Article

Environment and Planning A

Environment and Planning A
0(0) 1–18

DOI: 10.1177/0308518X16658291
epn.sagepub.com
SAGE

The EU Cohesion Policy in context: Does a bottom-up approach work in all regions?

Riccardo Crescenzi
London School of Economics, UK

Mara Giua
Università degli studi Roma Tre, Italy

Abstract
This paper looks at the European Union as a laboratory to study how 'spatially targeted' policies (i.e. the European Union Cohesion and Rural Development Policies) interact with sectoral 'spatially blind' policies (i.e. the Common Agricultural Policy), jointly shaping regional growth dynamics. The analysis of the drivers of regional growth shows that the European Union Cohesion Policy has a positive influence on economic growth in all regions. However, its impact is stronger in the most socio-economically advanced areas and is maximised when its expenditure is complemented by Rural Development and Common Agricultural Policy funds. The top-down funding of the Common Agricultural Policy seems to be able to concentrate some benefits in the most deprived areas of the Union. This suggests that bottom-up policies are not always the best approach to territorial cohesion. Top-down policies may – in some cases – be effective in order to channel resources to the most socio-economically deprived areas. Territorial cohesion requires the flexible integration and coordination of both bottom-up and top-down approaches.

Keywords
Regional Policy, Cohesion Policy, European Union, regional growth, bottom-up policies, rural development, Common Agricultural Policy

Introduction

At the peak of the global financial and economic crisis started in 2008, the European Commission launched a sophisticated and multi-dimensional strategy to boost growth and jobs in the European Union (EU) over the next decade: the Europe 2020 (EU2020) strategy (European Commission, 2010). EU2020 targets a large set of drivers of economic growth and employment in a co-ordinated and systemic fashion promoting, at the same time,

Corresponding author:
Riccardo Crescenzi, Department of Geography and Environment, London School of Economics, Houghton Street, London WC2A 2AE, UK.
Email: r.crescenzi@lse.ac.uk

gradual reforms in existing EU policies. In this context, EU2020 identifies the EU Cohesion Policy as a key delivery tool for its objectives. The EU Cohesion Policy is not simply aimed at inter-regional income redistribution; its key objective is to support long-term sustainable development in all EU regions including the most deprived areas. While giving Cohesion Policy a central role in shaping the economic future of the Union, EU2020 has also assigned all other EU policies (including the EU Common Agricultural Policy (CAP) and the Rural Development Policy (RDP)) the objective to contribute to the achievement of the developmental goals of the strategy. In other words, all EU policies (including sectoral policies) have been asked to contribute to economic growth and development in all areas of the EU in a coordinated fashion.

This fundamental shift in the objectives of all EU policies and the unprecedented emphasis on their coordination to serve a common set of overarching objectives pose a number of key conceptual and empirical questions. What is the impact of fundamentally different policies on the economic performance of the highly heterogeneous EU regions? What is the optimal combination between the traditional top-down approach of sectoral policies and the bottom-up nature of Cohesion and Rural Development policies? What are the benefits arising from better policy coordination?

Notwithstanding the importance of these questions for the economic growth prospects of the EU regions over the next decade, very limited attention has been paid so far to the interaction between the EU Cohesion Policy and other EU policies. The EU Cohesion Policy is a 'spatially targeted' policy: eligibility and funding are granted on the basis of geographical criteria, and its outcomes are also assessed in terms of the performance of well-defined spatial units (administrative regions). The EU RDP is also 'spatially targeted' although its targets are defined in terms of a combination of geographical, sectoral and socio-economic attributes that define 'rural areas'. Finally, there are also other policies, such as the CAP, that albeit neutral in their intent, exhibit considerable spatial impacts. As a consequence, the EU Cohesion Policy does not operate in a vacuum, but it interacts at the territorial level with other EU policies that – intentionally or unintentionally – might magnify or curb its influence on regional economic performance. In this sense, the 'New Regional Policy' paradigm (OECD, 2009b) advocates that all European policies, irrespective of whether they are 'spatially targeted' or 'spatially blind' (Duhr et al., 2010) should support territorial cohesion and promote growth in regions with 'different social, institutional, and technological features' (Barca et al., 2012: 143).

