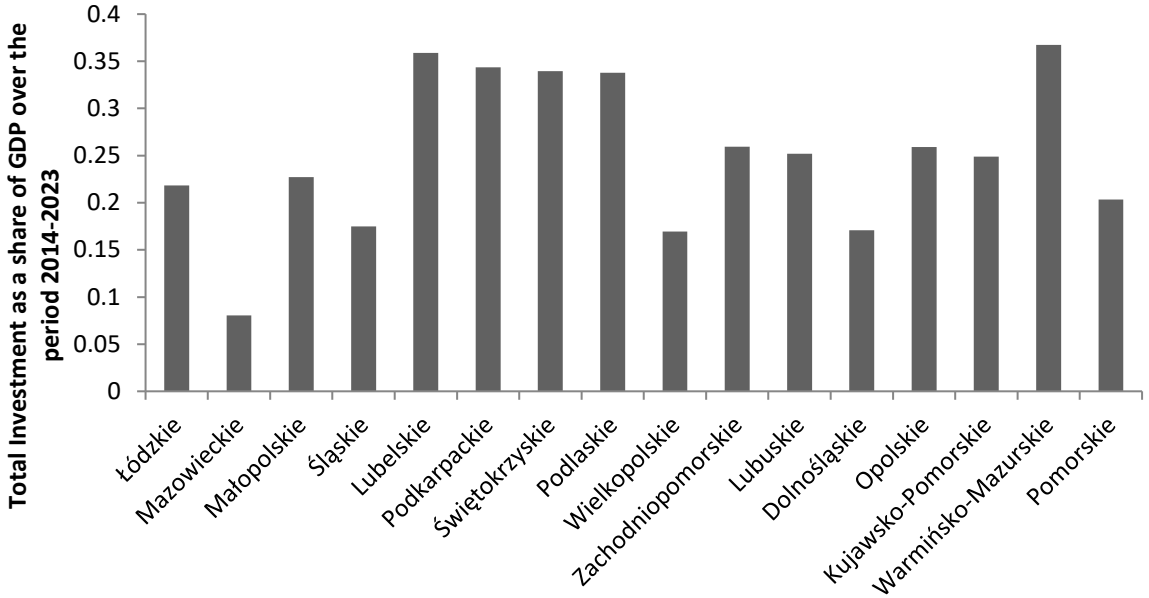
To get an idea of the magnitude of the investments and the relative allocation of funding across regions, Figure 1 plots the investments as a share of GDP for each of the Polish regions. We observe that the spatial allocation of funding is uneven across regions benefitting relatively more the poorer regions. Indeed, there is a group of regions, namely Lubelskie (PL31), Podkarpackie (PL32), Świętokrzyskie (PL33), Podlaskie (PL34) and Warmińsko-Mazurskie (PL62), that receive relatively more than other regions. Mazowieckie (PL12) – the largest, most populous and most prosperous region in Poland – receives a lower amount of funding relative to its own GDP.

Table 1. Introduction of cohesion policy shocks in RHOMOLO

Type of Shock	*TYPE*	*MODEL VAR*	*No*	*Temporary effect /EU budget money flow*	*Permanent policy effect*
Infrastructure - Transport	TRNSP	TCOST	1	Increase in government consumption	Decrease in transportation costs
Infrastructure - Other	INFR	IG	2	Increase in public investment	
		G	3	Increase in government consumption	
Human Capital	HC	TRAIN	4	Decrease in labour supply (all workers) + Increase in government consumption	Increase in labour productivity (all types of labour)
		TRAINH	5	Decrease in labour supply (highly skilled workers) + Increase in government consumption	Increase in high-skill labour productivity (highly skilled workers)
R&D	RTD	FCA	6	Increase in government consumption	Increase in TFP
		RPREMA	7	Investment subsidy to reduce risk premium	
Aid to Private Sector	AIS	FCY	8	Production subsidy	
		RPREMK	9	Investment subsidy to reduce risk premium	
		G	10	Increase in government consumption	
Technical Assistance	TA	G	11	Increase in government consumption of "other services" in recipient regions (financed by the others)	–

Note: TCOST – inter-regional transportation costs; IG – government investment; G – government consumption; FCA – entry costs to intermediates; FCY – fixed costs final demand firms; TRAIN(L,M,H) – worker training; RPREMK – shock to tangible capital cost; RPREMA – shock to intangible capital cost.

