AUGUST 2020

Working Paper 183

On the Economic Effects of a Reallocation of EU Cohesion Policy Expenditures

Stefan Jestl and Roman Römisch

The Vienna Institute for International Economic Studies
Wiener Institut für Internationale Wirtschaftsvergleiche

On the Economic Effects of a Reallocation of EU Cohesion Policy Expenditures

STEFAN JESTL
ROMAN RÖMISCH

Stefan Jestl and Roman Römisch are Economists at The Vienna Institute for International Economic Studies (wiiw).

Research for this paper was financed by the Anniversary Fund of the Oesterreichische Nationalbank (Project No.17796). Support provided by the Oesterreichische Nationalbank for this research is gratefully acknowledged.

Abstract

This paper analyses the economic effects of a reallocation of Cohesion Policy expenditures across EU countries. We evaluate a shift from stronger (i.e. older) Member States to less-developed EU economies (i.e. CEE countries) and vice versa. On top of that, we also assess the effects of a general reduction in the Cohesion Policy budget. For evaluation, we construct a demand-driven macroeconomic model which spans country models of 21 EU economies and is calibrated based on empirical data for the period 1995-2018. Our results suggest that a shift of Cohesion Policy funds to more (less) developed countries would result in a higher (lower) overall short-run economic performance. However, the reallocation would affect economic outcomes in EU economies unevenly. In addition to direct effects on demand and production, it is pivotal to take into account indirect effects via trade as well. As a result, Cohesion Policy seems to be confronted with a trade-off between long-run convergence and short-run economic performance.

Keywords: Cohesion Policy, Macroeconomic Models, Reallocation

JEL classification: C53, O11, R11

CONTENTS

TABLES AND FIGURES

Appendix

1. Introduction

Over decades, Cohesion Policy has been a fundamental cornerstone in EU policy. The pivotal goal has been to promote the reduction in disparities in welfare and prosperity across EU regions. In this way, Cohesion Policy constitutes a redistributive policy, since its funds are mainly distributed to the most backward and poorest regions in the EU in order to promote economic, social and territorial convergence.

Since its implementation in the 1980s, Cohesion Policy has been subject to a number of debates and discussions (see Becker, 2019). Many cast doubt on the legitimacy, purpose and tasks of the policy. A large body of analyses and reviews has been conducted to evaluate and quantify the direct and indirect economic effects of Cohesion Policy by using different methodological approaches (see Marzinotto, 2012, and Dall'Erba and Fang, 2017, for an overview of analyses). However, the results of the empirical literature are widely inconclusive, i.e. their findings on the effects on economic growth are either positive (e.g. Pellegrini et al., 2012; Beugelsdijk and Eijffinger, 2005; Becker et al., 2018), negligible (e.g. Dall'erba and Le Gallo, 2008), or rather mixed (e.g. Mohl and Hagen, 2010; Jestl and Römisch, 2017).

As a result of the global and financial crisis, richer EU countries have criticised the Cohesion Policy in even stronger terms and called for a more efficient use of funds (see Becker, 2019). It is argued that investments in richer areas would be more efficient and thus would produce more growth. Moreover, there have been heated debates on whether Cohesion Policy should address only imbalances across countries or also within countries (see Barca, 2009). Accordingly, Cohesion Policy funds might either be distributed exclusively among poorer countries or it might also encompass poorer regions in richer countries. This of course has crucial implications for the allocation of Cohesion Policy funds across EU countries. Begg (2008) sees the EU Cohesion Policy confronted with a trade-off: it is difficult to achieve greater cohesion while at the same time arriving at a higher overall economic performance.

More recently the departure of the United Kingdom from the EU has retriggered scepticism about the future financing of Cohesion Policy, given that the country was one of the most important contributors to the EU budget. Against this backdrop, the European Commission has already discussed several budget-cut scenarios for the post-2020 multiannual financial framework (see European Parliament, 2018). This gives further rise to questions about the allocation of Cohesion Policy expenditures across EU countries.

Aside from empirical investigations which employ solely econometric tools, some studies also use macroeconomic simulation models in order to assess the economic effects of Cohesion Policy (see Marzinotto, 2012). Most prominently, the HERMIN model and the QUEST model have been used to model the economic impact of the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) across countries. Bradley et al. (2008), using the HERMIN model, analyse the effects of Cohesion Policy expenditures in less developed EU economies on countries which make the largest contribution to the Cohesion Policy budget. Varga and In 't Veld (2011) use the QUEST model in order to evaluate Cohesion Policy expenditures on productivity. More recently, Brandsma et al. (2015) use the RHOMOLO model, which explicitly incorporates a spatial perspective, for assessing the impact of Cohesion Policy.

In this analysis we follow these modelling approaches and construct a simple demand-driven macroeconomic model. Specifically we evaluate three scenarios: (a) the economic effects from a shift of funds from more developed (i.e. older) Member States to less developed economies (i.e. CEE countries); (b) the effects of a shift of funds from less developed to more developed countries; and (c) a general reduction of funds.

The model is calibrated based on empirical data for the period 1995-2018 and covers 21 EU economies. In the current state of the model we exclude Croatia, Latvia, Estonia, Lithuania, Luxembourg, Malta and Cyprus. More specifically, we build 21 country models that are linked via trade. This allows us explicitly to take into account feedback effects, in particular those that operate from larger to smaller economies. By conducting within-sample simulations, we incorporate changes in ERDF and CF allocations throughout the period 2000-2015.

The results of our simulations suggest that an ERDF/CF shift from less to more developed countries would contribute to an overall positive short-run economic effect, while a shift from more developed (i.e. older) Member States to less developed economies (i.e. CEE countries) would result in an overall negative short-run economic effect.

In general, it seems that more developed EU economies are capable of internalising Cohesion Policy expenditures to a larger extent owing in particular to stronger demand effects. However, we find that changes in the allocation of Cohesion Policy funds affect EU economies differently. This variation is driven by three factors. First, there is an uneven initial distribution of ERDF and CF allocations across countries. Thus, a proportional change in ERDF and CF payments results in heterogeneous economic effects across countries. Second, since the country models are calibrated individually, i.e. based on country-specific estimation results, EU countries differ in their direct economic transmission channels when there are changes in Cohesion Policy expenditures. Third, EU economies respond in different ways to changes in external demand that have repercussions on imports and exports.

Among the older EU members, Greece, Spain and Portugal, in particular, which initially received relatively high Cohesion Policy payments, would experience losses in economic outcomes when ERDF and CF payments are shifted to the pool of CEE economies or are reduced in general. Among the CEE economies Bulgaria, Hungary and Poland would suffer the most from an ERDF/CF shift from less to more developed countries and are among the countries that would be most affected by a general reduction.

The remainder of this paper is as follows. Section 2 introduces our macroeconomic model. Section 3 describes the data we use for the calibration and discusses the calibration procedure in more detail. Section 4 provides a brief overview of our baseline scenario and presents the results of three scenarios. Finally, Section 5 concludes.

2. Macroeconomic model

To model the effect of Cohesion Policy empirically, we build on existing theoretical frameworks in the literature, such as the so-called HERMIN simulation model (see e.g. Bradley and Uniedt, 2007; Bradley et al., 2009) and the QUEST simulation model. The HERMIN model allows principally for simulations of the EU Cohesion Policy for poorer, less developed Member States and regions. More specifically, it takes into account the linkages between a number of sectors within countries and further distinguishes between internationally tradeable and non-internationally tradeable sectors. Since the HERMIN model focuses predominantly on economically small countries and regions, it makes use of stand-alone country models. For this reason, linkages between the countries are not considered explicitly in the model; effects of the external environment are regarded as entirely exogenous. Thus, economic development in the countries exerts no influence on the development in the other countries. By contrast, the QUEST simulation model is structured as a system of simultaneous equations which links countries explicitly in the simulations.

The HERMIN model is mainly applied for forecasts and projections and thus out-of-sample simulations. This also allows for the evaluation of medium- to long-run effects of Cohesion Policy. Along with short-run, demand-driven Keynesian features, the HERMIN model also imbeds neo-classical elements that operate in the longer run in the form of price and cost competitiveness. For the labour and capital demand, the model assumes cost minimisation behaviour (see Bradley and Uniedt, 2007).

In this analysis we apply a simulation model that incorporates 21 EU countries. However, we exclude Croatia, Latvia, Estonia, Lithuania, Luxembourg, Malta and Cyprus as a result of data issues and because of their relatively small economic size.[1]

More specifically, we build a very simplified simulation model without distinguishing between different sectors. By keeping the model structure simple, we ensure model convergence when conducting the simulations. We acknowledge that ignoring the sectoral structure in countries has some drawbacks (see Bradley and Uniedt, 2007), for instance for not taking into account sectoral shifts in countries over the years. Nevertheless, we model imports and exports (within the EU) explicitly in our model. We therefore account for changes in the openness of the economies. Moreover, we only use within-sample simulations, mostly with relatively small shocks to the historical paths. Sectoral shifts might therefore be of less concern. However, we still plan to expand the model structure to differentiate between sectors.

Unlike the HERMIN model and more in line with the QUEST model, our model applies fully integrated country models with a system of simultaneous equations. The 21 EU countries are linked via trade by considering imports and exports explicitly as empirical equations. In doing so, we focus primarily on trade flows within our set of countries; trade with external countries is therefore not taken into consideration.[2]

---

1 Incorporating these countries into the simulation model is left for future work.

2 Here the underlying implicit assumption is that the (global) trade with other countries is not affected by our simulations and thus remains constant. Global trade is treated as completely exogenous.

Modelling trade between countries allows us to take account of reverse causality feedback, i.e. higher demand in one country leads to higher production in other countries, which means higher foreign demand, which eventually results in feedback effects on the initial country. Such feedback effects are reasonable, since our country models also contain larger economies such as Germany, France, the United Kingdom, Spain and Italy. All countries reveal a relatively strong export dependency on these large EU economies. Smaller economies, in turn, account for only a small proportion of total exports in most EU countries. This is in line with the presumption of the HERMIN model that economically small countries and regions are less likely to exert economic feedback responses.

