ECONSTOR
Make Your Publications Visible.

A Service of
ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Barbero, Javier et al.

Working Paper

Improving government quality in the regions of the EU and its system-wide benefits for cohesion policy

JRC Working Papers on Territorial Modelling and Analysis, No. 04/2022

Provided in Cooperation with:
Joint Research Centre (JRC), European Commission

Suggested Citation: Barbero, Javier et al. (2022) : Improving government quality in the regions of the EU and its system-wide benefits for cohesion policy, JRC Working Papers on Territorial Modelling and Analysis, No. 04/2022, European Commission, Joint Research Centre (JRC), Seville

This Version is available at:
https://hdl.handle.net/10419/265241

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

https://creativecommons.org/licenses/by/4.0/

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

European Commission

JRC TECHNICAL REPORT

Improving government quality in the regions of the EU and its system-wide benefits for Cohesion policy

JRC Working Papers on Territorial Modelling and Analysis
No 04/2022

Authors:
Barbero, J.
Christensen, M.
Conte, A.
Lecca, P.
Rodríguez-Pose, A.
Salotti, S.

2022

Joint Research Centre

This publication is a Technical report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policymaking process. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication. For information on the methodology and quality underlying the data used in this publication for which the source is neither Eurostat nor other Commission services, users should contact the referenced source. The designations employed and the presentation of material on the maps do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Contact information
Name: Simone Salotti
Address: Edificio Expo, C/Inca Garcilaso 3, 41092 Sevilla (Spain)
Email: simone.salotti@ec.europa.eu
Tel.: +34 954488406

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

JRC128443

Seville: European Commission, 2022

© European Union, 2022

The reuse policy of the European Commission is implemented by the Commission Decision 2011/833/EU of 12 December 2011 on the reuse of Commission documents (OJ L 330, 14.12.2011, p. 39). Except otherwise noted, the reuse of this document is authorised under the Creative Commons Attribution 4.0 International (CC BY 4.0) licence (https://creativecommons.org/licenses/by/4.0/). This means that reuse is allowed provided appropriate credit is given and any changes are indicated. For any use or reproduction of photos or other material that is not owned by the EU, permission must be sought directly from the copyright holders.

All content © European Union, 2022 (unless otherwise specified)

How to cite this report: Barbero, J., Christensen, M., Conte, A., Lecca, P., Rodríguez-Pose, A., and Salotti, S. (2022). Improving government quality in the regions of the EU and its system-wide benefits for Cohesion policy. JRC Working Papers on Territorial Modelling and Analysis No. 04/2022, European Commission, Seville, JRC128443.

The **JRC Working Papers on Territorial Modelling and Analysis** are published under the supervision of Simone Salotti and Andrea Conte of JRC Seville, European Commission. This series mainly addresses the economic analysis related to the regional and territorial policies carried out in the European Union. The Working Papers of the series are mainly targeted to policy analysts and to the academic community and are to be considered as early-stage scientific papers containing relevant policy implications. They are meant to communicate to a broad audience preliminary research findings and to generate a debate and attract feedback for further improvements.

Improving government quality in the regions of the EU and its system-wide benefits for Cohesion policy

Javier Barbero[a], Martin Christensen[a], Andrea Conte[a], Patrizio Lecca[b], Andrés Rodríguez-Pose[c], and Simone Salotti[a]

a: European Commission, Joint Research Centre (JRC), Seville (Spain).
c/Inca Garcilaso 3, 41092, Seville (Spain)
Javier.BARBERO-JIMENEZ@ec.europa.eu
Martin.CHRISTENSEN@ec.europa.eu
Andrea.CONTE@ec.europa.eu
Simone.SALOTTI@ec.europa.eu

b: PBL Netherlands Environmental Assessment Agency
Bezuidenhoutseweg 30, 2594 AV The Hague, Netherlands
patrizio.lecca@pbl.nl

c: Cañada Blanch Centre and Department of Geography and Environment, London School of Economics
Houghton Street, London WC2A 2AE, United Kingdom
A.Rodriguez-Pose@lse.ac.uk

Abstract. We quantify the general equilibrium effects on economic growth of improving the quality of institutions at the regional level in the context of the implementation of the European Cohesion Policy for the European Union and the UK. The direct impact of changes in the quality of government is integrated in a general equilibrium model to analyse the system-wide economic effects resulting from additional endogenous mechanisms and feedback effects. The results reveal a significant direct effect as well as considerable system-wide benefits from improved government quality on economic growth. A small 5% increase in government quality across European Union regions increases the impact of Cohesion investment by up to 7% in the short run and 3% in the long run. The exact magnitude of the gains depends on various local factors, including the initial endowments of public capital, the level of government quality, and the degree of persistence over time.

Keywords: government quality, cohesion, economic growth, public investment, regions, EU

JEL codes: C68, O17, R13, R15

Executive summary

The role of government quality as a driver of economic development at subnational level has come under considerable scrutiny in recent years. In the EU, regional differences in government quality impinge on a wide range of socio-economic and political outcomes, including the delivery and efficiency of public investment. Variations in regional government quality across the EU have also been found to significantly affect the returns to investment under the Cohesion policy umbrella of the EU (Rodríguez-Pose and Garcilazo, 2015, p. 1288).

We revisit the question of the link between regional quality of government and the returns of European Cohesion policy, with the specific aim of quantifying in far greater detail than hitherto the impact of government quality on the returns of regional investment. We move away from the partial equilibrium setting, which has until now dominated research (e.g. Rodríguez-Pose and Garcilazo, 2015; Rodríguez-Pose and Ketterer, 2020), and use a dynamic spatial computable general equilibrium (CGE) model (Lecca et al., 2018 and 2020), to assess the system-wide effects of improvements in regional government quality across EU regions. To our knowledge no previous attempts have been made to assess quality of government in a broader (and regional) general equilibrium setting.

Our econometric estimates confirm the existence of a positive and significant relationship between government quality and GDP growth at a regional level in the EU. We use this evidence in combination with the results of general equilibrium modelling simulations showing that the public capital investments of the European Structural and Investment Funds (ESIF) —amounting to roughly 50% of the overall expenditure in Cohesion policy— generate GDP per capita gains of about €455 in the short-run (that is, at the end of the 10 years implementation period) and €2,380 in the long-run. We find that improvements in government quality can considerably enhance the returns of this type of investment, as a relatively small 5% increase in government quality across EU regions may increase the impact of ESIF investment by up to 7% in the short- and 3% in the long-run. Substantial economic gains for the EU population can therefore be made by paying greater attention to institutional bottlenecks and improving quality of government.

Introduction

The role of government quality as a driver of economic development at subnational level has come under considerable scrutiny in recent years. The majority of the research on the topic has focused on the European Union (EU), where it has been found that regional differences in government quality impinge on a wide range of socio-economic and political outcomes, including the delivery and efficiency of public investment. Variations in regional government quality across the EU significantly affect both economic growth and powerfully mediate the returns to investment under virtually all public policies, including major funding programmes such as the European Structural and Investment Funds (ESIF). "The quality of government becomes — for the large majority of regions — the basic factor determining why a region grows. In many of the regions receiving the bulk of Structural Funds, greater levels of cohesion expenditure would, in the best-case scenario, only lead to a marginal improvement in economic growth, unless the quality of the government is significantly improved" (Rodríguez-Pose and Garcilazo, 2015, p. 1288).

In this paper, we revisit in far greater detail than hitherto — by means of newly developed datasets and a variety of advanced econometric methods — the issue of the impact of regional quality of government on the returns to European Cohesion investments. We move away from the partial equilibrium setting, which has until now dominated research (e.g., Rodríguez-Pose and Garcilazo, 2015; Rodríguez-Pose and Ketterer, 2020), and use a dynamic spatial computable general equilibrium (CGE) model (Lecca et al., 2018 and 2020), to assess the system-wide effects of improvements in regional government quality across EU regions. This yields a unique and broader perspective on the topic that has been missing in the literature so far. To our knowledge, no previous attempts have been made to assess quality of government in a broader (and regional) general equilibrium setting.

Our econometric estimates confirm the existence of a positive and significant relationship between government quality and GDP growth at a regional level in the EU. We use this evidence in general equilibrium modelling simulations to show that the GDP gains generated by the public capital investments of the 2014-2020 European Structural and Investment Funds (ESIF) —

amounting to roughly 50% of the overall expenditure in Cohesion policy — may be considerably enhanced by improvements in government quality. Modelling simulations assuming a full absorption of the policy investments suggest that a relatively small 5% increase in government quality across EU regions can lead to increase the impact of ESIF investment by up to 7% in the short run and 3% in the long run. Substantial economic gains can therefore be accomplished by paying greater attention to institutional bottlenecks and improving quality of government.