This paper, therefore, makes a twofold contribution. First, it cross-fertilises different streams of literature by developing a conceptual framework for the joint analysis of the impacts of sectoral and territorial policies. It makes use of the European Union as a laboratory to study how sectoral/'spatially blind' policies interact on the ground with 'spatially targeted' policies, jointly shaping regional growth dynamics. This approach to policy-induced growth dynamics has significant implications for public policies not only in the European Union: relevant lessons can be learned for the USA (where Agricultural Policies still absorb relevant shares of public funds – see Alston, 2007; OECD, 2015) as well as for emerging countries (such as China and India) where agricultural and rural development policies are often the main source of funding for territorial development actions (OECD, 2015); Second, the paper challenges the conventional wisdom that bottom-up policies are intrinsically better equipped to promote regional development by tailoring the programmes to local conditions and maximising local involvement (Pike et al., 2010). A growing body of empirical evidence suggests that regional policies often fail to deliver in the most disadvantaged areas (e.g. Kline and Moretti, 2014; Neumark and

Simpson, 2014) due to their more limited planning (and lobbying) capabilities. This paper innovatively tests the hypothesis that top-down policies (e.g. the EU CAP) by virtue of their more automatic spending mechanisms and simplified procedures may – in some cases – be more effective than bottom-up policies in order to channel resources to the most socio-economically deprived areas, benefitting territorial development.

The empirical results – robust to a large number of checks – show that the EU Cohesion Policy has a positive and significant influence on economic growth in all regions that, however, is stronger in the most socio-economically advanced regions and maximised when Cohesion Policy expenditure is complemented by RDP and CAP funds, in line with the expectations of the EU2020 strategy. The top-down funding of the CAP seems to be able to concentrate some benefits in the most deprived areas. Conversely, only the most dynamic rural areas are capable of leveraging the bottom-up measures of the EU RDP. This suggests that EU policy makers in all fields should constantly look for the best mix of bottom-up and top-down measures in order to tackle structural disadvantage.

Existing evidence and gaps

The existing literature has identified a variety of regional characteristics as 'conditioning factors' for the impacts of the EU Cohesion Policy. Institutional (Bahr, 2008; Cappelen et al., 2003; Ederveen et al., 2002, 2006) and structural (Bouayad-agha et al., 2010; de Freitas et al., 2003; Giua, 2016; Martin and Tyler, 2006; Mohl and Hagen, 2008; Ramajo et al., 2008; Soukiazis and Antunes, 2006) elements have received a special attention in this stream of research. Other contributions have also looked into the nature and composition of the various policy measures promoted and funded by the EU Cohesion Policy, highlighting a strong heterogeneity in the returns to different areas of expenditure and the limited impact of unbalanced strategies narrowly focused on infrastructure (Dall'erba et al., 2007; Rodríguez-Pose and Fratesi, 2004). Conversely, very limited attention has been paid to the role of other EU policies that co-exist and interact with the EU Cohesion Policy on the ground. From a conceptual standpoint, this may hide relevant processes in the understanding of regional growth dynamics and policies (Duhr et al., 2010; OECD, 2009b). Overlooking (some of) the elements that influence the relationship between the EU Cohesion Policy and regional economic performance (such as other EU Policies simultaneously affecting the regions under analysis), entails *omitted variable* and *reverse causality* biases (Mohl and Hagen, 2010)[1] in part possibly explaining the conflicting conclusions reached by existing studies (for a review see: Crescenzi and Giua, 2017).

During their historical evolution, the EU Cohesion Policy, RDP and the CAP have influenced each other. Together they represent roughly 80% of the total 2014–2020 EU budget and the EU Cohesion Policy alone accounts for approximately 3% of the Gross National Income of the less advanced Member States (European Commission, 2014). For a long time, CAP market measures were the most important EU policies. Instead, Cohesion Policy and RDP were underfunded and marginally developed (Crescenzi et al., 2015; Saraceno, 2002). With the Reform of the Structural Funds (1989) and Agenda 2000, the CAP and the EU Cohesion Policy became closely interdependent. In the 2000–2006 policy programming period, Cohesion Policy and RDP were part of the same joint programmatic framework, and their different measures were implemented by the same Institutions (Manzella and Mendez, 2009; Mairate, 2006). In the 2007–2013 EU budget period, they were again separated from one another in terms of programming and managing authorities. However, both EU institutions and researchers continue to stress – in principle – their joint contribution towards territorial cohesion (Barca, 2009; Crescenzi et al., 2015).