In general, in our model we distinguish between two types of equations, namely empirical equations and identities. The empirical equations are principally defined based on theoretical considerations and are empirically estimated, while the identities are simply definitions.

2.1. OUTPUT DETERMINATION

In our simulation model we follow the traditional (Keynesian) approach to determine actual total output. In doing so, we define real total output[3] to be equal to total demand:

$$Y_t \equiv C_t + I_t + G_t - IM_t + X_t, \quad (1)$$

where Y_t denotes the actual total output and the right-hand side variables indicate the components of aggregate demand: C_t is consumption, I_t represents investments, G_t are government expenditures, IM_t are imports, and X_t captures exports. Investments, as captured by I_t, are further split into private investments (I_t^{PR}) and public investments (I_t^{PUB}). Each of these components is modelled in each country model.

By defining output as predominantly driven by the demand side, this approach does not properly take into account supply-side factors. This might be problematic, especially for smaller open economies, for which competitiveness is an important aspect (see Bradley et al., 2009). In the current state of our model the specifications are generally the same in each country (however, estimated separately by country). In this respect, we clearly see room for improvements and extensions. For instance, for smaller economies total output could be estimated by using demand- and supply-side factors, as is done in the HERMIN model.

Along with the actual total output, we define capacity production to be determined by the accumulated capital stock:

$$Y_t^* = \frac{1}{v} K_t, \quad (2)$$

where Y_t^* denotes the capacity/potential output; K_t represents the accumulated capital stock; while v is the marginal capital-to-production capacity ratio that is estimated empirically. The capital stock K is captured by a standard perpetual inventory formula:

$$K_t = (1 - d) * K_{t-1} + I_t^{PR} + I_t^{PUB}, \quad (3)$$

[3] Note that we do not consider intermediate goods in our model.

where d denotes the depreciation rate, which is set to 0.045 in all countries. In this framework, the actual output only makes up a part of the capacity output.[4] The share between actual and potential output gives us the degree of utilisation of production capacity, also known as the output gap. To estimate the capacity output, we apply Okun's law.[5]

2.2. FURTHER EQUATIONS

Each country model consists of a set of equations that is estimated empirically. We start by discussing the components of the aggregate demand:

Investments. As discussed above, we split investments into private investments (I_t^{PR}) and public investments (I_t^{PUB}). We treat public investments to be exogenous, thus using the estimated path over time:

$$\log(I_t^{PUB}) = \log(c) + \alpha_{I^{PUB}} * t, \tag{4}$$

where t indicates a time trend[6]. By contrast, private investments (I_t^{PR}) are specified to be endogenously determined in the following way:

$$\log(I_t^{PR}) = \log(c) + \beta_{I^{PR}} * \log(UNEMP_{t-1}) + \gamma_{I^{PR}} * \log(IR_{t-1}) + \alpha_{I^{PR}} * t, \tag{5}$$

where $UNEMP_{t-1}$ is the unemployment rate and IR_{t-1} denotes the long-term real interest rate of the previous period. Additionally, we incorporate a time trend t.[7] We choose to use the previous period for the two variables for two reasons: first, we want to consider a time lag in the effects on investments; and second, it allows us to give the model a bit more stability. Since private investments are part of the aggregate demand, this component allows to link the economic development directly with the labour market and the employment in economies. Private investments therefore play an important role for the transmission channel. Both the unemployment rate and the real interest rate are expected to exert a negative impact on private investments.

Government expenditures. Similar to public investments, government expenditures are also treated as exogenous. We also make use here of the estimated time trend t:

$$\log(G_t) = \log(c) + \alpha_G * t. \tag{6}$$

Consumption. The consumption function plays a crucial role for the economic transmission channels in our model, since consumption represents the most important component of aggregate demand in EU economies. We define the consumption function in the following simple form:

$$\log(C_t) = \log(c) + \beta_C * \log(DISPINC_t), \tag{7}$$

4 By using such a model we generally follow a Post-Keynesian approach (see, for instance Steindl, 1990; Laski 2007).

5 Okun's law refers to the general empirical relationship between unemployment and losses in a country's production. This relationship is applied to estimate the potential output for each country.

6 In some countries we additionally apply squared terms in order to have a better fit to the historical path.

7 In many EU countries we observe a strong correlation between the long-term interest rate and the time trend. We therefore do not consider a time trend in all countries in the investment function.

where $\mathrm{DISPINC_t}$ represents the disposable income, which is defined as $\mathrm{Y_t} * (1 - \mathrm{TAXR})$. TAXR is the average tax rate in the countries over the entire time period. By using $\mathrm{Y_t}$, we set the total private income to be equal to the total output. In this simple form, it is assumed that individuals are fully liquidity constrained (see Bradley et al., 2009). Given this equation, not only do exogenous shocks (e.g. in government activities) affect total demand/output directly, but they also exert influence, among others, indirectly on it via consumption. β_C is expected to reveal a positive sign.

We acknowledge that this specification could be adapted to a more sophisticated approach, such as, for instance, a forward-looking behaviour (see, for example. Bradley and Whelan, 1997).

Imports. As already discussed above, we only take into account trade within the EU, while other (global) trade is not considered and implicitly assumed to be exogenous.[8] In contrast to Bradley et al. (2009), imports in our model are purely demand-driven[9]. Imports $\mathrm{IM_t}$ are specified in the following form:

$$\log(\mathrm{IM_t}) = \log(\mathrm{c}) + \beta_{\mathrm{IM}} * \log(\mathrm{DD_t}), \tag{8}$$

where $\mathrm{DD_t}$ denotes the domestic demand that covers $\mathrm{C_t}$, $\mathrm{I_t}$ and $\mathrm{G_t}$. $\mathrm{DD_t}$ is expected to increase the demand for foreign goods.

Exports. Similar to imports, we only focus here on exports that refer to other EU countries and presume that exports are mainly demand-driven.[10] Exports, $\mathrm{X_t}$, are therefore determined by foreign demand:

$$\log(\mathrm{X_t}) = \log(\mathrm{c}) + \beta_{\mathrm{X}} * \log(\mathrm{FDD_t}), \tag{9}$$

where $\mathrm{FDD_t}$ is the weighted foreign demand which is calculated based on the export shares of trading partners (j) for each country (i) ($\mathrm{FDD_t} = \sum_j^{21} \mathrm{w_{ij}} * \mathrm{DD_t^j}$)[11]. The weights are calculated based on information from the World Integrated Trade Solution (WITS).[12] Using the domestic demand of trading partners directly as determinants for exports allows us to consider feedback effects across economies, in particular coming from larger EU economies. β_X is expected to show positive results.

In addition to the components of the aggregate total demand, we also apply a set of other equations.

Employment. Like consumption and private investments, employment is an important factor for the transmission channel in our model. We presume that the employment share $\mathrm{EMP_t}$ (employed individuals aged 15-64 as a percentage of working-age population) mainly reacts to changes in the total output:

$$\log(\mathrm{EMP_t}) = \log(\mathrm{c}) + \beta_{\mathrm{EMP}} * \log(\mathrm{Y_t}), \tag{10}$$

---

8 Effects associated with other (global) trade are therefore the same in the baseline and the simulation scenarios.

9 In this specification we do not take into account the real exchange rate. Here the underlying implicit assumption is that the real exchange rates in countries are fairly constant over time. The incorporation of the real exchange rate in the import function is left for future work. The real exchange rate could be directly linked to countries' price levels (see Equation 16 below).

10 Since both the import and export equations are estimated separately for each country, total exports and total imports are not balanced.

11 $\mathrm{w_{ij}} = 0$ if $\mathrm{i} = \mathrm{j}$; and $\mathrm{w_{ij}} \geq 0$ if $\mathrm{i} \neq \mathrm{j}$. Furthermore, the weights are row-standardised for each country, such that $\sum_j^{21} \mathrm{w_{ij}} = 1$.

12 Since there is no straightforward way to endogenise the weights, we apply constant weights for the trading partners over time. In the current state, we use information on exports from 2018.

where Y_t is the total output. β_{EMP} denotes the employment-output elasticity and is expected to be positive. We also plan to include educational attainment, proxied by the population with tertiary education, in this specification. However, we observe a high correlation between total output and the share of highly educated individuals in countries. We therefore do not consider the educational attainment in the specification for the employment share. Since a higher production fuels labour demand, we expect that total output shows to have a positive impact on the countries' employment share. Even though our model relies primarily on demand-side effects, we argue that the employment equation also accounts to some extent for supply-side factors. The employment-output elasticity might also be associated with structural disadvantages with respect to the functioning of the labour market, for example.

Real interest rate. In the current state, monetary policy is treated as entirely exogenous. We therefore make use of the actual evolution of the interest curve using a time trend t[13]:

$$\log(RI_t) = \log(c) + \alpha_{RI} * t. \quad (11)$$

We acknowledge that this is a strong presumption, as this approach does not account for possible feedback effects from economic developments on monetary policy. However, as we only apply within-sample simulations, this might mitigate the need for feedback effects. Moreover, interest rates are principally set by the central bank and are therefore exogenous. Nevertheless, since we also cover larger EU economies, comprehensive interrelations between the economic situation and monetary policy might be preferable. Future work shall endogenise monetary policy.