Quality of government and economic growth

Until now, most scientific research dealing with economic growth at subnational level has struggled to assess how and to what extent investment in regional development is transformed into economic growth. In particular, an ever growing volume of research focusing on the link between European Cohesion Policy investments and regional growth keeps on producing diverse results that make finding a common ground on the convenience and adequacy of the European Cohesion Policy hard to reach. One of the potential reasons for this lack of consensus is that most of this research has neglected until relatively recently the role of institutions on the economic dynamism of different regions. More importantly, it also has overlooked how variations in institutional quality across space mediate the returns of public policies, in general, and the European Cohesion effort, in particular (Rodríguez-Pose, 2013).

A recent spate of research has changed this panorama. Using the data on subnational government quality produced by Charron et al. (2014, 2015), the volume of work shedding light on how government quality affects economic development at a regional level has not ceased to increase. Most of this literature has covered regions in the EU. In addition to the research on government quality and the returns of European Cohesion policy by Rodríguez-Pose and Garcilazo (2015), several contributions have shown that local institutional quality impinges on economic growth through its effect on different policies and investments, such as interventions to promote entrepreneurship (Nistotskaya et al., 2015; Aparicio et al., 2016; Huggins and Thompson, 2016), regional competitiveness (Annoni and Dijkstra, 2017), innovation (Rodríguez-Pose and Di Cataldo, 2015), productivity (Kaasa, 2016), industrial diversification (Cortinovis et al., 2017), resilience (Ezcurra and Ríos, 2019), or infrastructure (Crescenzi et al., 2016). Similar

work has been carried out outside Europe (e.g., Rodríguez-Pose and Zhang, 2019; Iddawela et al., 2021). Overall, the bulk of this literature highlights that local government quality is a fundamental shaper of economic growth (Ketterer and Rodríguez-Pose, 2018) and that the connection between the quality of local institutions and economic performance is achieved both directly and indirectly, through how variations in government quality shape the design, implementation, and monitoring of public policies.

However, the majority of existing research on the topic — with the exception of Rodríguez-Pose and Garcilazo (2015) — does not quantify the potential impact of weak institutional ecosystems on the economic growth impact of different policies. This has made it difficult to go beyond the statement that institutions and government quality matter for regional development.

Quality of government in a partial equilibrium framework

Our aim is to overcome this shortcoming, by assessing in detail the extent to which regional variations in government quality across Europe lead to different economic impacts of Cohesion policy investment. We aim to quantify not only if such differences have an impact on the returns of ESIF investment, but also whether changes in government quality in certain regions of Europe yield gains (or losses) in the form of changes in the returns of the European development effort. To do that, we investigate the role of quality of institutions within a partial equilibrium framework. Building on Rodríguez-Pose and Garcilazo (2015), we estimate the following panel model with growth of GDP per capita as the dependent variable, using data for EU regions:

$$\Delta GDPpc_{i,t} = \beta_0 + \beta_1 \ln GDPpc_{i,t-1} + \beta_2 \ln ESIFunds_{i,t} + \beta_3 q_{i,t} + \phi \boldsymbol{X}_{i,t} + \mu_i + \lambda_t + v_{i,t} \qquad (1)$$

where $\Delta GDPpc_{i,t}$ is the annual growth rate of GDP per capita for region i between $t-1$ and t; $GDPpc_{i,t-1}$ represents the lag of GDP per capita for region i; $ESIFunds_{i,t}$ is the amount of Cohesion policy's ESIF per capita received by the region; and $q_{i,t}$ stands for the regional quality of government indicator. $\boldsymbol{X}_{i,t}$ denotes a vector of variables controlling for other factors —such as the level of primary and tertiary education, employment rate, employment density, and accessibility of the region— that may influence regional GDP per capita growth. The key parameter to be estimated in equation (1) is the elasticity of GDP per capita growth to changes

in the regional quality of government: $\hat{\beta}_3$. This captures the direct effect of changes in the quality of government on economic growth.

Equation (1) is estimated using the following data. The regional quality of government index is taken from the European Quality of Government Index (Charron et al., 2014, 2015, and 2019). This index was only available for the years 2010, 2013, and 2017 at the time of writing. We converted it into a full time-variant variable for the period of analysis, by combining it with the World Bank's Worldwide Governance Indicators. In making this combination, we assume that regional quality of governments varies in line with changes in government quality of the corresponding national governments.[1]

Data on the ESIF for the current programming period (2014-2020) come from the corresponding database provided by the European Commission Directorate General for Regional Policy (DG REGIO). The dataset contains the payments made by the European Commission to the Member States for each region, fund, and spending category for the 10 years over which the managing authorities are allowed to spend the money (up to 2023).[2]

Data for most of the control variables are taken from Eurostat. This is the case for GDP at current market prices, population aged 25-64 by educational attainment, employment rates, employment, and area by region (see Tables A1 and A2 of the Appendix for a description and for the descriptive statistics of the variables used in the estimations). The index for population road accessibility measures the number of inhabitants reachable within a 90-minute drive. It is constructed using information from the road transportation network in the EU for the years 2001, 2006, 2011 and 2014 (Dijkstra et al., 2019).[3]

The estimated coefficients of several specifications of model (1) are presented in Table 1. Columns 1 to 3 show the estimates of two-way fixed effects models with both region and time

[1] Following Rodríguez-Pose and Ketterer (2020), we use an unweighted average of the Voice and Accountability (VA), Government Effectiveness (GE), Rule of Law (RL), and Control of Corruption (CC) indicators of the Worldwide Governance Indicators (WGI).

[2] More information available at https://cohesiondata.ec.europa.eu/browse?limitTo=datasets.

[3] Data for the rest of the years were extrapolated. The index was provided to us by DG REGIO.

fixed effects. Column 1 contains the results of a parsimonious model, not including government quality or EU Cohesion funds among the explanatory variables. Columns 2 and 3 contain the results of the same model enriched first with EU Cohesion Funds, and then with government quality among the right-hand-side variables, respectively. We address the possible endogeneity of the latter variable by estimating an instrumental variable two-way fixed effects model in column (4). The government quality index is instrumented with the following variables: the level of regional development measured as regional GDP per capita over EU GDP per capita, two lags of the quality of government variable, two lags of the log ESIF variable, one lag of the log GDP growth variable, and one lag of the rest of the explanatory variables. Column (5) contains the estimated coefficients of the model including both EU Cohesion funds and government quality among the explanatory variables simultaneously. Finally, column (6) shows the instrumental variables estimates of that same model, with the same logic used for the choice of the instruments of these two variables, which, in this case, are both considered as potentially endogenous.

Table 1. *Impact of quality of government on regional growth — equation (1)*

	(1) Two-way FE	**(2) Two-way FE**	**(3) Two-way FE**	**(4) IV Two-way FE**	**(5) Two-way FE**	**(6) IV Two-way FE**
GDP per capita (log)	-0.203***	-0.254***	-0.214***	-0.282***	-0.262***	-0.316***
	(-23.27)	(-16.83)	(-24.40)	(-23.77)	(-17.76)	(-14.63)
Quality of govt.			0.026***	0.040***	0.024***	0.038***
			(4.38)	(4.39)	(3.82)	(3.90)
ESIF (log)		0.013***			0.013***	0.010*
		(4.62)			(4.53)	(1.93)
Primary education	0.009	-0.015	-0.017	-0.088	-0.038	-0.093
	(0.16)	(-0.26)	(-0.27)	(-1.31)	(-0.59)	(-1.39)
Tertiary education	0.064	0.046	0.016	-0.119*	0.002	-0.119*
	(1.02)	(0.76)	(0.25)	(-1.85)	(0.04)	(-1.85)
Employment rate	0.545***	0.534***	0.513***	0.516***	0. 505***	0.520***
	(7.37)	(6.37)	(6.99)	(6.91)	(6.10)	(6.21)
Empl. Density (log)	-0.005	0.013	-0.004	0.004	0.014*	0.016
	(-0.13)	(0.26)	(-0.10)	(0.10)	(0.28)	(0.32)
Accessibility (log)	-0.049**	-0.055**	-0.050**	-0.026	-0.056**	-0.033
	(-2.07)	(-2.30)	(-2.09)	(-1.08)	(-2.41)	(-1.40)
Constant	2.304***	2.912***	2.471**	2.899***	3.049***	3.318***
	(6.16)	(6.65)	(6.48)	(7.25)	(7.18)	(7.21)
R-squared	0.536	0.552	0.541	0.613	0.556	0.610
No. of Observations	2,184	2,184	2,184	1,996	2,184	1,996
No. of Regions	188	188	188	187	188	187
No. of instruments				10		12

Weak identification	189.009	48.688

Note: Robust t-statistics in parenthesis. ***, **, and * denotes coefficient is statistically significant at the 0.01, 0.05, and 0.10 level respectively. For the Weak identification test, Cragg-Donald Wald F statistic is reported. The null hypothesis of weak identification is rejected using Stock-Yogo critical values.