Given their 'spatially targeted' nature, the strongest relation is that between Cohesion Policy and RDP. However, it is increasingly recognised that CAP market measures have also spatial implications notwithstanding the purely top-down and 'spatially blind' nature of the policy. In line with the sectoral aim of agriculture support, CAP market measures[2] are 'captured' by dynamic, more specialised and efficient producers (Duhr et al., 2010) with potentially perverse impact in terms of 'distributive equity' favouring the polarisation of agricultural income and preventing less developed areas (where 'weaker' producers are disproportionally concentrated) from benefiting from its support (ESPON, 2004).

In the absence of proper coordination between different policies, the literature has highlighted the risk of a counter-treatment effect on overall economic growth, whereby one policy area may counterbalance the pro-cohesion effects of the other (Barca, 2009; Bivand e Brundstad, 2003; Bureau and Mahè, 2008; Duhr et al., 2010; European Commission, 2010). Conversely, other research suggests that the CAP does not counteract the impact of the EU Cohesion Policy (Esposti, 2007), and once regional characteristics are appropriately controlled for, its contribution to cohesion might be greater than Cohesion funds (Montresor et al., 2011). In addition, RDP can also contribute to economic development in the most disadvantaged areas (Shucksmith et al., 2005).

This review highlights two fundamental gaps in the existing literature. On the one hand, limited attention has been devoted to the coexistence of a variety of EU policies in the same territorial unit, omitting a key set of territorial variables in the identification of policy impacts. On the other hand, the interaction (and the balance) between top-down and bottom-up approaches has been rarely studied, failing to learn relevant lessons for their coordination and optimal mix.

A policy-augmented model of Regional Growth

In order to analyse in a systematic and integrated fashion the interactions and regional impacts of 'spatially targeted' and 'space blind' (as well as 'top-down' and 'bottom-up') policies, it is necessary to extend 'standard' regional growth models in order to account for: (a) a broad set of policies that operate in the same territory; (b) the territorial characteristics that shape (or condition) the impacts and the interactions of these policies. Following this line of reasoning, the standard regional growth model (Camagni and Capello, 2010, 2013; Capello and Lenzi, 2013; Cappelen et al., 2003; Crescenzi and Rodriguez-Pose, 2011, 2012; Paci and Marrocu, 2013; Petrakos et al., 2005, 2011) is augmented by: a 'policy matrix' that includes expenditure under the EU Cohesion Policy, RDP and CAP; a 'Territorial conditioning factors matrix' that includes proxies for regional structural conditions and a 'Policy interactions matrix' that includes the interaction terms between the different policies and between the policies and regional contextual conditions.[3]

The model is specified as follows

$$\Delta Y_{it-1} = \beta_0 Y_{i0} + \beta_1 X1_{it-1} + \beta_2 X2_{it-1} + \beta_3 X3_{it-1} + \beta_4 WX_{it-1} + \beta_5 C_{it-1} + \varepsilon_{it} \qquad (1)$$

where ε is idiosyncratic error, i represents the unit of analysis, t the policy programming period (1994–1999; 2000–2006; 2007–2013/2009) and where[4]:

ΔY *is the regional GDP growth rate per capita* (expressed in Purchase Power Parity) over the period from $t-1$ to t;

Y *is the natural logarithm of the level of regional GDP per capita* at the beginning of each period;

*X*1 *is the 'EU policy matrix'*: expenditure in each region for the EU budget programming periods 1994–1999; 2000–2006 and 2007–2013 for Cohesion Policy, RDP ('spatially targeted' policies) and CAP ('spatially blind' policy with territorial implications);

*X*2 *is the 'Territorial conditioning factors matrix'*: it includes regional structural socio-economic conditions in terms of demographics, productive structure and the labour market as well as regional innovative capacity and infrastructural endowment. In particular, the Social Filter Index (Crescenzi and Rodríguez-Pose, 2009, 2011; Rodríguez-Pose, 1999) combines a set of proxies for territorial structural pre-conditions conducive to favourable environments for the genesis of innovation and its translation into economic growth (Crescenzi, 2005); the share of R&D in Regional GDP captures regional innovation efforts (Crescenzi and Rodríguez-Pose, 2011) and the level of regional infrastructural endowment (regional kilometres of motorways standardised by 'total regional surface'[5]) is a proxy for the existing physical capital endowment.