As discussed above, in the country models private investments are affected by the real interest rate and the unemployment rate. In order to calculate the unemployment rate $UNEMP_t$ in countries, we use information about the employment share EMP_t, the activity rate $ACTIV_t$, and the total stock of the population POP_t:

$$UNEMP_t = \frac{POP_t * (ACTIV_t - EMP_t)}{POP_t * ACTIV_t}. \quad (12)$$

The determination of the employment share is shown in Equation 10. The activity rate refers to the working-age population (15-64) and is treated exogenously, thus modelled by a time trend t:

$$ACTIV_t = \log(c) + \alpha_{ACTIV} * t. \quad (13)$$

Population also only covers the working-age population (15-64) in countries and is determined over time by its average natural growth rate $(APOPGR)$:

$$POP_t = POP_{t-1} * (1 + APOPGR). \quad (14)$$

13 In some countries we additionally apply squared terms in order to have a better fit to the historical path.

Real wages. [14] Wages can have different determinants from a theoretical point of view. We consider two of the most important factors that drive real wages in a macro perspective:

$$\log(W_t) = \log(c) + \beta_W * \log(UNEMP_t) + \gamma_W * \log(PROD_t) + \alpha_W * t, \quad (15)$$

$UNEMP_t$ is again the unemployment rate in a country, while $PROD_t$ represents the productivity, as defined as $\frac{Y}{\text{Employed individuals}}$. t further captures the trend over time. The unemployment rate is expected to reduce real wages, while productivity in general is expected to increase real wages.

Price level. [15] In general, our model relies on real values and variables. To also bring in the nominal perspective, we further consider the overall price level in countries. In doing so, we define the price level, P_t [16], to be determined in the following way:

$$P_t = \log(c) + \beta_P * \log(ULC_t) + \gamma_P * \log(Gap_t) + \alpha_P * t, \quad (16)$$

where ULC_t are the unit labour costs, as defined as $\frac{W_t}{Y_t}$; Gap_t denotes the output gap, as defined as $\frac{Y_t}{Y_t^*}$; and t is a time trend.

2.3. COHESION POLICY

After having discussed the general structure of the simulation model, we embark on the incorporation of Cohesion Policy. The HERMIN model generally distinguishes between different types of Cohesion Policy areas, such as physical infrastructure, human resources and R&D. In all areas, Cohesion Policy funds operate in two different ways. First, funds principally increase domestic public (capital) expenditures, which mainly results in a conventional (short-run) demand-side impact. Second, funds spur externalities further, which allows for stronger supply-side effects, including a direct impact on output and an indirect impact via total factor productivity. Moreover, the HERMIN model explicitly accounts for domestic co-finance in recipient countries and thus also considers repercussions on the budgetary situation in countries.

In this study, Cohesion Policy investments are defined as the (cumulative) expenditures of the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).[17] In our simple simulation model we generally adopt the approach of the HERMIN model and add ERDF and CF allocations to the domestic public expenditures and public investments.

However, we do not include any spillover effect that is directly associated with Cohesion Policy expenditures. Furthermore, in the model as it currently stands it is not possible to consider co-financing in the recipient countries. In the absence of externalities directly related to Cohesion Policy, funds fundamentally have a (short-run) demand-side effect via multipliers in our model. Funds increase domestic

[14] Note that real wages are only an outcome variable and that the variable is not considered in any other equation. In general, real wages might also exert an impact on other variables. However, we find, for example, a high correlation between unemployment rates and unit labour costs in all countries, which makes it difficult to include both variables in the private investment function.

[15] In the current state of the model the price level is also only an outcome variable. We still plan to consider and model the impact of the price level on wages and on the real exchange rate in our simulation model. This is left for future work.

[16] The price level is measured as a price index with reference to the year 2015.

[17] We also have detailed information on EU payments coming from the European Social Fund (ESF). Thus, future research can also work with scenarios that also take account of the ESF.

public expenditures and public investments and push up total demand and private consumption as well as imports from other EU economies. This subsequently also affects employment and unemployment, which in turn has repercussions for private investments. Moreover, higher imports lead to higher production and increased demand in other EU economies, which eventually results in feedback effects and thus higher exports in the initial country. Further research shall attempt to augment the transmission channels of Cohesion Policy to also account for spillovers in combination with supply-side effects.[18]

[18] Percoco (2016) found that supply-side factors, .e.g. regional specialisation, are important for the Cohesion Policy impact.

3. Data

The input data for this analysis stem primarily from the AMECO database provided by the European Commission. We exploit information about all the key variables in real terms basically for the period 1995-2018. For some EU members, in particular East European economies, data on specific variables are only available from 2001/2002 onwards. Real-term values apply to the reference year 2015. To convert the variables into euros in non-euro area members, we use the average exchange rate over the period 1995-2018 from AMECO.

In addition, information on the bilateral export shares is taken from the World Integrated Trade Solution (WITS).

Finally, we draw on a novel dataset from the European Commission that provides information about yearly EU payments to countries coming from the ERDF and CF.[19] These data allow us to gain information about the total ERDF and CF budget for the period 2000-2015.

3.1. CALIBRATION AND CHECKS

To obtain estimates for the equations presented above, we employ standard econometric estimation techniques. By using an ordinary least squares (OLS) method, we estimate all specifications in a log-linear form using panel data (basically 1995-2018) for each country. In this respect, we face two issues.

First, the global financial and economic crisis in 2007-2008 resulted in a large drop in production, demand and investments in nearly all EU economies. Given the small number of observations, we stick to a small set of explanatory variables in our specifications. Since an OLS estimate principally captures the impact of covariates on the dependent variable on average, it is not possible to account fully for such large shocks in the estimation.[20]

Even though we therefore do not capture properly all the effects of the crisis, we record the overall trend sufficiently throughout the observation period. Figure 1 illustrates the development of private investments in Germany and Italy over a simulated path of 20 periods (within-sample simulation from 1995 onwards). As can be seen, the two countries exhibit different paths: while Germany shows a marginal increase in investments, Italy experiences a steady decline after a push at the beginning of the period. This is not particularly surprising, as Italy experienced a continuous decrease in private investments in the post-crisis period. Accordingly, our simulation model principally takes the longer historical paths of countries into account.

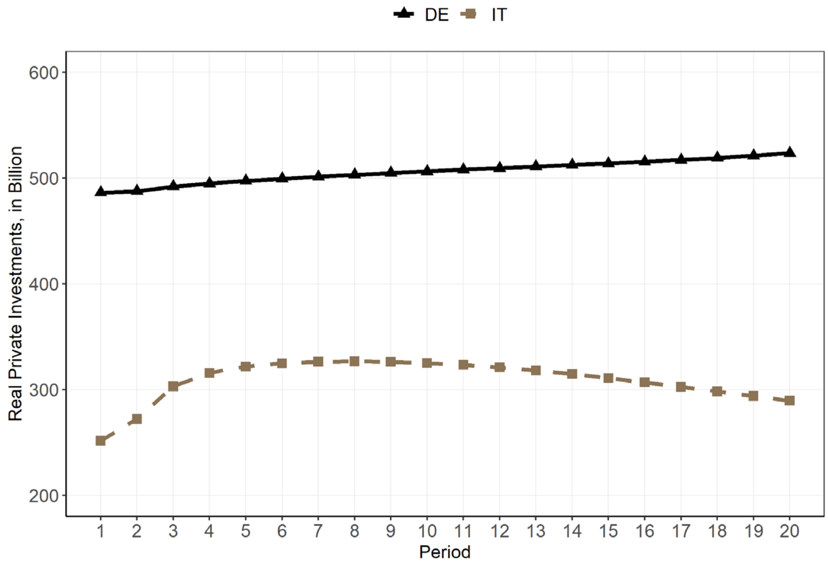
---

19 https://cohesiondata.ec.europa.eu/Other/Historic-EU-payments-regionalised-and-modelled/tc55-7ysv

20 A typical way to incorporate such shocks is to include a set of dummies into the specification. This is equal to adding an exogenous shock directly to the simulation. Especially in the crisis countries (e.g. Italy, Portugal, Spain and Greece) this shock is quite large, which might result in convergence problems in the simulations.

Second, we observe a very high correlation between many variables, which restricts the pool of explanatory variables substantially. For instance, we find a high correlation between unemployment rates and unit labour costs in all countries, which makes it difficult to include both variables in the private investment function. Furthermore, total output and the share of the population with tertiary education shows to have a high correlation in some countries.

Figure 1 / Private Investments in Germany and Italy – 20 Period Simulation



Source: Own calculations and Illustration.

Based on the estimated coefficients we obtain from the regressions, we calibrate our simulation model. To start the simulation, we input the initial actual starting values for all variables. We modify some estimated coefficients to a small extent in order to calibrate the model to the actual historical paths. To assess the overall quality of the calibration process, we conduct a residual check simulation (see, for example, Bradley and Uniedt, 2007). In doing so, we compare the simulated path with the actual historical path, i.e. the within-sample fit. As already discussed, we observe larger deviations from the actual path in the period of the global financial and economic crisis. Nevertheless, the long-term path is largely captured in our simulations.

4. Results

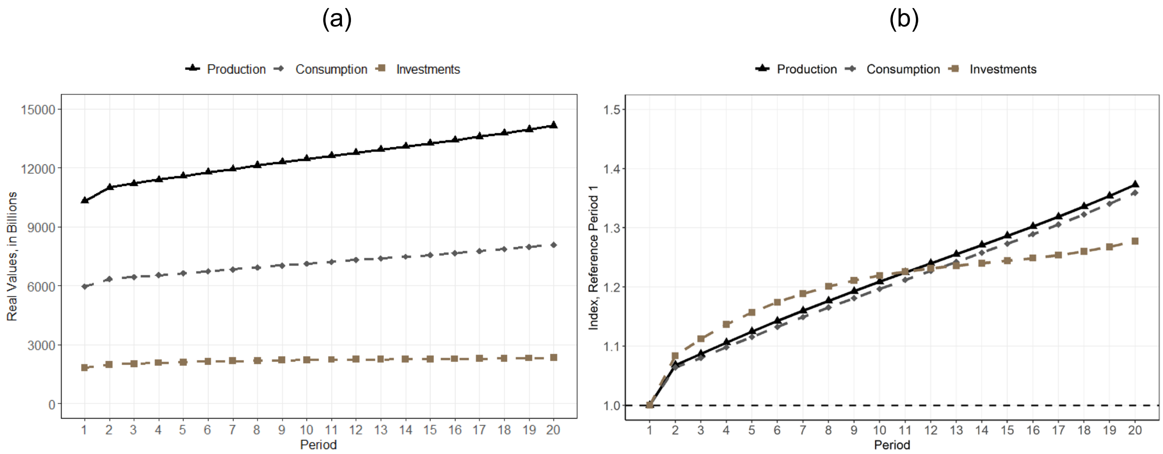
We now turn to the results of our simulation analysis. Based on our calibrated country models, we simulate 20 periods. Before we introduce our simulation scenarios for Cohesion Policy, we briefly discuss the results and the structure of the baseline scenario.