Figure 1. ESI Funds as a share of GDP in Polish NUTS 2 regions[9]



Source: European Commission, DG REGIO (https://cohesiondata.ec.europa.eu/browse).

4. Modelling analysis of Polish regions

4.1 Macroeconomic impact in Poland

In this section, we present the results of the simulations implemented in RHOMOLO, as described in the section above. We mainly focus on the macroeconomic impact of the cohesion policy in Poland at national and regional level. The simulation results suggest an increase in Polish GDP for the entire programming period and beyond, with long-lasting effects generated by the structural policies simulated (Figure 2). In the year 2062 (forty years after the end of the policy, considered here as the very long-run time horizon of the analysis), GDP increases by 0.63% compared to base year values and reaches its peak in 2023, that is at the end of the financing period. In Figure 2, we also plot the level of the investment shock (bars) as a share of GDP. We observe that in the short-run and for the period between 2014 and 2020, the investment expenditure in Poland is higher than the benefits in terms of GDP generated in the country. This means that in this time frame, multiplier effects are positive but lower than one.[10] Nevertheless, after this period, positive permanent effects remain as the interventions durably improve the structure of the Polish economy, thus allowing the policy to have an impact even many years after the termination of the programmes. In the long-run, the structural change effects associated with the interventions might be very substantial and able to generate cumulative multipliers greater than 1, as in this case.

The response to the investment funds is asymmetric across the regions in Poland. This is confirmed in Figure 3, where we show the long-term impact on GDP and employment

[9] https://ec.europa.eu/eurostat/web/nuts/nuts-maps-.pdf-

[10] The multiplier is defined as the ratio between the changes in national income to the change in government expenditures. Therefore, a multiplier greater than 1 implies changes in GDP larger than the changes in the initial stimulus.

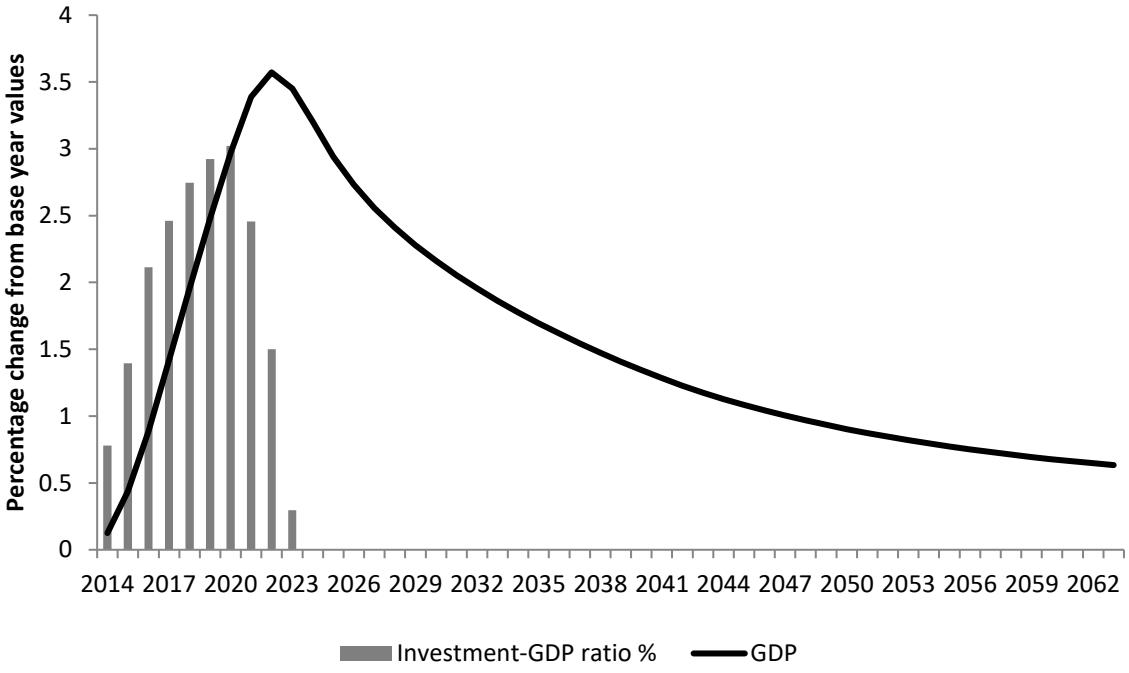
disaggregated at NUTS 2 level. Typically, we observe that the impact is higher in regions receiving relatively more in terms of funds, as confirmed by Figure 1. We also notice that changes in GDP are greater than changes in employment. This suggests that capital stock is increasing more than employment. Essentially, the European policy is targeted to stimulate investments generating bigger substitution effects in favour of capital.[11] Overall, employment does rise in the long-run, implying that the general equilibrium demand curve for labour is wage-elastic, that is employment is fully responsive to changes in wages.