*X*3 *is the 'Policy interactions matrix'*: it includes interaction terms between the individual components of the 'policies matrix' – in order to capture synergies or trade-offs between different EU policies – and interactions between the 'policies matrix' (X1) and the 'territorial factors' matrix (X2) in order to identify factors conditioning policy impacts.

WX is the 'spatially lagged variables matrix': it includes spatially lagged values computed with the k-nearest neighbours criterion for: (a) social filter index (favourable socio-economic conditions in neighbouring regions influence indigenous economic performance through imitative effects and the mobility/movement of human capital/skills facilitated by geographical proximity); (b) R&D activities (Accessibility to extra-regional innovative activities can also influence internal economic performance through localised knowledge spillovers) and (c) infrastructural endowment (the infrastructural endowment of neighbouring regions proxies adequate inter-regional accessibility and the lack of infrastructural bottlenecks).

C is a matrix of standard control variables, including the national annual growth rate; the Krugman index of specialisation and population density.

Units of analysis and data sources

In order to maximise the homogeneity of the territorial units in terms of the degree of autonomy and administrative roles as also to capture the relevant target area in which the policies under analysis are implemented, the empirical analysis relies on a combination of NUTS-1 (for Belgium, Germany and the UK) and NUTS-2 (Austria, Finland, France, Greece, Italy, the Netherlands, Portugal, Spain and Sweden) regions.[6] Denmark, Ireland and Luxembourg are excluded from the analysis because they do not have relevant or equivalent sub-national divisions for the entire period under analysis. In addition, lack of data prevents the French Départments d'Outre-Mer (FR9) and of Trentino-Alto Adige from being included, while, given the introduction of spatially lagged variables, remote islands or enclaves could not be included. Therefore, the final database comprises 139 territorial units belonging to 12 European EU-15 countries.[7]

Structural Fund (ERDF and ESF) data (per capita 'commitments' for each policy programming period) have been provided for by the Directorate General for Regional Policy of the European Commission in May 2009. Data referring on RDP are based on per capita 'commitments' for each policy programming period. The first-pillar CAP data are instead, based on actual expenditure based on CAP total subsidies on crops and on livestock and CAP de-coupled payments included in the Farm Accountancy Data Network. The details of the computation of the regionalised expenditure data for RDP and CAP are discussed in Crescenzi et al. (2015).[8]

Data for all territorial variables (dependent and independent) come from Eurostat.[9] The values assigned to each of the three periods are computed as the average of their annual values over the policy programming period itself. With respect to the latest programming periods (2007–2013), all the territorial data are computed as an average of their annual values from 2007 to 2009, as 2009 is the last year for which data are available.

The choice of aggregating all expenditure/commitment data by programming period is customary in the literature due to the lack of reliability of annual expenditure data that reflects the complexity of EU budgetary and reporting rules: expenditure reported in a specific year might not necessarily be spent in that year. In addition, this choice allows us to minimise reverse causality (Mohl and Hagen, 2010) much more effectively than with annual data. Whole-period commitments are in fact assigned at the beginning of a multiannual period and, consequently, they do not depend on any subsequent shock (e.g. economic macro trend) that could occur over the period under analysis, thus leading to adjustments in annual expenditure (European Commission, 2015). The same multiannual specification is also generally preferred for the 'regional growth rate', which instead of being computed as the ratio between the level of GDP per capita in two consecutive years, is usually considered as the ratio between average GDP per capita levels over a period of at least five-years (OECD, 2009a). The analysis conforms strictly to the literature and in this sense adopts the most common specification for the model: regional growth rate between time t and time $t-1$ is regressed on the policy at time $t-1$, where t stands for the policy programming periods.

Empirical results

The model specified in equation (1) is estimated by means of fixed effect (FE) panel data. In estimating the model, FEs were found to be preferable to both random effects (RE) and correlated REs-CRE specifications[10] (Wooldridge, 2002). Standard tests were carried out on the estimated FE model. The model controls for heteroschedasticity and the spatial autocorrelation of the residuals. Time dummy variables capture programming period FEs, i.e. the evolution of the policies over time and 'clean' the estimated coefficients from the influence of factors specific to individual programming periods. The inclusion of the spatially lagged variables allows us to remove spatial autocorrelation with no impact on the significance of the key variables of interests. In the robustness checks section, the key specification of the model is re-estimated by means of spatial panel data models, confirming the results reported in the main tables and allowing us to exclude any bias due to spatial autocorrelation.[11]

This is an exploratory analysis aimed at uncovering territorial dynamics linked with the EU Policies rather than identifying causal relationships – consequently, in what follows, we focus mainly on the sign and significance of coefficients, rather than the size of specific point estimates.