4.1. BASELINE RESULTS

In the baseline scenario we make use of the initial starting point from actual historical data and follow the estimated trends in all our exogenous variables without any external shock. In this respect, we assume that all ERDF and CF payments are already included in our demand components and all associated effects are fully integrated. Thus, Cohesion Policy is already in place in our model.

The country models cover 21 EU economies: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, Spain, Sweden, Slovenia, Slovakia and the United Kingdom. Putting the simulation results together, we can assess how the countries perform as a group. Figure 2 presents total production, consumption and private investments for the 21 EU countries aggregated. Overall, we see a steady increase in all three components, with a stronger increase in total production compared with consumption. By contrast, the increase in private investments changes over time: while there is a boost in private investments at the beginning of the period, the increase flattens over time and recovers a bit at the end of the period. Moreover, Figure 2 shows the important role of consumption for total demand and production that clearly exceeds private investments.

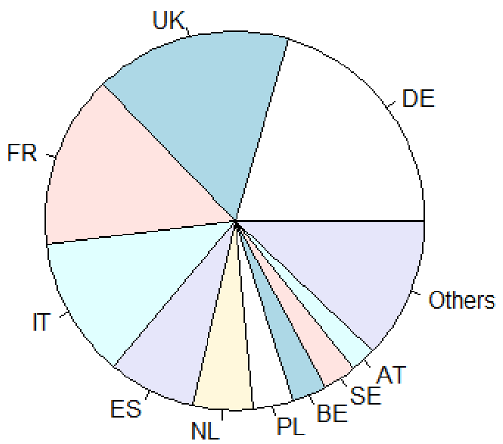
Figure 2 / Total Production, Consumption and Private Investments in EU-economies – 20 Period Simulation



Notes:(a) refers to real absolute values; while in (b) all real values are shown relative to respective period 1 values.
Source: Own calculations and Illustration.

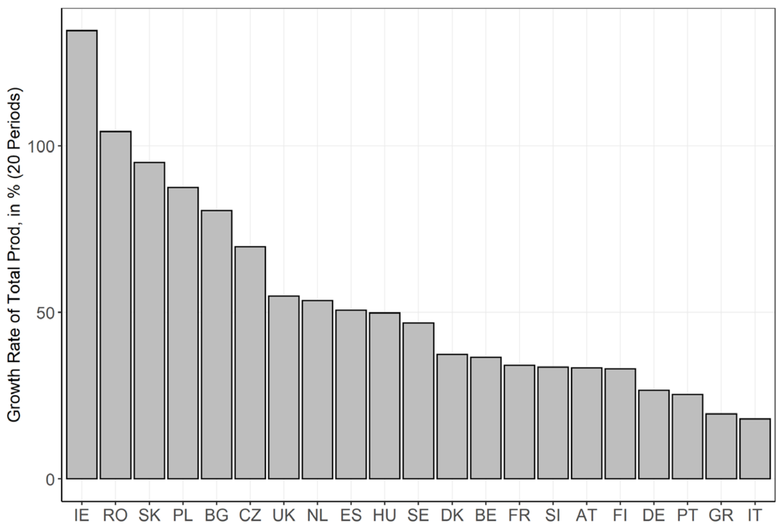
Obviously, these results are predominantly driven by larger, economically stronger countries. In general, EU economies reveal a highly heterogeneous pattern in terms of economic size. As illustrated in Figure 3, the five economically strongest countries (Germany, the UK, France, Italy and Spain) account for almost three-quarters of the overall total production in our pool of EU economies. Unsurprisingly, most countries from the CEE region account for only a small share of the total output. Only Poland is listed with a share that is comparable to that of Belgium, Sweden and Austria. All other CEE economies are captured in the group “Others”.

Figure 3 / Share in Overall Total Production in EU-economies – End of period 20



Source: Own calculations and Illustration.

Figure 4 / Cumulative Growth in Total Production by Country – 20 Period Simulation



Source: Own calculations and Illustration.

After the results for the overall total production across EU economies, we now turn to the results for individual countries. In general, our pool of countries contains country groups with different growth paths, such as the crisis countries in Southern Europe and the transition economies in Central and Eastern Europe, for example. By looking at the cumulative growth in total output across countries over 20 periods in

Figure 4, we observe a very heterogeneous pattern. At 100%, Ireland records by far the strongest growth in total production. Conversely, Italy and Greece report the lowest growth with values below 30%. For most of our countries the growth in total output ranges between 30% and 70%. Moreover, the results indicate some signs of convergence: Romania, Slovakia, Poland, Bulgaria and the Czech Republic show a higher growth than the strongest EU economies.

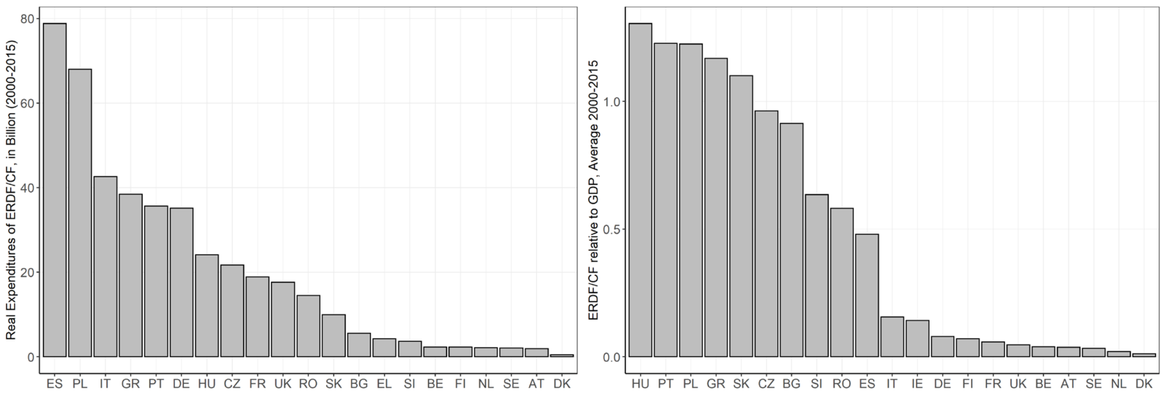
4.2. SCENARIOS

In our analysis we focus on Cohesion Policy that emanates from the ERDF and CF. More specifically, we utilise detailed information on yearly EU payments to the individual countries coming from these funds throughout the period 2000-2015. Primarily, we are interested in how Cohesion Policy operates in and across countries and how economies can benefit from it. In doing so, we employ scenarios in which we change EU payments of funds to countries by using exogenous shocks in the period 2000-2015 on domestic public expenditures and public investments.

In general, we distinguish in our simulations between more developed EU economies (older Member States) and less developed EU economies (CEE countries). The CEE countries, Poland, Hungary, Romania and Bulgaria, show to have regions that are largely lagging behind and are characterised by low-income levels (see Brown et al., 2017).

Figure 5 / Real EU payments of ERDF and CF, 2000-2015

(a) (b)



Notes:(a) refers to real absolute values; while (b) shows average proportions relative to GDP.
Source: European Commission, 2020.

Figure 5 contrasts the accumulated real EU payments of the ERDF and CF in the 21 countries over the period 2000-2015. In general, we record the total ERDF/CF budget of approximately EUR 430 billion (real values) over the period 2000-2015. Figure 5 shows that payments are not evenly distributed across EU countries. Large parts of Cohesion Policy funds are allocated to Spain, Poland, Italy, Greece, Portugal and Germany (see (a) in Figure 5). Accounting for countries' economic size, funds are in turn also relatively important for the economies of Hungary, Slovakia, the Czech Republic, Bulgaria, Slovenia and Romania (see (b) in Figure 5). By contrast, ERDF and CF investments play a minor role in economies such as Finland, France, the United Kingdom, Belgium, Austria, Sweden, the Netherlands and Denmark.

Interestingly, even though Germany receives a large amount of Cohesion Policy funds, it is of less importance in relative terms. From this point of view, it is interesting and important to address the question of how economic development within the EU changes when the pattern of funds varies.

In our analysis, we simulate the following three scenarios:

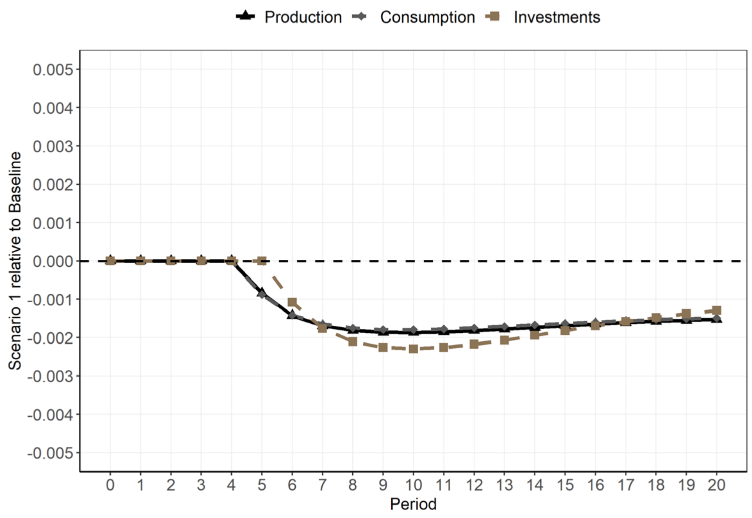
1. **Scenario 1:** Reduce payments by 50% in old Member States and increase payments in CEE countries in equal measure.
2. **Scenario 2:** Reduce payments by 50% in CEE countries and increase payments in the four largest EU economies (Denmark, the UK, France and Italy) in equal measure.
3. **Scenario 3:** Reduce payments by 20% in all countries.