According to Di Comite et al. (2018b), the EU average long-run increase in GDP settles to 0.62% from base-year values. Hence, with the exception of the Mazowieckie and Wielkopolskie Voivodeships, the remaining regions in Poland are growing at a bigger long-term rate than that registered for the EU as a whole. This partially means that Polish regions are catching up and that structural and cohesion funds are largely helping the process of regional convergence.

The macroeconomic adjustments generated by the European cohesion policy induce a system-wide increase in the efficiency of Polish economies in the long run. The stimulus to investments is then translated into a reduction in the price of capital that in turn puts downward pressure on the price of all commodities. This has the effect of increasing real income in the target economy, thereby raising consumption of domestic goods. Moreover, the fall in prices provides a source of positive effects in terms of international trade, which eventually stimulate foreign demand for goods and services, increasing output in the economy even further. This mechanism is confirmed by Figure 4 where we show the deviation from base-year values of exports of all the NUTS 2 regions of Poland. In all regions, exports fall in the short run, because the demand-side effects of the policy interventions dominate the overall impact putting upward pressure on prices and, in turn, generate a reduction in competitiveness. On the contrary, in the long run, the economies involved are able to fully adjust, materialising the supply-side effects intrinsically incorporated into the policy shocks, and therefore stimulating an increase in exports through a reduction in domestic prices.

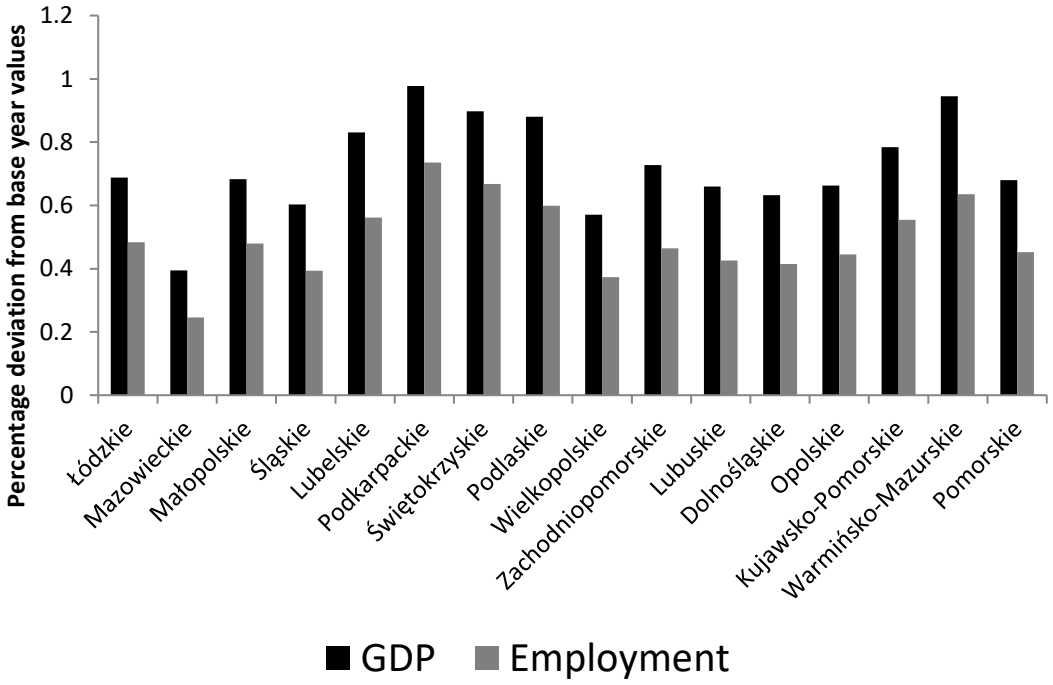
[11] The substitution effect is the change in the demand of factors of production (here capital and labour) due to changes in the relative prices of factors of production. In this case, policy intervention makes the price of capital lower than the price of labour.