The results show that the European Cohesion funds had a positive and significant effect on regional economic growth at the European level. This is in line with the findings of Cappelen et al. (2003), Rodríguez-Pose and Fratesi (2004), Becker et al. (2012), Pellegrini et al. (2013); Crescenzi and Giua (2015), or Cerqua and Pellegrini (2018). The rest of the controls also show coefficients in line with those of the literature on the determinants of economic growth in Europe, e.g., positive and significant coefficients associated with employment and negative and significant ones for the initial level of GDP per capita and accessibility (Rodríguez-Pose and Ketterer, 2020).

More importantly for our purposes, a positive and significant relationship between the quality of government and regional growth emerges from all the specifications of the model in which government quality is included among the explanatory variables. The effect is positive and highly statistically significant according to all the model specifications including the government quality index among the right-hand-side variables. The range of the estimated coefficients lies between 0.024 and 0.040, with 0.038, being associated to government quality in the richest of the model specifications presented here (column 6 of Table 1).

These results confirm earlier findings by Ketterer and Rodríguez-Pose (2018) and Rodríguez-Pose and Ketterer (2020). Thus, from a partial equilibrium point of view, it appears that the government quality is a fundamental determinant of economic growth at the regional level in the EU. We now turn to a general equilibrium setting in order to understand the full implications of the relationship between government quality and growth when all the channels operating in an economy are taken into account, something that, to the best of our knowledge, has not been analysed yet in the literature.

Quality of government and growth in a general equilibrium setting

Do these results stand in a general equilibrium setting? General equilibrium models have the advantages of more solid theoretical and econometric foundations and provide far greater

internal consistency. At the same time, they allow for a far bigger level of disaggregation. All these factors make general equilibrium models more suitable and reliable when assessing the impact of public policies, as they facilitate measuring, in a more reliable and consistent way, the returns of different types of investment. Hence, in order to test whether the results of the partial equilibrium model stand, we perform the general equilibrium analysis using the RHOMOLO model, a spatial CGE model of the EU NUTS2 regions. The main features and technical details of the model are described in the Supplementary Appendix. In the model, the quality of institutions at regional level is attached to the public capital, constituting a combined factor of production.

Simulations set up

The aim of this analysis is to quantify the system-wide benefits of enhancing institutional quality across EU regions. Since it is plausible to assume that government quality is capable of affecting economic growth mainly via public capital and its role in the economy, we concentrate on public capital investments. In particular, we set up a baseline scenario simulating the impact of the ESIF investments on infrastructures in energy production, transport, and communication, as well as investments in social infrastructure (human capital and health and housing infrastructures). In other words, we focus solely on the part of ESIF that can be considered as public capital expenditure. Over the programming period 2014-2020, cumulative public capital expenditures were approximately 50% of the whole Cohesion policy, representing, in total, 1.3% of the annual EU GDP (see the Appendix for the list of expenditure categories included in this analysis).[4]

The regional distribution of the funds over the whole implementation period is laid out in Figure 1, where each region is characterised by a different colour shade, depending on the amount of

[4] The ESIF amounted to roughly €460 billion for the period 2014-2020, a third of the total EU budget. 43% of expenditures were allocated to the European Development Fund (ERDF), 21.7% to the European Agricultural Fund for Rural Development (EAFRD), 20.1% to the European Social Fund (ESF), 13.7% to the Cohesion Fund (CF), and 1.2% to European Maritime and Fisheries Fund (EMFF). The Cohesion policy 2014-2020 split the policy interventions in 123 categories (See the Nomenclature for the categories of intervention of the Funds under the Investment for growth and jobs goal and of the Youth Employment Initiative, available here: https://webgate.ec.europa.eu/esiflegislation/pages/viewpage.action?pageId=34441370). The 123 categories of expenditures are shown in Table A3 in the Appendix together with the list of those considered as public capital expenditures in our analysis.

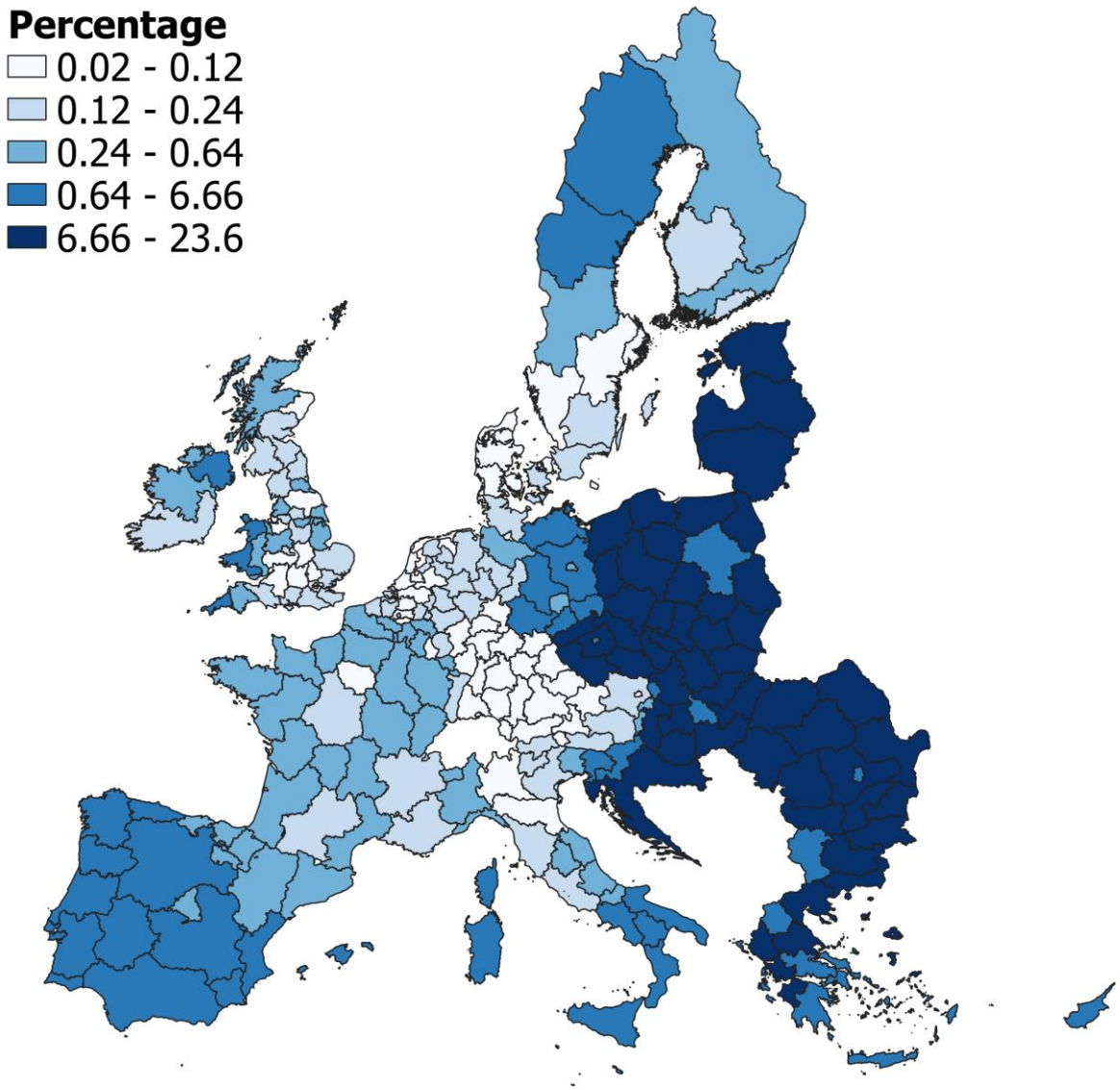
these public capital investments. The bulk of these capital expenditures targeted Southern and Eastern Europe. For some regions, the total amount of funds received over the whole implementation period represented substantial amounts of investments relative to their GDP. For instance, the regions of Hungary and Poland received cumulative funds of around 15% of their annual GDP in investments, while Portugal and the South of Italy were allocated cumulative funds of around 5% and 2.5% of their annual GDP, respectively.[5]

Although the EU budget is organised over a seven-year programming cycle, the actual implementation period of ESIF may be different. This discrepancy is due to the so-called N+2 rule, which indicates that at the beginning of each programming period annual funding is allocated to each programme and these funds must be spent by the end of the second year after their allocation. In our simulations, we assume that regions are shocked for 10 periods and the funds are equally distributed over that period. Thus, the funds allocated to regions of Hungary and Poland represent, on average, 1.5% of the annual GDP of the region over the entire ten year spending period. Those allocated to Portuguese and southern Italian regions on average represent 0.5% and 0.25% of their annual GDP, respectively. Although most investments tend to take place towards the end of each programming period, we believe this assumption does not bear any meaningful consequences for the specific purposes of this exercise.