Table 1 shows the magnitude and distribution of the policies' commitments over time: the most significant part of total EU funding is represented by the CAP and Cohesion Policy. RDP's role in terms of the amount of resources is still relatively small (Table 1).

Moreover, both the CAP and the EU Cohesion Policy increased their resources from the first to the second programming period but underwent a reduction in the latest period (2007–2013) as a consequence of the extension of the policies to the New Member States of the EU (European Commission, 2008). Funds for RDP increased over the whole period studied (1994–1999; 2000–2006 and 2007–2013).

Table 1. Policy commitments (in euro values, per capita) and regional growth (average rate).

		Mean	Std. dev
CAP	1994–1999	813.47	631.47
	2000–2006	1118.44	847.91
	2007–2013	1042.24	834.57
Cohesion Policy	1994–1999	413.61	481.23
	2000–2006	652.84	707.95
	2007–2013	531.17	540.32
Rural Development Policy	1994–1999	78.82	95.52
	2000–2006	202.25	213.91
	2007–2013	206.26	181.36
Regional GDP per capita average growth rate	1994–1999	0.0198	0.0017
	2000–2006	0.0255	0.0010
	2007–2013	−0.0124	0.0026

Financial periods 1994–1999; 2000–2006 and 2007–2013.
Source: Authors' elaboration using European Commission Data.
CAP: Common Agricultural Policy.

Table 2. EU regional growth and overall EU Funding (all policies).

Dependent variable: GDP per capita average growth rate		
	1	2
Ln of initial GDP p.c.	−0.8016*** (0.0676)	−0.7570*** (0.0670)
Total EU funding	0.0570*** (0.0122)	0.0520*** (0.0125)
Social Filter Index	0.0190* (0.0102)	−0.0002 (0.0176)
R&D Activities	0.0055 (0.0208)	0.0070 (0.0195)
Infrastructural endowment	1.5220 (1.1194)	0.8422 (0.9630)
Spatially Lagged Social Filter		0.0249 (0.0168)
Spatially lagged R&D Activities		0.0330** (0.0167)
Spatially lagged Infrastructure		2.1387 (1.4234)
National Growth Rate	0.1270*** (0.0141)	0.1352*** (0.0147)
Krugman index	−0.0670** (0.0286)	−0.0771** (0.0304)
Population density	0.0001 (0.0000)	0.0001* (0.0000)
Constant	7.7730*** (0.6841)	7.2372*** (0.6717)
Obs	242	242
R squared	0.902	0.908
Prob>F	0.000	0.000

Robust and clustered standard errors in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

In contrast to the positive trend registered in the first two policy programming periods, the growth rate during the period 2007–2013 turned negative, reflecting the regional impacts of the 2008 financial and economic crisis.

Table 2 offers the key initial diagnostics for regional growth dynamics and EU expenditure. Total EU funding is positively and significantly correlated with regional economic growth. There is no evidence of a composition effect neutralising the overall impact of total EU funding: when considering total committed expenditure for the EU

Cohesion Policy (ERDF and ESF), the RDP and the CAP together, the link with regional economic growth is positive and significant.

When looking at the role of other key drivers of regional economic performance, Table 2 shows that the coefficient of initial conditions (level of GDP at the beginning of the period) is negative and highly significant, confirming the process of conditional convergence detected in the existing literature (Bouayad-agha et al., 2010; Esposti and Bussoletti, 2008; Mohl and Hagen, 2008; Ramajo et al., 2008). The social filter – the broader set of socio-economic conditions – has also a positive but only marginally significant correlation with economic growth. The key controls behave as expected. National growth exerts a positive and significant influence on regional growth, confirming the importance of national framework conditions for regional performance (Monastiriotis, 2014). The Krugman Index – negative and highly significant – confirms that diversification is a key strength for EU regions. When spatially lagged variables are introduced into the regression (column 2), the high significance of total EU funding is confirmed and inter-regional knowledge spillovers emerge as a key driver for regional growth in line with previous literature (Moreno et al., 2005a, 2005b; Rodríguez-Pose and Crescenzi, 2008).