In the following section we discuss the simulation results of these three scenarios.

4.2.1. Scenario 1: Reallocation from stronger to poorer economies

In Scenario 1 we simulate a reallocation of the ERDF and CF budget across EU economies. Most importantly, in so doing the total budget for the period 2000-2015 remains unchanged. Specifically, we simulate a scenario where we reduce the payments from the EU funds by 50% in old EU Member States and allocate this amount equally across all CEE countries in our country sample, such as Hungary, Poland, the Czech Republic, Slovakia, Slovenia, Romania and Bulgaria. Thus we explore a situation where resources from Cohesion Policy funds are simply shifted from economically stronger EU economies to weaker EU economies. In total, we reallocate an amount of EUR 141.33 billion. Table 1 in the Appendix summarises the changes in the ERDF and CF in each period from period 5 to period 20. We assume that the changes in the ERDF and CF refer to 50% allocated to domestic public expenditures and 50% to public investments. Conceptually, the changes constitute exogenous shocks in all countries that permanently operate from period 5 onwards.

Figure 6 / Total Production, Consumption and Private Investments in EU-Economies – Scenario 1 relative to Baseline



Source: Own calculations and Illustration.

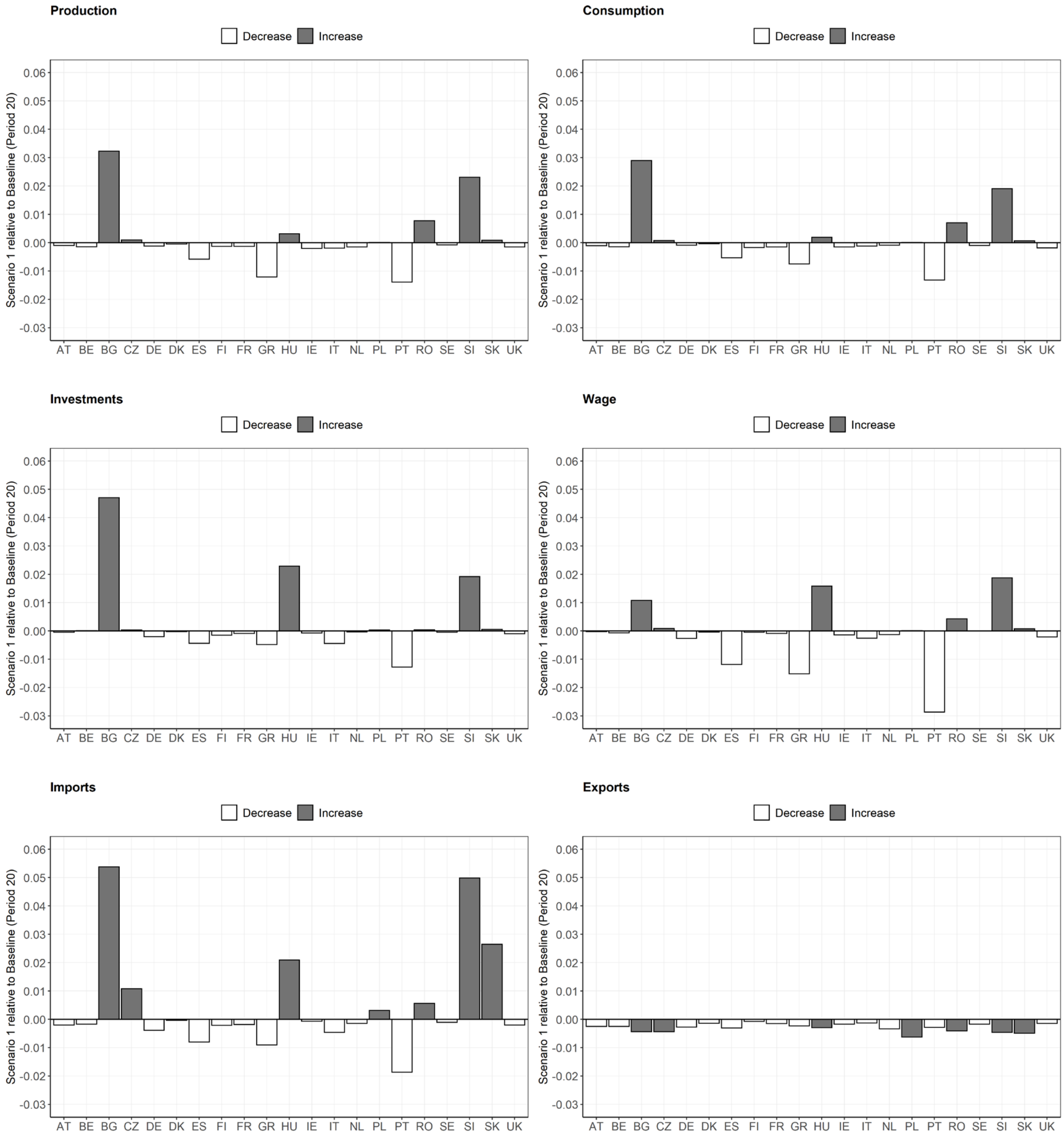
First we assess the impact of the reallocation of funds on the overall performance of the EU economy. Figure 7 illustrates the changes in total production, total private consumption and total private investments when we compare the simulated results of Scenario 1 with our baseline results in each period. Even though the budget of the ERDF and CF is constant, we find that the allocation of funds matters for economic outcomes. Overall, the reallocation has a small and permanent negative effect on the total performance. Even though the negative effects only amount to 0.2%, the corresponding absolute effects are not that small. For instance, total production is around EUR 28 billion smaller than in the baseline scenario at the end of the period. Production and consumption show to have similar effects, whereas private investments reveal a more sensitive response to the funds' changes. Interestingly, private investments show a return to a slight recovery after period 10, even though funds are changed of the same magnitude over time (see Table 1 in the Appendix). This relatively stronger recovery in private investments is attributable to lower interest rates in the aftermath of the global financial and economic crisis. Lower long-term real interest rates generally encourage private investments, which counteracts the initial negative effects.

As country models are calibrated based on country-specific regression results, the transmission channels (see Section 2) differ across countries. Thus, our results suggest that CEE countries have a lower ability to utilise funds than more developed EU countries owing to systematic differences in their economic transmission channels. This seems to be in line with findings in the empirical literature, even though they mostly address supply-side factors. Rodríguez-Pose and Novak (2013) found that Cohesion Policy tends to produce more beneficial effects in richer than in poorer countries. The concentration of knowledge and human capital in core areas/countries allows for comparative advantages that result in a higher economic impact. The incomplete fulfilment of specific preconditions (e.g. human capital) might limit the absorptive capacity in poorer countries (for an overview of conditions for an effective Cohesion Policy, see Fratesi and Wishlade, 2017). A lower absorptive capacity might be reflected in a lower employment-output elasticity that brings with it repercussions on unemployment and subsequently private investments. On average, CEE economies show to have a lower employment-output elasticity than more developed European economies. Moreover, Crescenzi (2009) argues that more funds in most disadvantaged regions do not necessarily result in economic growth due to substantial structural disadvantages. This might also come along with poorer demand-side effects.

To provide a deeper insight into the effects of the reallocation, we next take a look at the core economic outcomes in each country: total production, private consumption, private investments, real wages, imports and exports. Figure 7 shows the comparison between the outcomes in Scenario 1 and the baseline results in period 20. The grey bars indicate the countries that experience an increase in funds, while the white bars capture those countries that face a decrease. By looking at total production, private consumption and private investments, the results suggest a clear direct economic impact: countries with a decrease show a decline in economic outcomes, while countries with an increase tend to reveal an increase in economic outcomes. As can be seen, especially the smaller economies, such as Bulgaria and Slovenia, improve their economic performance. This is not particularly surprising, since we distribute the funds coming from stronger economies equally to the weaker economies. Interestingly, we do not identify any effects in Poland and only small ones in the Czech Republic and Slovakia. Among the countries with a decrease, the impact from the reallocation is strongest in Spain, Greece and Portugal. Unsurprisingly, these countries are also among the group of economies that initially invest the largest amounts of ERDF and CF finance (see Figure 7).

Overall, we find a similar picture when we assess the impact on real wages. Especially Portugal faces a relatively strong drop in wages. For imports and exports we observe heterogeneous effects. While the boost to domestic demand results in higher imports in the receiving economies, we see a negative effect on imports as a result of lower domestic demand in the more developed economies. By contrast, the reallocation has a predominantly negative impact on exports. Even though imports increase in the receiving countries, the total effect on exports is negative in all countries. As the exports of our countries rely largely on the strongest EU countries, exports are to a large extent determined by the demand situation in larger economies. In particular, exports of Poland are affected by the reallocation.

Figure 7 / Results by country – Scenario 1 relative to Baseline (Period 20)

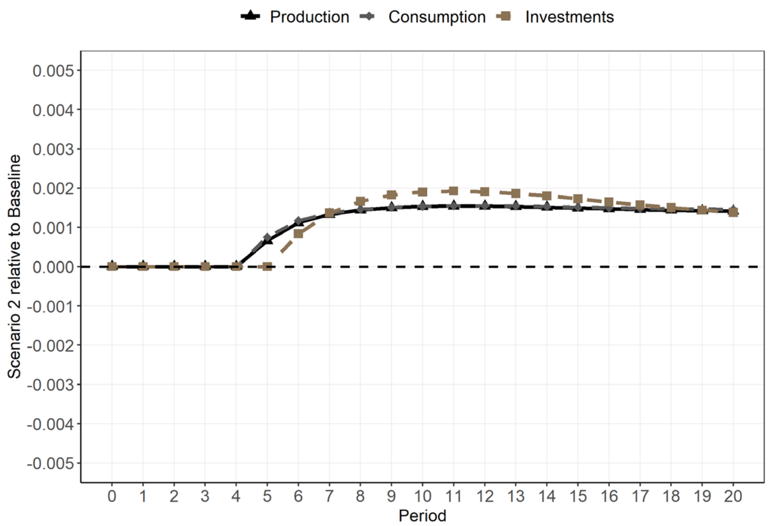


Source: Own calculations and Illustration.