The Cohesion policy is mainly financed by the national contributions to the EU budget. Those contributions are proportional to the GDP weight of each member state, so that the larger the GDP share over the EU GDP of a country, the higher its contribution. Thus, we assume that the policy is financed by regions in accordance with their regional GDP level, irrespectively of the amount of funds received. This assumption is reasonably close to the actual disbursement method. We also assume that the investment is financed via non-distortionary taxation on household income.

[5] There is considerable regional heterogeneity behind public capital expenditures being about 50% of total 2014-2020 Cohesion policy investments. Capital expenditures represent, on average, 60% of the total Cohesion policy investments in eastern and southern European regions, while they constitute between 20% and 35% of the funds in the more developed EU regions.

***Figure 1**: Distribution of cumulative ESIF public capital expenditure by region (% of 2013 GDP)*



Source: own elaborations on DG REGIO data.

The temporary increase in public investment financed through a lump sum tax on household income, as defined above, represents the baseline scenario of our analysis. The aim of the article is not to explore the economic mechanisms at work with regards to the public capital investments of Cohesion policy, but rather to build a scenario against which to compare the potential effects of changes in the quality of government affecting the effectiveness of the public capital stock and, in turn, the production processes of the European economies.

Thus, we simulate an increase in institutional quality affecting public capital to be compared with the first baseline scenario. This ensures that the quality improvement is analysed in a context in which public capital stock changes over time as a result of the implementation of ESIF.

We assume that in each region the quality of government follows an autoregressive process, AR(1), as shown in the equation below:

$$\log(q_t) = c + \rho \log(q_{t-1}) + \varepsilon_t \tag{2}$$

Where q_t is the time-series of the European Quality of Government Index, ρ is the persistence parameter and ε is the shock implemented in the model.[6] Using OLS regression analysis, we find that the average estimated value of ρ is around 0.76 with standard deviation across regional values around 0.2.[7] In all regions, we impose $\varepsilon = 0.05$ only for the first period (an increase in government quality of five percentage points) while from the second period onwards, ε bounces back to zero. Thus, the shock is temporary, but the persistence parameter governs the period-by-period intensity of shock. For instance, the higher the level of ρ, the longer the timeframe for the shock to disappear. Intuitively this also means that regions characterised by a higher persistence are more likely to benefit from improvements in institutional quality in the long run.

The persistence parameter is a crucial element in our analysis, as it determines the duration of the government quality shock over time. A number of institutional factors may affect the degree of persistence of government quality. Constant political instability, institutional rigidities, the coherence and effectiveness of institutional structures, the impartiality and transparency of tendering, public service provision and procedures, the role of the media, and the degree of social trust may all potentially explain different degrees of persistence across countries and regions over time.[8]

[6] As the European Quality of Government Index is calculated using survey data, the indicator is accompanied by a margin of error. The time series of this indicator is constructed using the point estimates of the indicator.

[7] We report the distribution of the estimated values for all regions in Figure A1 of the Appendix.

[8] The investigation of the role played by each of these potential determinants would certainly require greater attention in future research. These are all interesting issues that, nevertheless, fall outside the scope of this paper.

Given the model configuration, any improvement in regional government quality works similarly to a Hicks-neutral technical change. The improved quality generates an increase in effective public capital, in turn, rising the productivity of capital and labour according to the initial shares of these factors of productions. This also means that the prices attached to factors of production are expected to fall, reducing the general equilibrium price of commodities. The fall in prices should also trigger competitiveness effects stimulating exports and, therefore, also improve regional current accounts.

We expect the long-run magnitude of the impact in each region to be affected by its initial level of government quality, by the persistence of the latter, and by the regional capital stock that is combined with the quality of government in the production function.[9] It is reasonable to assume that a positive relationship will emerge between GDP (and other variables, such as employment and private consumption) and each of those parameters/variables. The precise nature of such relationship can only be uncovered by analysing the results of the simulations as we do below.

Empirical analysis and results

The results of the modelling simulations are presented as follows: first, we present the baseline state of the economy, following the injection of the ESIF categorised as public capital expenditure. Then, we focus on the system-wide effects of an improvement of government quality in all the EU regions.

The baseline scenario

The baseline scenario assumes the injection of the ESIF public capital investments presented in the section above (spread evenly over the ten years-long policy implementation period) financed through a lump sum tax on household income. After the shock, the economies gradually return to their original equilibrium. However, the supply-side nature of the shock suggest that the funds generate long-run effects, with their impact remaining long after the end of the programming

[9] Public capital enters the production function as an unpaid factor of production and it is augmented by the quality of government in a multiplicative way. This results in a composite factor that we refer to as effective public capital. Please see equation (A1) in the Appendix for further details.

period. Thus, in this section we quantify the impact during and after the policy implementation period. We also comment on the drivers and transmission mechanisms behind the economic effects caused by the shock.

Table 2 shows the percentage deviations from base year values of some key macroeconomic variables obtained for the aggregate EU economy.[10] We report the results obtained for selected periods to assess the effects of public investment both during the implementation period (years 1, 5, and 10) and after the end of it (years 20 and 30). We report the cumulative impacts in addition to the year-specific ones. This strategy allows us to evaluate the extent of the legacy effects associated with an increase in capital expenditure. In period 1, private capital stock is fixed at its initial level, while the public stock of capital adjusts immediately as capital expenditure increases. In this period, public investments negatively affect both household consumption and investments, while employment increases. In addition, there is a reduction in commodity prices and an increase in exports of goods and services. The related changes in exports are greater than the changes in GDP and compensate crowding out effects on consumption and investments. After period 1, constraints on private capital stock are relaxed allowing the economy to expand further. Consumption and investments are crowded in and the changes in employment gradually become lower than the changes in GDP, meaning that capital accumulation stimulates positive substitution effects in favour of private capital. At the end of the implementation period, the supply-side implications of the policy are reflected in huge improvements in the current account. In this period (year 10 of the simulation), exports increase by 0.44% while imports register a tiny increase of 0.004%, and the cumulative changes amount to +1.88% and +0.23%, respectively.

Table 2. *Impact on key macroeconomic variables - percentage deviations from steady-state equilibrium (cumulative impact in parenthesis)*

	Implementation period			**Post-implementation**	
	1	**5**	**10**	**20**	**30**
GDP	-0.006	0.151	0.374	0.394	0.271
	(-0.006)	(0.342)	(1.771)	(6.026)	(9.286)
Export	0.045	0.137	0.435	0.546	0.379
	(0.045)	(0.306)	(1.881)	(7.484)	(12.031)
Import	-0.027	0.039	0.004	-0.075	-0.056

[10] Note that since we are using data for the 2014-2020 programming period, the UK is included in the EU.