Table 3 opens the 'black box' of total EU funding. The first specification (column 1) relates the dependent variable to the initial level of GDP, the policy variables, the territorial conditioning factors, the spatially lagged terms and the control variables (coefficients not reported in the table as in line with Table 2). Columns 2, 3 and 4 show the results obtained by considering the interactions between EU Policies and territorial conditioning factors: column 2 shows the interaction between each EU policy and the social filter index; column 3 shows the policy interaction with R&D Activities; column 4 shows the policy interaction with regional infrastructural endowment. Finally, column 5 shows the results obtained by considering the interactions within the 'EU policy matrix' (i.e. the interactions between the Cohesion, RDP and CAP policies).

Column 1 shows that the positive influence of total European funding should be attributed to the positive and significant role played by the EU Cohesion Policy, while the coefficients of both RDP and CAP are not significant. The EU Cohesion Policy is the only EU budget heading delivering a positive influence on regional growth. The 'spatially targeted' approach of the EU Cohesion Policy has been successful in supporting regional growth. Conversely, the CAP – notwithstanding the relevance of the financial resources distributed in each region – has not produced any relevant influence on average regional growth (Esposti, 2007). Furthermore, the results for RDP are not more encouraging: even if RDPs should, in principle, combine an emphasis on rural areas with a bottom-up approach, they seem unable to do better than 'traditional' CAP interventions in terms of territorial cohesion.

The analysis of the interaction terms makes it possible: (i) to explore how the role of Cohesion policy depends on the overall structure of the EU policies and on territorial conditioning factors; (ii) to capture potential synergies or conflicts between Cohesion and other EU policies of different nature and (iii) to understand how these interactions can change depending on their territorial context.

The links between expenditure for the various policies and socio-economic contextual conditions are depicted by the interaction terms between the individual EU policy variables and the social filter index (column 2). Similarly to what Cappellen et al. (2003) suggested in a different framework, socio-economic conditions turn out to be a positive conditioning factor for Cohesion policy impacts. The relationship between Cohesion Policy funding and regional growth is stronger for areas with more favourable socio-economic conditions: both the coefficients of the EU Cohesion Policy and that of the term of interaction 'regional

Table 3. Regional growth and the EU Cohesion Policy, Rural Development Policy and CAP.

Dependent variable: GDP per capita average growth rate					
	1	2	3	4	5
Ln of initial GDP p.c.	−0.7320*** (0.0786)	−0.8060*** (0.0760)	−0.7320*** (0.0778)	−0.6710*** (0.0847)	−0.7350*** (0.0778)
Cohesion Policy	0.1028*** (0.0301)	0.1365*** (0.0359)	0.1095*** (0.0354)	0.1184*** (0.0354)	−0.0569 (0.0551)
Rural Development Policy	0.0026 (0.0236)	0.0172 (0.0273)	−0.0649 (0.0358)	−0.0400 (0.0282)	0.1116 (0.0734)
CAP	0.0308 (0.0235)	0.0245 (0.0305)	0.0804 (0.0348)	0.0458* (0.0254)	−0.0060 (0.0385)
Social Filter Index × Regional Policy		0.0414** (0.0205)			
Social Filter Index × Rural Development Policy		0.0067 (0.0397)			
Social Filter Index × CAP		−0.0129 (0.0120)			
R&D Activities × Regional Policy			−0.0014 (0.0353)		
R&D Activities × Rural Development Policy			0.0264*** (0.0001)		
R&D Activities × CAP			−0.0410** (0.0178)		
Infrastructure × Regional Policy				−2.0114 (1.5513)	
Infrastructure × Rural Development Policy				3.8648** (1.4986)	
Infrastructure × CAP				−2.8016** (1.1935)	
Regional Policy × Rural Development Policy					0.1452** (0.0638)
Regional Policy × CAP					0.0422** (0.0185)
Rural Development Policy × CAP					−0.1056*** (0.0376)
'Territorial Conditioning Factors', 'Spatially Lagged terms', Controls and constant	X	X	X	X	X
Period Dummies	X	X	X	X	X
Obs	242	242	242	242	242
R squared	0.913	0.921	0.916	0.917	0.922
Prob>F	0.000	0.000	0.000	0.000	0.000