Figure 2. Cohesion policy investments as a share of GDP (bars) and GDP impact (black line) as % deviations from the baseline GDP in Poland



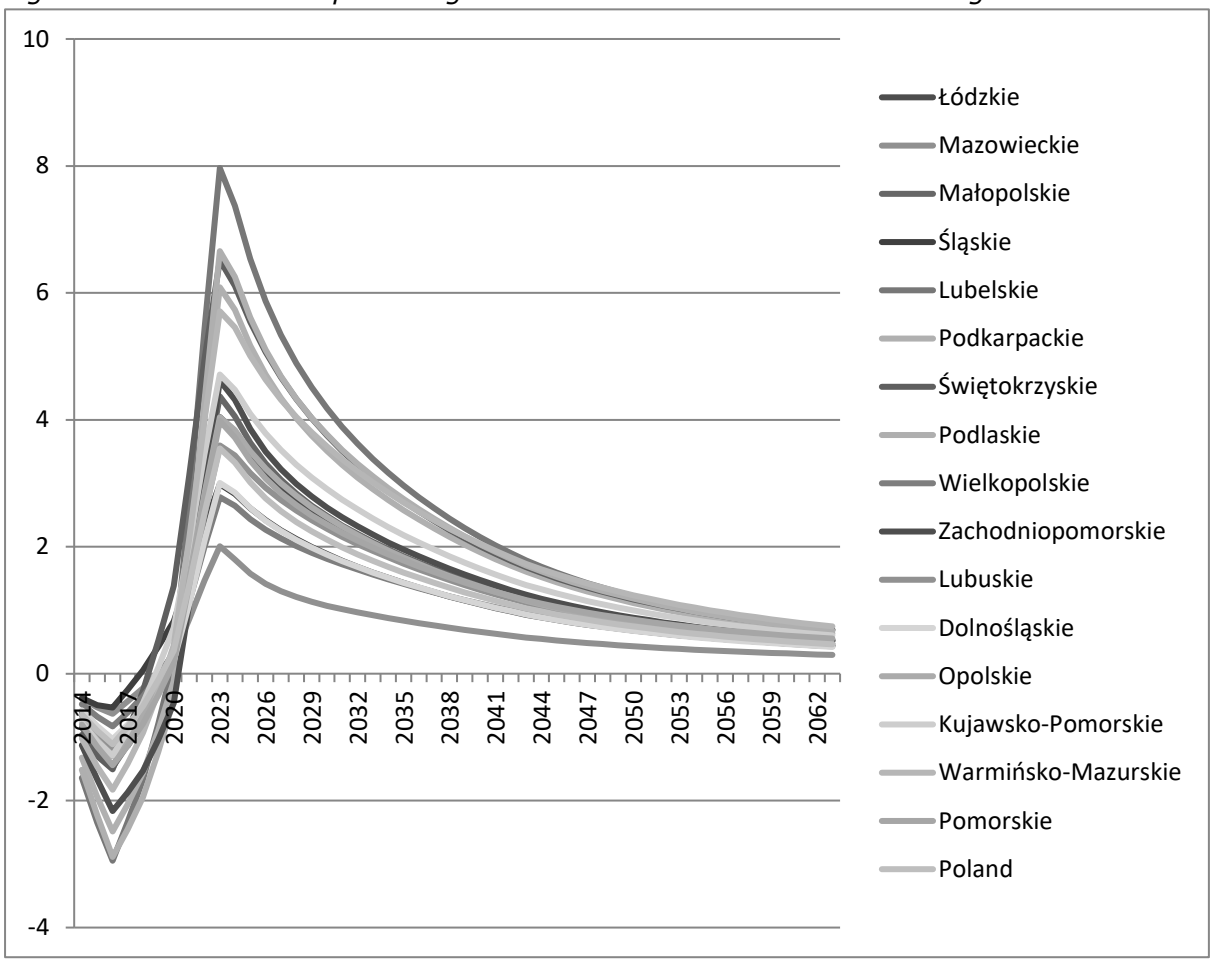
Source: Authors' simulations.