4.2.2. Scenario 2: Reallocation from poorer to stronger economies

After our discussion of an ERDF/CF shift from stronger to poorer EU economies, we also evaluate a reverse reallocation, namely a transfer from less developed to more developed EU economies. Analogous to Scenario 1, we reduce the 2000-2015 budget by 50%; however, this time the allocations are diverted from CEE economies and redistribute equally across the four largest EU economies, Germany, the United Kingdom, France and Italy. Importantly, by doing so, the total budget of the funds for the period 2000-2015 again remains constant. Thus, in this scenario we generally distinguish between countries with a decrease (Hungary, Poland, Czech Republic, Slovakia, Slovenia, Romania and Bulgaria), an increase (Germany, UK, France and Italy) as well as countries without any change (Spain, Austria, Belgium, the Netherlands, Portugal, Greece, Finland, Sweden, Denmark and Ireland). Consistent with Scenario 1, we assume that the changes in the ERDF and CF allocations refer 50% to domestic public expenditures and 50% to public investments. In total, we remove an amount of EUR 73.74 billion (real values) from CEE regions. Table 2 in the Appendix gives an overview of the ERDF/CF changes per period that operate from period 5 to period 20 under Scenario 2. Overall, the changes are smaller compared with Scenario 1. We therefore expect to find somewhat smaller effects.

Figure 8 / Total Production, Consumption and Private Investments in EU-Economies – Scenario 2 relative to Baseline

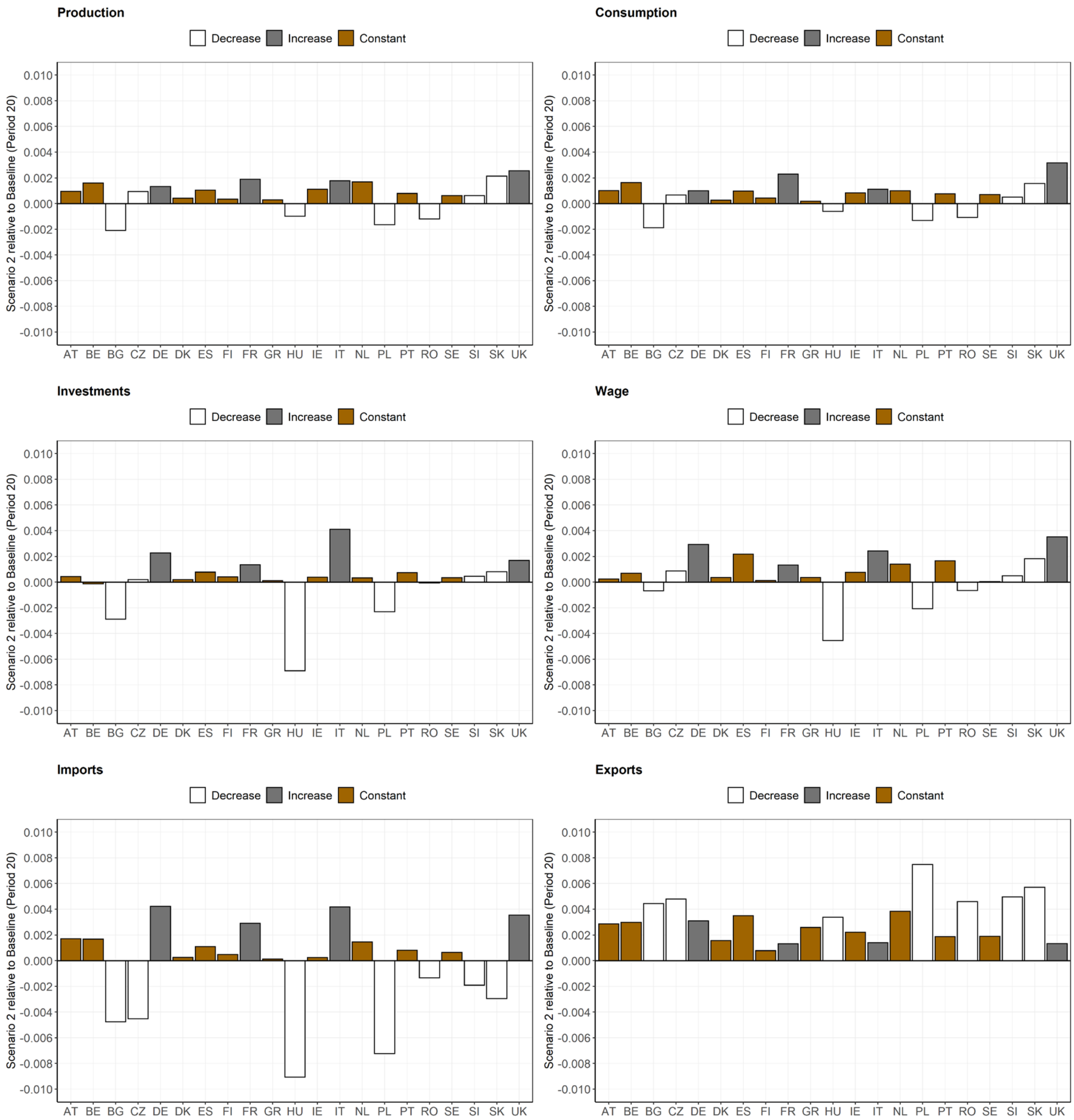


Source: Own calculations and Illustration.

In a first step, we again assess the impact on the overall performance of the entire group of countries. Figure 8 shows the impact of Scenario 2 by comparing the results for total production, private consumption and private investments from Scenario 2 with the baseline results. In contrast to Scenario 1, we find that a reallocation from the weaker to the strongest economies has a positive effect. The path of the three components overlaps to a large extent, even though private investments seem to react a bit more. In accordance with the overall impact in Scenario 1, this result points to systematic differences in the economic transmission channels between less developed and more developed EU economies.

In order to disentangle the total effects shown in Figure 8, we now turn to the changes in economic outcomes in individual countries. The pattern in total production, private consumption and private investments in Figure 9 looks much the same. In general, we identify two key findings. First, not only do the strongest EU economies benefit from higher ERDF and CF allocations, but we can also find indirect positive repercussions on countries that experienced no change in their ERDF and CF payments. Interestingly, the small open economies, Austria, Belgium and the Netherlands, tend to react in a similar way as the strongest economies (except where private investments are concerned). Second, even though ERDF and CF payments are decreased in the CEE economies, we do not see a clear economic response from them. Whereas Bulgaria, Hungary, Poland and Romania show predominantly negative effects via the direct demand multiplier, in the Czech Republic, Slovenia and particularly in Slovakia the direct negative effects on demand appear to be more than offset by positive indirect effects (which emanate from trade). The strong response in Bulgaria is consistent with the findings of Surubaru (2016). His results suggest that Bulgaria has a high ability to absorb funds owing to a high level of administrative capacity, which results in relatively strong effects from Cohesion Policy.

Figure 9 / Results by country – Scenario 2 relative to Baseline (Period 20)



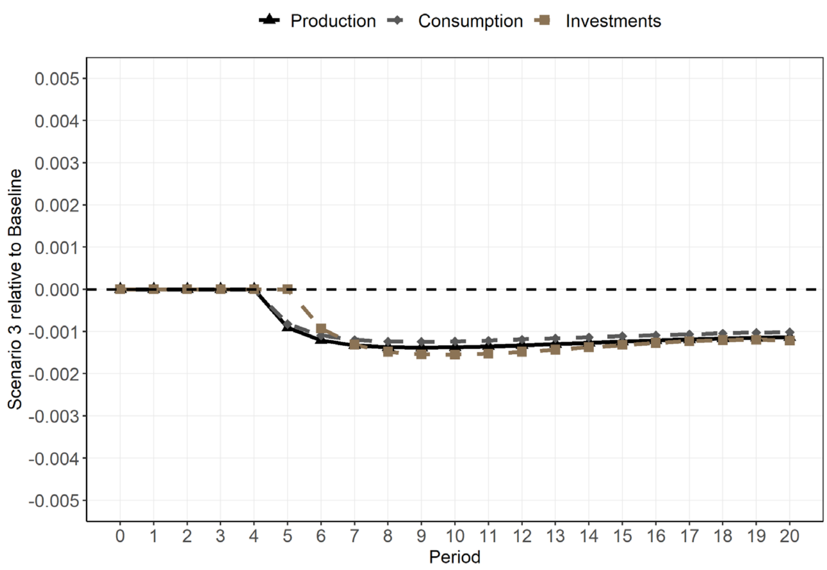
Source: Own calculations and Illustration.

The results for real wages in Figure 9 largely resemble those discussed before. Moving to imports and exports, we also find interesting results. In CEE regions imports are seen to be clearly negatively affected. Even though private consumption and private investments increase in Slovenia and Slovakia, this does not offset the negative impact on domestic demand due to the reduction in ERDF/CF payments. The steepest drops can be found in Hungary and Poland. When we look at the results for exports, we observe a clear positive impact: there is an increase in exports, irrespective of whether the country is experiencing an increase, a decrease or no change in ERDF/CF allocations. This is not all that surprising, as total production, private consumption and private investments increase in almost all counties as a result of the reallocation. Interestingly, we find the largest effects on exports in the countries that actually experience a decrease in ERDF/CF payments. This reflects a pronounced sensitivity in exports from the CEE economies.

4.2.3. Scenario 3: General reduction

Over the years many debates have addressed the question of what the optimal scale of Cohesion Policy is and whether the budget needs to be reduced or not. Since the withdrawal of the United Kingdom from the EU the discussions about a general budget reduction have taken on an even greater importance. The full information about the yearly payments coming from the ERDF and CF allows us to simulate an overall reduction in ERDF and CF finance in each country. To do so, we reduce the sum of both funds by 20%. In total, this adds up to a reduction of around EUR 86 billion (real values). Table 3 in the Appendix provides an overview of the decline in funds along period 5 until period 20.