	(-0.027)	(0.132)	(0.227)	(-0.344)	(-0.999)
Employment	0.029	0.161	0.353	0.366	0.262
	(0.029)	(0.467)	(1.849)	(5.659)	(8.760)
Household cons.	-0.147	-0.036	0.131	0.305	0.212
	(-0.147)	(-0.466)	(-0.145)	(3.073)	(5.614)
Commodity prices	-0.028	-0.061	-0.149	-0.153	-0.104
	(-0.028)	(-0.175)	(-0.745)	(-2.369)	(-3.626)
Investment	-0.154	0.195	0.413	0.317	0.199
	(-0.154)	(0.240)	(1.901)	(6.033)	(8.510)

Note: % deviation from initial steady-state

Looking at the last two columns to the right of Table 2 (the long run), we find substantial legacy effects that persist well beyond the last year in which the investments are carried out. The GDP is 0.39% and 0.27% above base year values, ten and twenty periods after the end of the implementation period, respectively (amounting to substantial cumulative changes of +6.03% and +9.29% in periods 20 and 30). The long-term persistence of the shock is also reflected on employment, consumption, and investments.[11]

The long lasting impact of ESIF public capital investments also generates improvements in the EU current account in periods 20 and period 30 (with above-baseline exports and below-baseline imports), indicating that public investments have prolonged positive competitiveness effects. Thus, expansionary policies that aim to increase the stock of public capital may crowd out consumption and investments in the first years of the programming period. However, long-term positive effects materialise as soon as the economy adjusts and the persistence of the shock continues to ensure positive terms of trade effects even many periods after the end of the shock. In monetary terms, our simulations suggest that the Cohesion policy public capital investments considered in our analysis may generate, cumulatively, up to €455 of GDP for each European citizen in the short run (period 10) and about €2,380 in the long run (period 30) — using the average EU GDP per capita in 2013 (amounting to €25,600) as the reference.

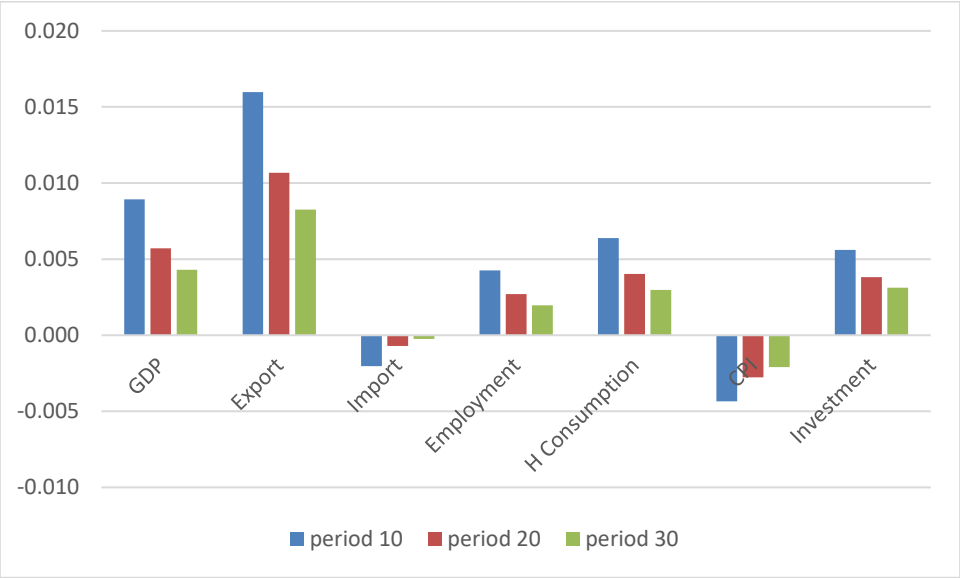
[11] For GDP, employment and investments we observe a declining pattern of legacy effects, while for household consumption our simulation suggests a peak in period 20. This is perhaps to be expected, as the additional government investment has been completed at the end of the implementation period and this frees up resources for households that were bearing the full cost of the investments.

The economic impact of improving quality of institutions

In this Section, we initially focus on the system-wide effects of improving institutional quality. All the results reported in this section are to be interpreted as deviations from the baseline scenario presented in the previous section.

Figure 2 shows the percentage deviations from the baseline of some key macroeconomic variables for period 10 and period 20. In all periods, GDP and employment are above their baseline values. Changes in employment are lower than those in GDP, suggesting that the improvement in government quality causes a substitution in favour of capital. As in Di Cataldo and Rodríguez-Pose (2017), better government quality creates an economic expansion with an increase in investment and a reduction in the unemployment rate, putting workers in the condition to bargain for higher wages. Hence, the real wages rise generating additional income and consumption that boost the economy even further. The change in government quality also positively affects the productivity of production factors and thus puts downward pressure on commodity prices, while enhancing competitiveness vis-à-vis the rest of the world. In all periods, exports of goods and services grow faster than GDP and imports fall, generating extensive improvements in the current account.

Figure 2: *Percentage deviations from baseline at periods 10, 20, and 30*



Since the values of the shock persistence parameter ρ lie between zero and one, the government quality shock in most regions gradually diminishes in intensity. Thus, on aggregate, the

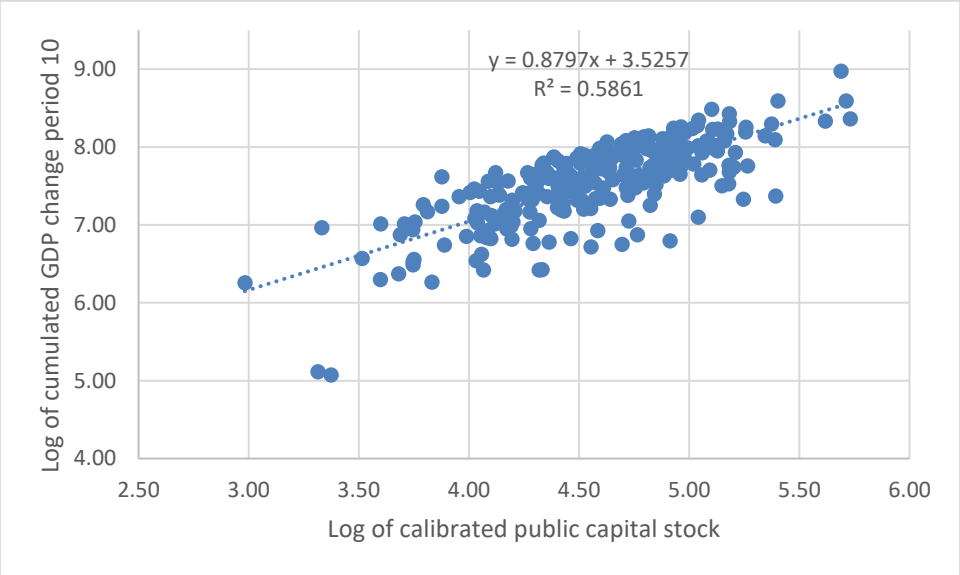
expansionary effects are reduced over time. The main adjustments remain in operation in this period, meaning that most of the regions experience persistent benefits from the shock.

Although the economic adjustments and transmission mechanisms are similar across regions, the economic impact is unevenly distributed. The improved quality of government affects the effectiveness of the public capital stock, based on the assumption that better institutions are able to use more efficiently their whole endowment of capital and infrastructures. Thus, it seems reasonable to assume that regions with larger capital stocks will benefit the most from the policy shock. Figure 3 indeed confirms this intuition by showing the high and positive correlation between the log of the regional calibrated stock of public capital (horizontal axis) and the log of cumulative absolute changes in GDP observed in period 10 (vertical axis).[12]

The public capital stock is crucial to explaining the positive effects stemming from an improvement in quality of regional governments. However, there are other parameters affecting the different regional impact. One of these is the calibrated initial level of government quality in the model. Interestingly, there is a positive correlation between the level of the capital stock and the government quality index. This suggests that regions with better initial endowments of public infrastructure also tend to have better quality institutions. Another parameter affecting the impact across regions is the persistence parameter ρ, which plays a pivotal role in governing the time persistence of the shock.

[12] It is important to note that in the model capital stock is calibrated in steady-state with an assumed depreciation rate identical for all regions. As such, this might not reflect the real stock of public infrastructure present in each region. Nonetheless, an important implication from this analysis is that an effort to improve the quality of institutions may not be equally beneficial across all regions. Regions with better government quality are likely to benefit more.