Figure 3. GDP and employment impact (% deviations from the baseline) in Polish NUTS 2 regions, very long run.



Source: Authors' simulations.

Figure 4. Evolution of exports of goods and services in Polish NUTS 2 regions



Source: Authors' simulations.

4.2 Inter-regional spillover effects

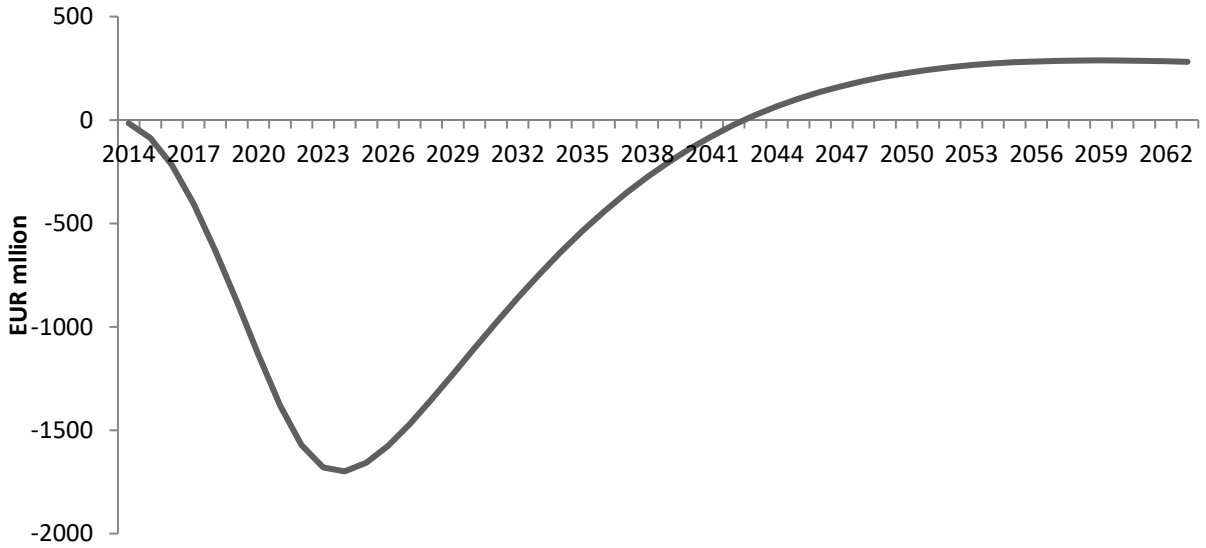
In the preceding section, we have discussed the economic impact that would occur in Poland as a result of a coordinated effort where the policy is implemented simultaneously in all regions and countries in Europe. We are now interested in exploring the nature of inter-regional interactions and spillover effects that would occur as a result of implementing the European cohesion policy in a single country and to what extent the rest of the regions are likely to be affected. In particular, we would like to quantify the scale and the determinants of inter-regional spillover effects and detect channels of adjustment and drivers of benefits (or losses) due to the policy, for the territories not receiving the investments. What would happen if all countries except one would contribute to the policy without receiving any funding from it? Would the policy-induced benefits occurring in the recipient country spill over to the rest of the EU as a result of the indirect trade effects and other inter-regional inter-dependencies? These are essentially the main questions we will attempt to answer.