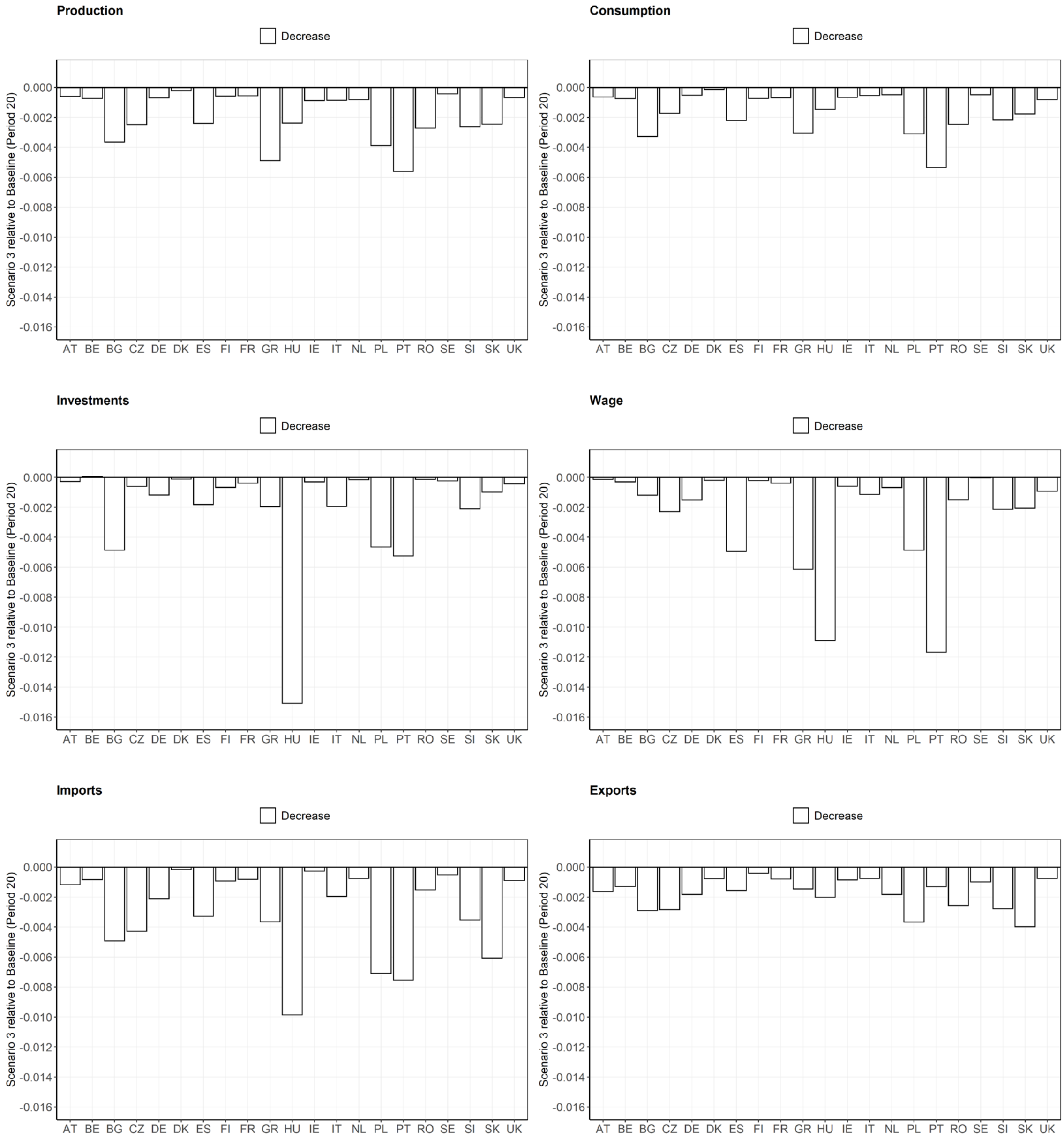
Figure 10 / Total Production, Consumption and Private Investments in EU-economies – Scenario 3 relative to Baseline



Source: Own calculations and Illustration.

When we evaluate the impact of the general reduction on the overall performance in Figure 10 we observe, not surprisingly, a negative effect on total production, private consumption and total investments. As the reduction applies to all countries, total domestic demand declines, which has negative repercussions on other economic outcomes.

Figure 11 / Results by country – Scenario 3 relative to Baseline (End of Period 20)



Source: Own calculations and Illustration.

Since ERDF and CF allocations are distributed quite differently among EU economies (see Figure 5), the economic effects that come along with the general reduction are most likely to operate unevenly across the countries. This disproportionally adverse effect is confirmed in the results across countries in Figure 11. The largest slumps in total production, private consumption and private investments can be found in Bulgaria, the Czech Republic, Spain, Greece, Hungary, Poland, Slovenia and Slovakia. Among the CEE economies, Bulgaria and Poland experience relatively large declines in production and demand, and among the older Member States, Greece and Portugal. The results for Bulgaria are again in line with the findings of Surubaru (2016). The drops in economic outcomes tend to be in the smallest in countries, where ERDF/CF payments play only a minor role, such as Denmark, Austria and Sweden (see Figure 5). The results for real wages are in line with this general pattern. In particular, real wages in Hungary and Portugal show a strong decline as a result of the general reduction in ERDF/CF finance.

Finally, the results for imports and exports provide some interesting insights. Given the relatively sharp drop in domestic demand and real wages in Hungary and Portugal, it is not surprising that we also find the largest decrease in imports in these countries. Interestingly, Poland and Slovakia also register a relatively strong response in imports. This high sensitivity in Polish imports has already been indicated by the results of Scenario 2. By contrast, exports are mostly affected in Bulgaria, the Czech Republic, Poland, Slovenia and Slovakia, which indicates that exports from CEE economies, in particular, are hit hard by the general reduction. This again indicates a sensitive response in exports from CEE economies.

5. Conclusion

In this paper we address the question of the allocation of Cohesion Policy funds across EU countries. In doing so, we evaluate the economic effects of a shift of ERDF and CF allocations from more developed (i.e. older) Member States to less developed countries (i.e. CEE economies) and vice versa. Moreover, we investigate a situation where funds are subject to a general reduction. In order to assess these scenarios, we make use of a simple macroeconomic model that relies largely on demand-driven features and is calibrated based on empirical data for the period 1995-2018. More specifically, we construct a set of 21 country models that are connected via trade within the EU. Information on EU payments channelled through the ERDF and CF per year allows us to simulate changes in ERDF and CF payments across EU economies in the period 2000-2015.

The results of our simulations suggest that an ERDF/CF shift from less to more developed countries would contribute to an overall positive short-run economic effect, while a shift from more to less developed countries would result in an overall negative short-run economic effect. Thus, it seems that CEE countries have a lower ability to utilise funds than more developed EU countries owing to systematic differences in their economic transmission channels. However, we find that changes in the allocation of Cohesion Policy funds affect EU economies in different ways. The variation in economic effects across countries can be ascribed to three factors. First, there is an uneven initial distribution of ERDF/CF finance across countries. Changes in the ERDF/CF therefore have heterogeneous effects across countries. Second, since we apply country-specific estimates for the country model calibration, EU countries differ in their direct economic transmission when there are changes in Cohesion Policy expenditures. Third, EU economies respond differently when there are changes in external demand, which has repercussion on imports and exports. Greece, Spain and Portugal would have experienced losses in economic outcomes when ERDF/CF are shifted to CEE economies or are reduced in general. By contrast, Bulgaria, Hungary and Poland would be negatively affected by an ERDF/CF shift from weaker to stronger EU countries and are also among the countries that would suffer the most from a general reduction. The results further emphasise the role of indirect effects via EU trade. All CEE economies benefit from a Cohesion Policy that operates in more developed EU economies through higher exports.

However, further research is needed to improve the performance of the macroeconomic model. As outlined by Marzinotto (2012), macroeconomic models rely largely on their underlying theoretical assumptions. The simulation model that is applied in this study largely imbeds demand-side effects. These short-run effects could be coupled with longer-term supply-side factors. Beyond that, the model structure could be adapted to differentiate between sectors in order to account for sectoral shifts within countries over time. This would allow us to give even more profound inputs for discussions.

Nevertheless, our results allow us to draw some policy conclusions. In general, there seems to be a trade-off for EU Cohesion Policy between long-run convergence and the overall short-run economic performance. When it comes to discussions about the distribution of Cohesion Policy expenditures, however, it is important for policymakers to consider each country individually. A simple split into more developed and less developed countries in the discussion might fall short and might lead to adverse outcomes (e.g. divergence, polarisation), as countries seem to react differently to changes in Cohesion Policy expenditures. Moreover, indirect effects via trade need be taken fully into account in discussions about the allocation of Cohesion Policy funds. Cohesion Policy in more developed countries seems to be beneficial, as positive externalities exert an impact via trade. In the light of our results, an overall reduction in the Cohesion Policy budget might be linked to economic losses in all EU economies.

References

Barca, F. (2009). An agenda for a reformed cohesion policy, Independent Report prepared at the request of Danuta Hübner, Commissioner for Regional Policy.

Becker, P. (2019). The reform of European Cohesion Policy or how to couple the streams successfully, *Journal of European Integration*, 41(2), 147-168.

Becker, S. O., Egger, P. H. and M. von Ehrlich (2018). Effects of EU regional policy: 1989-2013, *Regional Science and Urban Economics*, 69, 143-152.

Begg, I. (2008). Structural policy and economic convergence, CESifo forum, 9(1), No. 1, 3-9.

Beugelsdijk, M. and S. C. Eijffinger (2005). The effectiveness of structural policy in the European Union: An empirical analysis for the EU-15 in 1995–2001, *JCMS: Journal of Common Market Studies*, 43(1), 37-51.

Bradley, J. (2006). Evaluating the impact of European Union Cohesion Policy in less-developed countries and regions, *Regional Studies*, 40(2), 189-200.

Bradley, J. and G. Untiedt (2007). The COHESION system of HERMIN country and regional models: Description and operating manual, Contract, (2005).