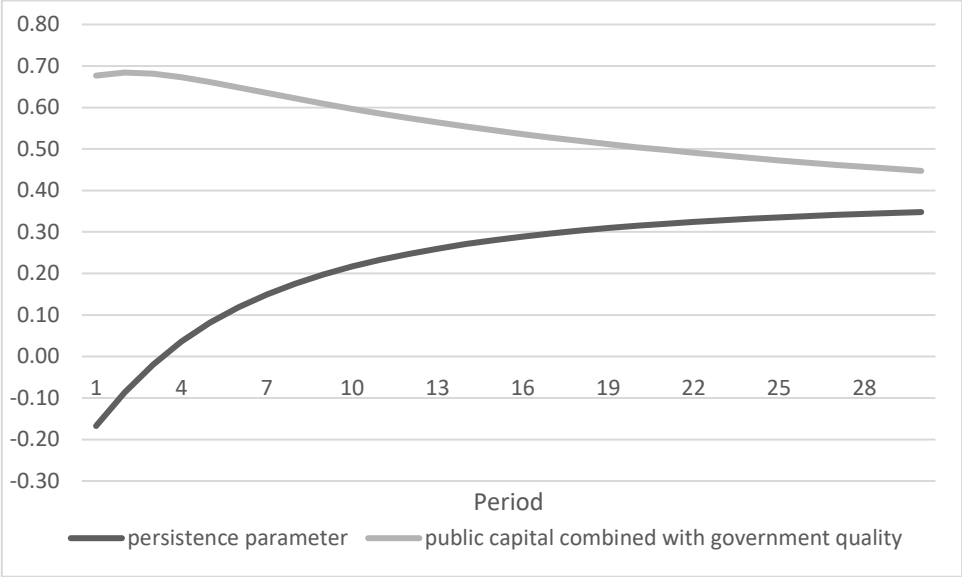
Figure 3: *Correlation between the calibrated public capital stock and GDP deviations from baseline at period 10*



We next examine to what extent these parameters affect the economic impact across regions. Figure 4 shows the evolution of two different correlations over time. The black line reports the correlation over time between the GDP cumulative deviations from baseline and the persistence parameter. The grey line shows the period-by-period correlation between the GDP cumulative deviations from the baseline and the initial levels of the combined factor of production, that is public capital and government quality. As indicated before, these two factors are highly correlated. However, combining the two has the advantage that it gives a comprehensive well-weighted measure of effective public capital that includes the efficiency associated with the quality of institutions.

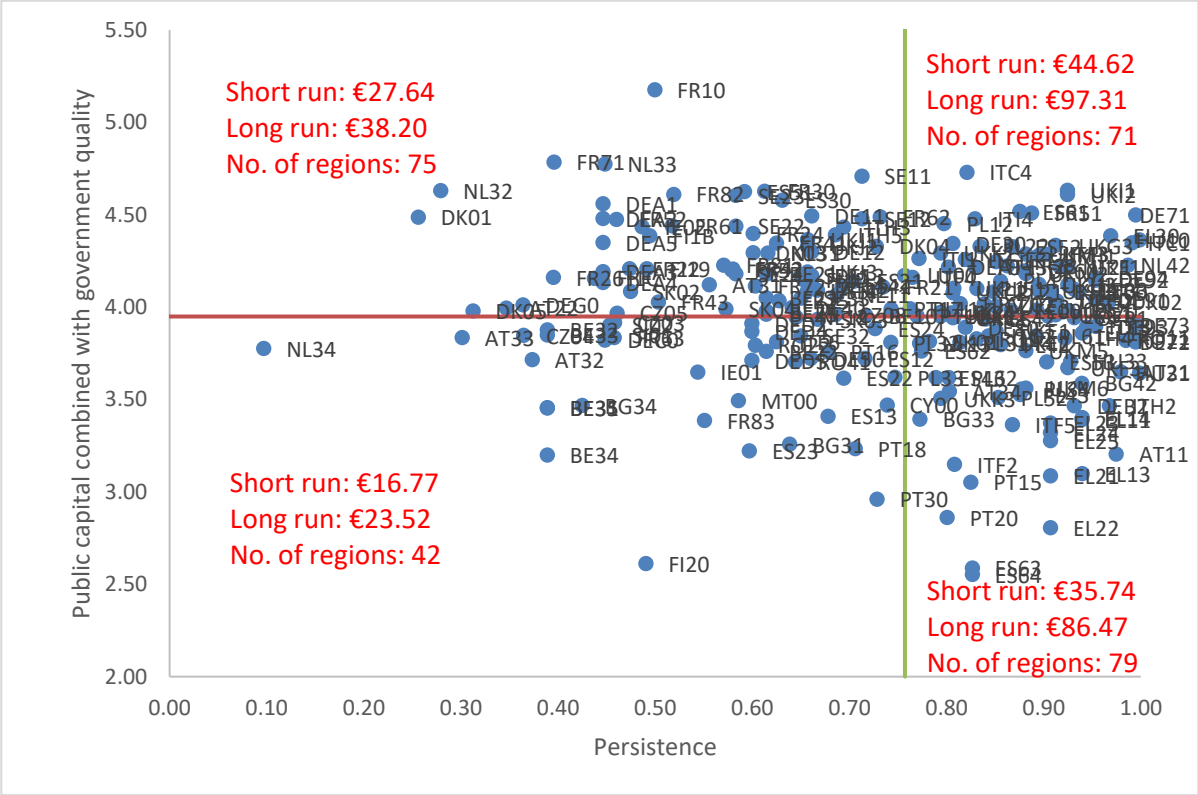
The solid line suggests that the persistence of the shock has adverse effects in the short run, but it is positively correlated with GDP deviations in the long run. This is to be expected, as a higher persistence mitigates the short-run positive impact. However, in the long run, it is likely that these regions will enjoy larger benefits. The opposite may also be true, with the stock of public capital augmented by government quality, whose correlation with changes in GDP is high in the short run but decreases over time. This result suggests a way to define four different groups of regions by combining the different short-run and long-run system-wide benefits associated with the hypothesised 5% temporary increase in government quality.

Figure 4: *Period-by-period correlation between absolute cumulative changes in GDP and, alternatively, the persistence parameter and public capital combined with government quality*



Building on that idea, Figure 5 plots the relationship between persistence ρ and the combined factor of production made up of public capital and government quality. The vertical and horizontal blue lines identify the average regional level of ρ and the average value of the combined factor of production respectively, dividing the plot into four quadrants. In each of these, we report the short run and long run average GDP per capita income associated with the increase in government quality for the regions populating each quadrant.

Figure 5: *Classification of regions according to the short and long run system-wide benefits of government quality improvements*



The numbers reported in Figure 5 should be read bearing in mind that, according to the baseline scenario illustrated above, the gains in terms of GDP per capita associated with European Cohesion public capital investments for the whole EU amount to €455 and about €2,380 in the short run and the long run, respectively. The numbers of Figure 5 are additional to those ones and achieved via the simulated 5% increase in government quality across all EU and UK regions. The latter numbers show a notable regional disparity depending on the initial stock of quality adjusted public capital and on the regional persistence of government quality.

In line with Rodríguez-Pose and Ketterer (2020), the EU regions starting with a relatively low adjusted stock of public capital gain little in the short run from the improvement in government quality. This is around €17 per capita, if low values of the combined factor of production are associated with low levels of ρ, and €36 per capita, if ρ is above average. However, even for smaller than average adjusted public capital endowments, higher persistence can make a difference in the long run. The 79 regions populating the bottom-right quadrant report an increase of €86 per capita versus only €24 for the regions positioned in the bottom-left characterised by low persistence. The regions with an initial above-average adjusted public

capital stock gain more in the short run (between €28 and €45 per capita, depending on the persistence parameter) as well as in the long run, with the range going from €38 on average for the 75 low persistence regions to €97 for the 71 regions characterised by both adjusted public capital and persistence above their average values.

Another result is that regions characterised by a high degree of persistence (those in quadrants 2 and 4) benefit more than the others, both in the short and in the long run. This is illustrated in Figure 6, which shows the dispersion of the short and long run regional GDP per capita impact. Furthermore, regions with larger endowments of effective public capital (quadrants 1 and 2) benefit more than those with smaller endowments with similar degrees of persistence. Essentially, this suggests that initial conditions matter and are an important factor governing the size of the shocks in this analysis as well as their economic impact.

The fact that above-average values of the persistence parameter increase the gains associated with improvements in government quality is demonstrated by Figure 7, which shows the correlation between long run GDP per capita impact and, respectively, persistence and the adjusted public capital stock for regions in the four quadrants. We note that the correlation between GDP and persistence is higher for regions characterised by above average persistence (regions in quadrants 2 and 4). This implies that regions characterised by high persistence benefit from disproportionally higher GDP impact following an improvement in government quality. This is irrespective of whether they are endowed with high or low initial levels of adjusted public capital. In contrast, the positive correlation between the stock of adjusted public capital and per capita GDP are approximately of the same magnitude across regions in the four quadrants. This suggests that the initial endowment of adjusted public capital is identically associated with higher economic benefits for all regions following a rise in the quality of government.