Our simulation strategy remains the same as the one described in section 3. This means that the simulations performed include the six policy shocks described in Table 1 and that the monetary injections as well as the structural effects implemented are unchanged. However, for the purpose of this section, the investments are directed exclusively to all regions of Poland, while all the other regions of the EU are simply financing such

investments through a lump-sum tax on household income in order to ensure a balanced EU budget.

It is appealing in the first instance to quantify the differences between the GDP impacts obtained under coordinated efforts that we discussed in the previous section with the results obtained when Poland is the only country receiving policy funds. Figure 5 plots the discounted cumulative differences in Polish GDP between the two simulations.[12] We can see that from the short to medium run Poland would be better off if the European policy was only targeted at its regions. However, the opposite occurs in the long run. Once the structural change effects fully materialise in all Member States, Polish economy will gain more if all countries in Europe benefit at the same time from the cohesion policy. As the economy of the other Member States expands due to the cohesion policy, the aggregate effects on the Polish economy will be larger. There is therefore a clear system-wide benefit of the Cohesion policy in the long run.

Figure 5. Discounted cumulative differences in Polish GDP between two alternative simulations



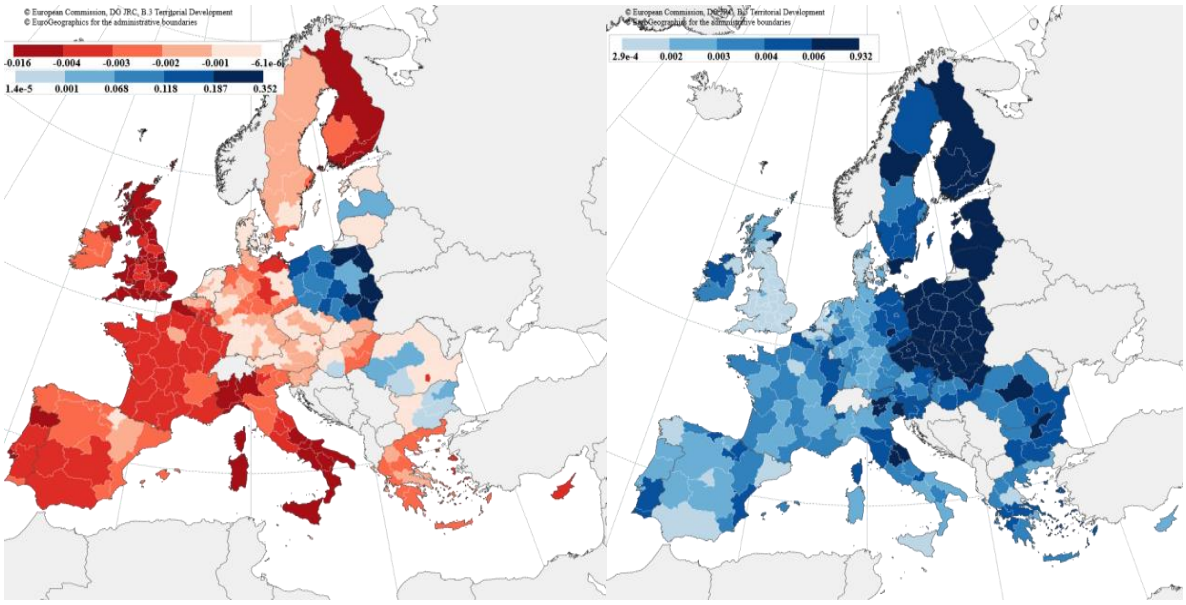
Source: Authors' simulations.

Figure 6 shows the short- and long-run impact of cohesion policy for all EU regions, in a hypothetical situation, where Poland is the only beneficiary of EU funds. The left-hand pane maps the percentage change in GDP from baseline scenario obtained in the first period of the simulation whilst the right-hand pane shows GDP deviations for the year 2063.

The results of our modelling exercise suggest that in the first period after the implementation of the shock, the impact on the recipient regions is positive as expected. However, for some (not all) of the non-receiving regions the effects are significantly negative, in particular for the Italian region of Mezzogiorno, the south of Spain and the wider UK. The average negative effect for the economies of the rest of the EU is however around 0.003% and reaches the highest negative impact in Abruzzo at 0.015%.