Bradley, J. and K. Whelan (1997). The Irish expansionary fiscal contraction: A tale from open small European economy, *Economic Modelling*, 14, 175-201.

Bradley, J., Matur, E. P., Yaşar, P., Vardal, M. and A. S. Bahçeci (2009). Structure and Properties of The Turkish Hermin Model-HTR5. Economic Modelling Department, General Directorate of Economic Modelling and Strategic Research, State Planning Organisation, Ankara.

Brandsma, A., Kancs, D. A., Monfort, P. and A. Rillaers, (2015). RHOMOLO: A dynamic spatial general equilibrium model for assessing the impact of cohesion policy, *Papers in Regional Science*, 94, 197-221.

Brown, A., Fornoni, R., Gardiner, B., Greunz, L., Jestl, S., Rabemiafara, N., Römisch, R., Stenning J. and T. Ward (2017). Economic challenges of lagging regions, Publications Office of the European Union, Luxembourg.

Crescenzi, R. (2009). Undermining the principle of concentration? European Union regional policy and the socio-economic disadvantage of European regions, *Regional Studies*, 43(1), 111-133.

Dall'Erba, S. and F. Fang (2017). Meta-analysis of the impact of European Union Structural Funds on regional growth, *Regional Studies*, 51(6), 822-832.

Dall'Erba, S. and J. Le Gallo (2008). Regional convergence and the impact of European structural funds over 1989–1999: A spatial econometric analysis, *Papers in Regional Science*, 87(2), 219-244.

European Parliament (2018). Challenges for EU cohesion policy. Issues in the forthcoming post-2020 reform, Briefing, February 2018.

Fratesi, U. and F.G. Wishlade (2017). The impact of European Cohesion Policy in different contexts, *Regional Studies*, 51(6), 817-821.

Jestl, S. and R. Römisch (2017). Online Annex–Economic Challenges of Lagging Regions: Annex II-Econometric Analysis and Supplemental Tables (No. 426), wiiw Research Report.

Laski, K. (2007). Do Increased Private Saving Rates Spur Economic Growth?, wiiw Working Paper. No. 45.

Marzinotto, B. (2012). The growth effects of EU cohesion policy: a meta-analysis. Bruegel Working Paper No. 2012/14.

Mohl, P. and T. Hagen (2010). Do EU structural funds promote regional growth? New evidence from various panel data approaches, *Regional Science and Urban Economics*, 40(5), 353-365.

Pellegrini, G., Terribile, F., Tarola, O., Muccigrosso, T. and F. Busillo (2012). Measuring the effects of European Regional Policy on economic growth: A regression discontinuity approach, *Papers in Regional Science*, 92(1), 217-233.

Percoco, M. (2017). Impact of European Cohesion Policy on regional growth: does local economic structure matter?, *Regional Studies*, 51(6), 833-843.

Rodríguez-Pose, A. and K. Novak (2013). Learning processes and economic returns in European Cohesion policy, *Journal of Regional Research*, (25), 7-26.

Steindl, J. (1990). Stagnation Theory and Stagnation Policy, in: Josef Steindl, *Economic Papers 1941-88*, London: Macmillan.

Surubaru, N. C. (2017). Administrative capacity or quality of political governance? EU Cohesion Policy in the new Europe, 2007-13, *Regional Studies*, 51(6), 844-856.

Varga, J. and J. in't Veld (2011). A model-based analysis of the impact of Cohesion Policy expenditure 2000–06: Simulations with the QUEST III endogenous R&D model, *Economic Modelling*, 28(1-2), 647-663.

Appendix

Table 1 / Scenario 1 – Changes in Domestic Public Expenditures and Public Investments in each Period, Period 5-20

#	Country	Public Expenditures	Public Investments
1	DE	-0.58582	-0.58582
2	FR	-0.31503	-0.31503
3	ES	-1.31322	-1.31322
4	AT	-0.03161	-0.03161
5	BE	-0.03897	-0.03897
6	NL	-0.03565	-0.03565
7	UK	-0.29380	-0.29380
8	IT	-0.71021	-0.71021
9	PT	-0.59354	-0.59354
10	GR	-0.64124	-0.64124
11	FI	-0.03823	-0.03823
12	SE	-0.03500	-0.03500
13	DK	-0.00783	-0.00783
14	IE	-0.07087	-0.07087
15	HU	0.67300	0.67300
16	PL	0.67300	0.67300
17	CZ	0.67300	0.67300
18	SK	0.67300	0.67300
19	SI	0.67300	0.67300
20	RO	0.67300	0.67300
21	BG	0.67300	0.67300

Source: Own calculations.

Table 2 / Scenario 1 – Changes in Domestic Public Expenditures and Public Investments in each Period, Period 5-20

#	Country	Public Expenditures	Public Investments
1	DE	0.61451	0.61451
2	FR	0.61451	0.61451
3	ES	0.00000	0.00000
4	AT	0.00000	0.00000
5	BE	0.00000	0.00000
6	NL	0.00000	0.00000
7	UK	0.61451	0.61451
8	IT	0.61451	0.61451
9	PT	0.00000	0.00000
10	GR	0.00000	0.00000
11	FI	0.00000	0.00000
12	SE	0.00000	0.00000
13	DK	0.00000	0.00000
14	IE	0.00000	0.00000
15	HU	-0.40214	-0.40214
16	PL	-1.13253	-1.13253
17	CZ	-0.36171	-0.36171
18	SK	-0.16527	-0.16527
19	SI	-0.06162	-0.06162
20	RO	-0.24194	-0.24194
21	BG	-0.09286	-0.09286

Source: Own calculations.

Table 3 / Scenario 3 – Changes in Domestic Public Expenditures and Public Investments in each Period, Period 5-20

#	Country	Public Expenditures	Public Investments
1	DE	-0.23433	-0.23433
2	FR	-0.12601	-0.12601
3	ES	-0.52529	-0.52529
4	AT	-0.01265	-0.01265
5	BE	-0.01559	-0.01559
6	NL	-0.01426	-0.01426
7	UK	-0.11752	-0.11752
8	IT	-0.28408	-0.28408
9	PT	-0.23742	-0.23742
10	GR	-0.25650	-0.25650
11	FI	-0.01529	-0.01529
12	SE	-0.01400	-0.01400
13	DK	-0.00313	-0.00313
14	IE	-0.02835	-0.02835
15	HU	-0.16086	-0.16086
16	PL	-0.45301	-0.45301
17	CZ	-0.14468	-0.14468
18	SK	-0.06611	-0.06611
19	SI	-0.02465	-0.02465
20	RO	-0.09678	-0.09678
21	BG	-0.03714	-0.03714

Source: Own calculations.

Table 4 / Estimated coefficients for selected variables

#	Country	β_{EMP}	$\beta_{I^{PR}}$	$\gamma_{I^{PR}}$	β_{C}	β_{X}	β_{IM}
1	DE	0.7517	-0.1168	-0.0068	0.7376	2.3880	3.3953
2	FR	0.2201	-0.3287	-0.1478	1.2253	1.3487	1.5624
3	ES	0.4583	-0.3433	-0.0728	0.9222	2.1309	1.4982
4	AT	0.2774	-0.0929	-0.0050	1.0574	2.2195	2.5176
5	BE	0.2747	0.0257	-0.0495	1.0154	1.9325	2.0023
6	NL	0.2977	-0.0360	-0.0288	0.5829	2.5770	2.5161
7	UK	0.1553	-0.3566	-0.0431	1.2342	1.0684	1.3668
8	IT	0.6832	-0.2786	-0.0991	0.6327	0.9733	2.3364
9	PT	0.2791	-0.3630	-0.0590	0.9505	1.3088	1.3354
10	GR	0.3074	-0.4038	-0.1778	0.6225	1.7304	0.9798
11	FI	0.4749	-0.4994	0.0430	1.2663	0.5932	1.5526
12	SE	0.2453	-0.1815	-0.2349	1.1457	1.3546	1.5590
13	DK	0.0742	-0.3911	-0.0412	0.6612	1.1056	1.3907
14	IE	0.1476	-0.2276	-0.1525	0.7433	1.2569	0.4502
15	HU	0.5880	-0.2391	-0.0265	0.6149	2.6862	1.7265
16	PL	0.3152	-0.2031	-0.0064	0.7987	5.3335	1.8472
17	CZ	0.0858	-0.2527	-0.0015	0.6975	3.7956	1.9866
18	SK	0.2419	-0.1600	0.0314	0.7283	4.7738	2.7946
19	SI	0.1238	-0.4457	-0.1568	0.8265	3.7069	1.4760
20	RO	0.0098	-0.2770	-0.1117	0.9025	3.3262	0.7315
21	BG	0.3953	-0.3884	-0.0897	0.8992	3.4794	1.3057

Notes: The private investment equation is estimated without a time trend in DE, FR, ES, UK, PT and SE.
Source: Own estimations.

IMPRESSUM

Herausgeber, Verleger, Eigentümer und Hersteller:
Verein „Wiener Institut für Internationale Wirtschaftsvergleiche“ (wiiw),
Wien 6, Rahlgasse 3

ZVR-Zahl: 329995655

Postanschrift: A 1060 Wien, Rahlgasse 3, Tel: [+431] 533 66 10, Telefax: [+431] 533 66 10 50
Internet Homepage: www.wiiw.ac.at

Offenlegung nach § 25 Mediengesetz: Medieninhaber (Verleger): Verein "Wiener Institut für Internationale Wirtschaftsvergleiche", A 1060 Wien, Rahlgasse 3. Vereinszweck: Analyse der wirtschaftlichen Entwicklung der zentral- und osteuropäischen Länder sowie anderer Transformationswirtschaften sowohl mittels empirischer als auch theoretischer Studien und ihre Veröffentlichung; Erbringung von Beratungsleistungen für Regierungs- und Verwaltungsstellen,
Firmen und Institutionen.

wiiw

wiiw.ac.at

https://wiiw.ac.at/p-5387.html