Figure 6: *Dispersion of the short and long run regional GDP impact of government quality improvements*

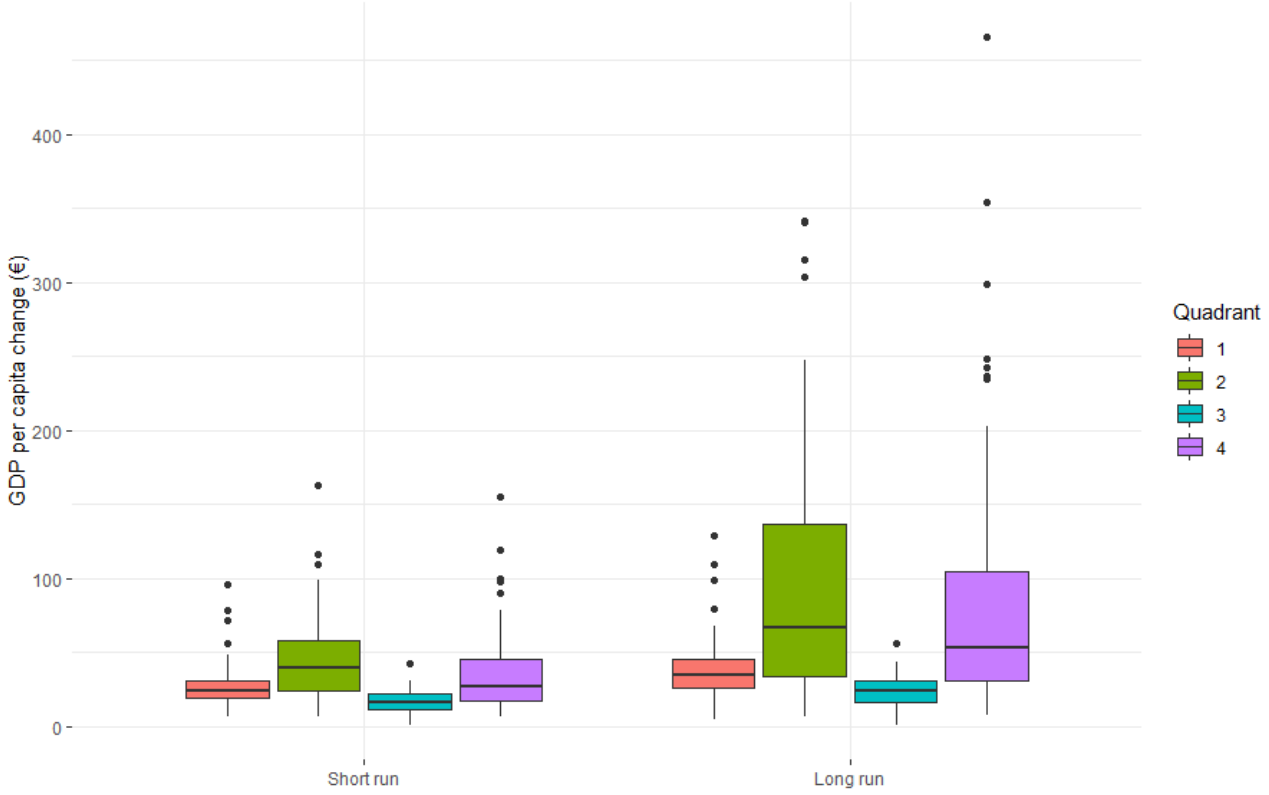
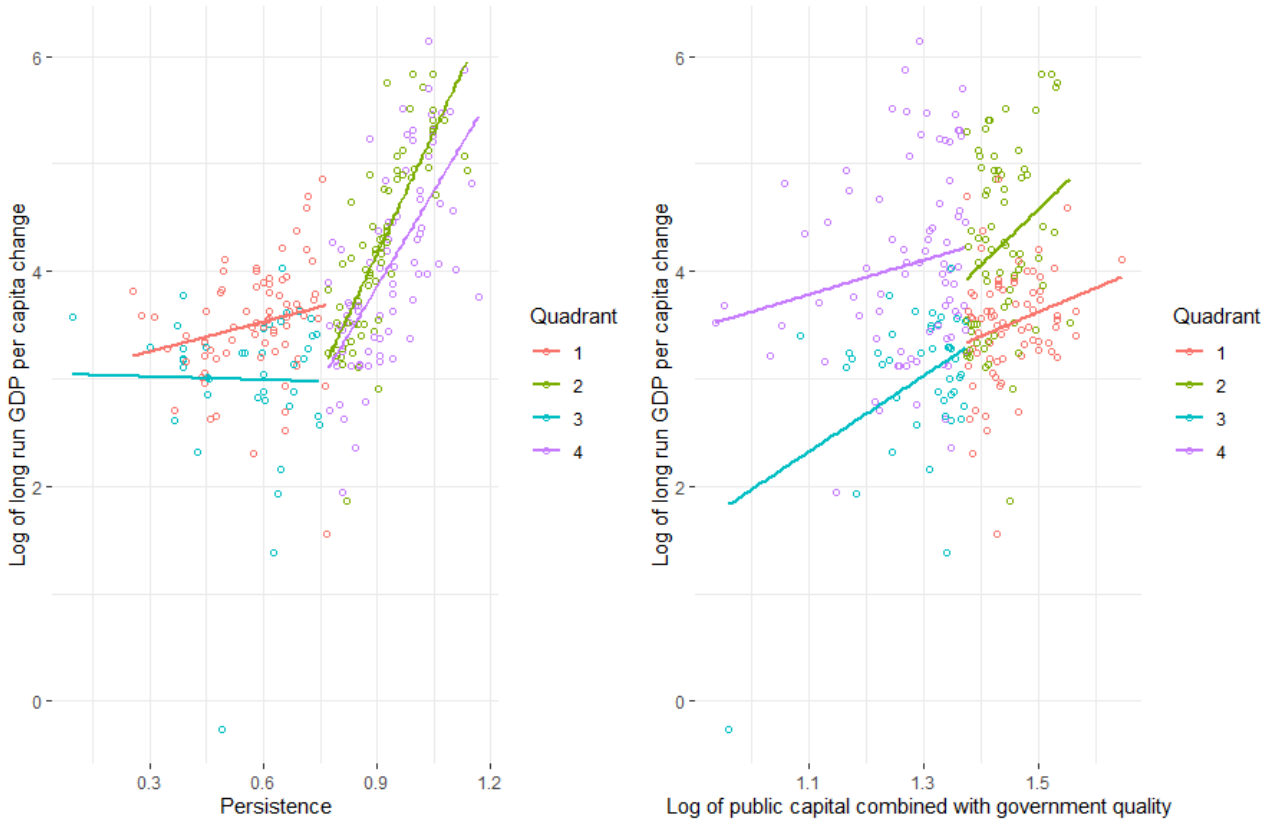


Figure 7: *Correlation between absolute cumulative changes in long run regional GDP and, alternatively, the persistence parameter (left) and public capital combined with government quality (right)*



Overall, these results indicate that even a small improvement in government quality may yield ample monetary gains depending on the regional public capital endowments and on the characteristics of government quality over time. For instance, the 71 regions of the upper right quadrant of Figure 5 see the Cohesion policy gains related to public capital investments increased on average by 7% in the short run and by just above 3% in the long run. Slightly smaller gains are found for the regions with smaller values of either of the two key parameters, or both. In any case, this finding is telling of the economic potential of government quality in the EU in relationship to policies affecting public capital.

Conclusions

This paper has revisited the question of the link between regional quality of government and the returns of European Cohesion policy, using a more sophisticated general equilibrium framework. In this respect, the analysis has tested previous findings (e.g., Rodríguez-Pose and Garcilazo, 2015) on the role of quality of regional government for economic growth, but using novel up-to-date data and a wider variety of more sophisticated econometric methods. It has also quantified with greater precision the system-wide effects of improvements in government quality across NUTS2 EU regions, using ESIF expenditures related to public capital for the 2014-2020 programming period.

An attractive feature of the quantitative assessment strategy adopted in this paper is the link between the partial equilibrium model and the general equilibrium one. These models are often seen as competitive tools and they are rarely used in combination in quantitative policy analysis. However, a key element of the analysis above is the incorporation of the effects estimated with a partial equilibrium model into a system-wide general equilibrium framework. The econometric analysis has the advantage of capturing the effects of the quality of government in isolation, abstracting from endogenous drivers and feedback effects. It provides a measure of the direct impact of the policy. This elasticity is also a crucial parameter in the CGE analysis. Frequently, key elasticities used in CGE models for policy evaluations are taken from empirical studies that are only loosely related with the policy object of the analysis. Here, we use an appropriate

estimate of the direct effect of the quality of government in order to carry on a rigorous quantification of the indirect and general equilibrium effects of the policies under consideration.