[12] The discount factor is set to 5%.

Figure 6. The impact of investment under the EU cohesion policy in Poland in the period 2014–2020 on the GDP of EU regions in the short run (left pane) and in the long run (right pane) as % deviation from the baseline



Source: Authors' simulations.

It is interesting to see that a higher share of the positive benefit spills over in the first place to the regions neighbouring the areas financed under the policy, either partially or totally offsetting the negative impact associated with the reduction in income in the regions providing funds. This is due to the fact that it is easier to trade with regions which are closer geographically, which means there is a closer integration among neighbouring economies. For example, negative impact in CZ05, CZ07 and DE40 is almost negligible, while, in Latvia, the impact on GDP is positive. Nevertheless, the majority of non-simulated-contributor regions experience a negative impact on economic activities in the short run. Thus, the issue here is that the incentive to undertake costly policies that generate a positive stimulus to a local economy such as Poland could be discouraged if much of the short-run impact was actually negative for a prolonged period in the non-stimulated regions.

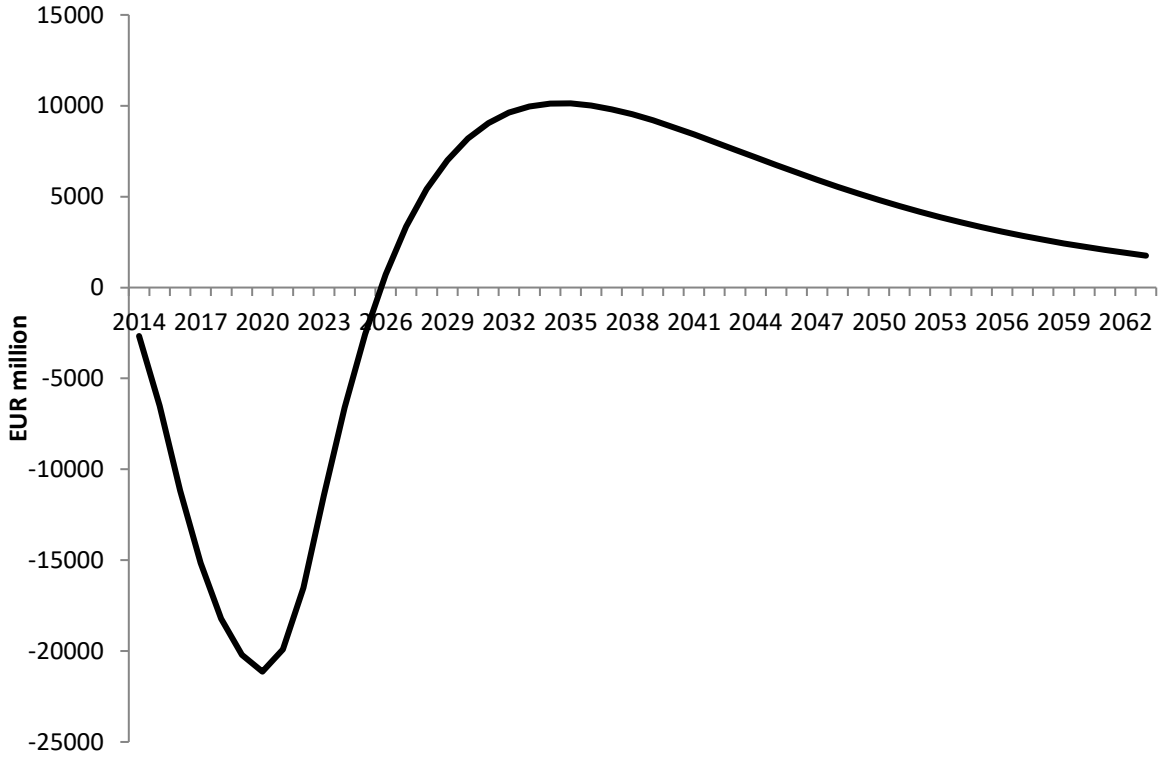
However, as the supported regional economies grow, further additional output is generated. Therefore, a bigger share of the local benefits spill over to those regions not necessarily located in the neighbourhood of the ones where the interventions took place. As the right-hand pane of Figure 6 suggests, all regions in the EU enjoy positive economic benefits in the long run. This implies a form of delayed compensation for the non-beneficiaries that have partly contributed to external policy benefits for other local economies.