The results show that local government quality matters, and it matters a lot, in promoting economic growth across the regions of Europe. First, there is evidence of a significant direct effect of government quality on economic growth. Second, it has shown that there are as well considerable system-wide benefits of policies aiming to improve the quality of institutions in the regions of the EU. The modelling experiment suggests that the economic impact of improving the quality of regional government can be substantial in terms of additional GDP and jobs generated. The precise magnitude of these effects depends on a few key factors which include the initial level of the quality of government, its persistence over time, and the stock of capital with which each region is endowed. A relatively small increase in government quality of 5% can yield large monetary gains both in the short run and in the long run, boosting the average regional GDP impact of ESIF public capital investments by up to 7% and 3% in the short and long run, respectively, depending on the starting conditions of each region. Exploring the heterogeneity across EU regions with respect to initial characteristics and the potential to benefit from improved government quality would be an interesting path for further research. As a larger share of Cohesion funds is being channelled to regions in less-developed and/or newer member states that also have the greatest institutional bottlenecks, the economic implications for the returns of Cohesion Investment of improvements in government quality may vary considerably across Europe.

Our conclusions have important implications for policy-making. They suggest that the returns of promoting greater public investment to trigger economic growth can be substantially enhanced if improving government quality becomes a part of public policy, in general, and of the European Cohesion effort, in particular. Inaction with respect to government quality failures — which has been the norm until very recently — bears significant costs for EU citizens. The dimension of the benefits can be important, as even a relatively small increase in government quality is likely to yield considerable benefits, which we are able to quantify in terms of euro per capita thanks to the general equilibrium model simulations. Hence, in order to fulfil the objective of improving EU competitiveness, while, at the same time, reducing some of the gaps in territorial development,

putting government quality movements firmly in the policy agenda will deliver sizeable economic results, while, simultaneously, contribute to improve the design, implementation, and returns of most public policies.

References

Annoni, P., & Dijkstra, L. (2017). ´Measuring and monitoring regional competitiveness in the European Union´. In R. Huggins and P. Thompson, *Handbook of Regions and Competitiveness*. 49-79. Cheltenham: Edward Elgar Publishing.

Aparicio, S., Urbano, D., and Audretsch, D. (2016). ´Institutional factors, opportunity entrepreneurship and economic growth: Panel data evidence´. *Technological Forecasting and Social Change*, *102*, 45-61.

Becker, S. O., Egger, P. H., & Von Ehrlich, M. (2012). ´Too much of a good thing? On the growth effects of the EU's regional policy´. *European Economic Review*, *56*(4), 648-668.

Cappelen, A., Castellacci, F., Fagerberg, J., & Verspagen, B. (2003). ´The impact of EU regional support on growth and convergence in the European Union´. *JCMS: Journal of Common Market Studies*, *41*(4), 621-644.

Cerqua, A., & Pellegrini, G. (2018). ´Are we spending too much to grow? The case of Structural Funds´. *Journal of Regional Science*, *58*(3), 535-563.

Charron, N., Dijkstra, L. & Lapuente, V. (2014). ´Regional Governance Matters: Quality of Government within European Union Member States´, *Regional Studies*, 48 (1): 68-90. DOI:10.1080/00343404.2013.770141

Charron, N., Dijkstra, L., & Lapuente, V. (2015). ´Mapping the regional divide in Europe: A measure for assessing quality of government in 206 European regions´. *Social Indicators Research*, 122(2), 315-346.

Charron, N., V. Lapuente & P. Annoni (2019). ´Measuring Quality of Government in EU Regions Across Space and Time´. *Papers in Regional Science*, 98(5): 1925-1953. DOI: 10.1111/pirs.12437

Cortinovis, N., Xiao, J., Boschma, R., and van Oort, F. G. (2017). ´Quality of government and social capital as drivers of regional diversification in Europe´. *Journal of Economic Geography*, *17*(6), 1179-1208.

Crescenzi, R., Di Cataldo, M., and Rodríguez-Pose, A. (2016). ´Government quality and the economic returns of transport infrastructure investment in the European Union´. *Journal of Regional Science* 56, 555–582.

Crescenzi, R., & Giua, M. (2016). ´The EU Cohesion Policy in context: Does a bottom-up approach work in all regions? ´. *Environment and Planning A: Economy and Space*, *48*(11), 2340-2357.

Di Cataldo, M., & Rodríguez-Pose, A. (2017). ´What drives employment growth and social inclusion in the regions of the European Union?´. *Regional Studies*, *51*(12), 1840-1859.

Dijkstra, L., Poelman, H., and Ackermans, L. (2019). ´Road transport performance in Europe. Introducing a new accessibility framework´. Working Papers 01/2019 — A Series of Short Papers on Regional Research and Indicators Produced by the Directorate-General for Regional and Urban Policy. 2018. Available online: https://ec. europa. eu/regional_policy/sources/docgener/work/2019_02_road_transport.pdf.

Ezcurra, R., & Rios, V. (2019). ´Quality of government and regional resilience in the European Union. Evidence from the Great Recession´. *Papers in Regional Science*, *98*(3), 1267-1290.

Huggins, R., and Thompson, P. (2016). ´Socio-spatial culture and entrepreneurship: some theoretical and empirical observations´. *Economic Geography*, *92*(3), 269-300.

Iddawela, Y., Lee, N., and Rodríguez-Pose, A. (2021). ´Quality of sub-national government and regional development in Africa´. *Journal of Development Studies*. https://doi.org/10.1080/00220388.2021.1873286

Kaasa, A. (2016). ´Social capital, institutional quality and productivity: evidence from European regions´. *Economics & Sociology*, *9*(4), 11-26.

Ketterer, T. D., & Rodríguez-Pose, A. (2018). ´Institutions vs. 'first-nature' geography: What drives economic growth in Europe's regions? ´. *Papers in Regional Science*, *97*, S25-S62.

Lecca, P., Barbero, J., Christensen, M., Conte, A., Di Comite, F., Diaz-Lanchas, J., Diukanova, O., Mandras, G., Persyn, D., and Sakkas, S. (2018). ´RHOMOLO V3: A Spatial Modelling Framework´. EUR 29229 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-85886-4, doi:10.2760/671622, JRC111861.

Lecca, P., Christensen, M., Conte, A., Mandras, G., and Salotti, S. (2020). ´Upward pressure on wages and the interregional trade spillover effects under demand-side shocks´. *Papers in Regional Science* 99(1), 165-182.

Nistotskaya, M., Charron, N. and Lapuente, V. (2015) ´The wealth of regions: quality of government and SMEs in 172 European regions´. *Environment and Planning C: Government and Policy*, 33(5): 1125-1155.

Pellegrini, G., Terribile, F., Tarola, O., Muccigrosso, T., & Busillo, F. (2013). ´Measuring the effects of European Regional Policy on economic growth: A regression discontinuity approach´. *Papers in Regional Science*, *92*(1), 217-233.

Rodríguez-Pose, A. (2013). ´Do institutions matter for regional development?´. *Regional Studies*, *47*(7), 1034-1047.

Rodríguez-Pose, A., and Di Cataldo, M. (2015). ´Quality of government and innovative performance in the regions of Europe´. *Journal of Economic Geography* 15(4), 673-706.

Rodríguez-Pose, A., & Fratesi, U. (2004). ´Between development and social policies: the impact of European Structural Funds in Objective 1 regions´. *Regional Studies*, *38*(1), 97-113.

Rodríguez-Pose, A., and Garcilazo, E. (2015). ´Quality of government and the returns of investment: Examining the impact of cohesion expenditure in European regions´. *Regional Studies* 49(8), 1274–1290.

Rodríguez-Pose, A., & Ketterer, T. (2020). ´Institutional change and the development of lagging regions in Europe´. *Regional Studies*, 54(7), 974-986.

Rodríguez-Pose, A., and Zhang, M. (2019). ´Government institutions and the dynamics of urban growth in China´. *Journal of Regional Science*, *59*(4), 633-668.

The European Commission's science and knowledge service

Joint Research Centre

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

EU Science Hub

ec.europa.eu/jrc

@EU_ScienceHub

EU Science Hub - Joint Research Centre

Joint Research Centre

EU Science Hub