In order to verify whether the efforts undertaken by the REU to finance the overall cohesion policy in Poland is financially viable, we compute the Net Present Value (NPV) of investments for the EU as a whole. The NPV in this context gives us the magnitude of the (discounted) multiplier effect in each period for the entire EU. Note that even if the NPV is negative, the overall impact on the economy is not necessarily negative. It could simply mean that the multiplier effect is less than one.[13] The NPV in this case provides an

[13] Meaning that the proportionate changes in GDP are lower than the initial stimulus.

indication of the time in which the EU economy is able to fully absorb the exogenous demand shock implemented in Poland. The results plotted in Figure 7 suggest that the NPV is negative for a prolonged period, but then eventually becomes positive in 2026. Hence, our results suggest that the funding countries should wait for a protracted period of time before seeing some returns. The gains for the funding countries could be bigger if investments in the target regions were directed towards interventions that are intrinsically supply-side policy with long-lasting effects (such as improvements in transport infrastructure or policies aiming to increase labour productivity).

Figure 7. Net present value of investments under the EU cohesion policy in Poland (EUR million)



Source: Authors' simulations.

The type of policies considered can generate a different set of results. The long-lasting effects of the EU cohesion policy are crucial in that sense. This particular policy, at least part of it, is designed intrinsically to develop a better supply-side regional policy and our simulations suggest that, in this case, it is capable of generating overall positive spillover effects in the long run. This is reassuring, as alternative policies (either supply-side or demand-side) could have led to different results and entail negative effects due, for instance, to increased competitiveness in one region adversely affecting its neighbours.

5. Conclusions

The European cohesion policy is the EU's main investment policy which targets all regions and cities across the EU to support job creation, business competitiveness, economic growth, and sustainable development. The aim of the cohesion policy is to achieve economic and social cohesion, that is to reduce the disparities between EU regions by promoting more balanced and sustainable territorial development. In the 2014–2020 programming period, one third of the EU budget has been allocated to the projects under this policy. The European Commission is responsible for the evaluation and reporting of its policies on a regular basis, and the cohesion policy is no exception. These evaluations and the IAs of the European policies are carried out with a number of instruments, including economic models. This Report makes use of one of them, RHOMOLO, and focuses on Polish regions.

RHOMOLO is a spatial CGE model of the European Commission focusing on EU regions. It has been developed and maintained by the Regional Economic Modelling team at JRC Seville in cooperation with DG REGIO. The model is particularly well-suited for analysing policies related to investments in human capital, transport infrastructure and innovation. RHOMOLO is being used extensively for evaluating interventions financed by European Structural and Investment Funds, such as the ERDF and the ESF, and is used together with the European Investment Bank (EIB) to evaluate the macroeconomic impact of the EIB group.

The above analysis deals with the inter-regional interactions that would occur as a result of implementing the EU cohesion policy in a single country, namely Poland. The intention is to determine whether the policy-induced benefit enjoyed by one country receiving the cohesion policy funds would spill over to the rest of the EU as a result of indirect trade effects and other inter-regional inter-dependencies and interactions. In these regions, the positive spillover effects coming from the supported regions in terms of increase demand of imports partially offset the negative impact associated with the reduced income required to finance the policy.

Cohesion policy interventions substantially increased GDP in Poland, especially in the regions which are the main beneficiaries of the policy. The highest impact is found in Podkarpackie (PL32) and Warmińsko-Mazurskie (PL62) Voivodeships, where at the end of the implementation period GDP increases by ca. 1%.

The analysis shows that the policy has a long-run impact, lasting years after the end of the programmes. This reflects the fact that cohesion policy supports investments in key engines of growth and durably improves the structure of the Polish economy. Finally, the results suggest that interventions in Poland also benefit other EU regions as they produce positive spillover effects, thereby partly offsetting the partial financing of the costs of the Polish programmes.

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