Robust and clustered standard errors in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$, 'territorial conditioning factors' (Social Filter Index, R&D Activities, Infrastructural endowment Spatially Lagged Social Filter, Spatially lagged R&D Activities, Spatially lagged infrastructure) and the same control variables (Constant; National Growth Rate; Krugman Index and Population Density) reported in Table 2 are included in all regressions but not reported in the table.
CAP: Common Agricultural Policy.

policy × social filter index' are positive and significant. This makes it possible to reinforce and generalise existing evidence so far restricted to the impacts of EU investment in infrastructure (Crescenzi and Rodríguez-Pose, 2012). Overall, Cohesion policy generally supports growth but with stronger benefits for areas with favourable socio-economic conditions. It also emerges that the impact of RDP and CAP is totally independent of socio-economic contextual conditions: their impact is not significant generally and nor is it conditioned by the socio-economic conditions of the regions.

The interactions between EU policies and regional R&D activities and infrastructural endowments are presented in columns 3 and 4, respectively. The coefficients suggest that both R&D activities and infrastructure matter when RDP and CAP funds are considered. In particular, RDP funds might influence economic growth when targeted at regions with a comparatively stronger innovative and infrastructural environment (i.e. the most dynamic rural areas in Europe). Conversely, CAP funds – with their spatially blind approach, uninfluenced in the allocation and absorption of the funds by the a priori socio-institutional quality of the region– work better in the most disadvantaged areas, characterised by limited infrastructural and innovation endowments. This section of the analysis, therefore, confirms that 'spatially blind' policies do have spatial implications (Montresor et al., 2011). CAP funding is not influenced by the heterogeneous capabilities of the regions to 'bargain' for resources – these are allocated in a top-down fashion by means of subsidies largely linked to 'historical' production data – or by their administrative capacity to absorb allocated funds. As a result, CAP resources are able to exert a positive influence on economic growth in the most deprived and structurally disadvantaged regions of the Union.

The results in column 5 of Table 3 provide new evidence on the links within the 'EU policy matrix': the model specification now includes the terms of interaction between Cohesion Policy and other EU policies. The EU Cohesion Policy's role is positively conditioned by synergies with all other policies: all interaction terms are positive and capture the marginal benefit from the policies on cohesion determined by such synergies. Instead, the interaction between the two 'agricultural' policies (CAP and RDP) shows a negative sign. When both CAP and RDP are targeted at regions that also benefit from more generous EU Cohesion Policy resources, the positive influence on regional growth is – ceteris paribus – maximised. But the same is not true for the interaction between RDP and CAP: when both 'agricultural' policies channel a high level of funding to the same region they tend to generate sectoral distortions detrimental to long-term economic growth. Consequently, the results suggest that the synergistic use of different sources of funding and tools of a diversified nature can boost economic growth, while 'specialisation' in one single policy area is likely to generate decreasing returns and reinforce inconsistencies.

EU policies in regions of varying economic performance: a quantile regression analysis

The use of interaction terms made it possible to study how the impact of the policies varies according to the characteristics of the regions in which they are implemented. However, the inclusion of the initial GDP per capita among the interacted terms is technically problematic due to endogeneity and simultaneity since initial regional GDP is also the key eligibility criterion for Cohesion Policy expenditure. Therefore, we rely on quantile regression (QR) techniques in order to measure the effect of the policy not only at the centre but also for different quantiles of the distribution (Chernozhukov and Hansen, 2004; Koenker and Bassett, 1978). By estimating QR models, we can investigate how the link between the EU Cohesion Policy and regional growth changes with the distribution of regional growth. This additional analysis captures if and to what extent areas with different regional growth rate

(three distribution's quantiles: 0.10, 0.5 and 0.75) benefit from the EU Cohesion Policy. Unfortunately, contrary to the effects of other covariates, it is technically impossible to allow individual FEs to vary across quantiles given that the quantile of the difference can be not equal to the difference in quantiles (Ponomareva, 2011). As a consequence, QR cannot be applied in the FE panel data framework (Kato et al., 2012) adopted in the rest of this paper. However, in line with the current state-of-the-art of the econometrics literature, we can still apply QR in a cross-sectional framework (Buchinsky, 1994; Powell, 2011; Powell and Wagner, 2011) in order to shed some new light on the impacts of the policy in regions with different economic performance. The corresponding results are presented as ancillary evidence and reported in Table A.3 in online Appendix A.[12] FE panel data estimates – that allow us to deal with omitted variable bias as extensively discussed above – remain our main results.

The coefficients of the key variables confirm that the link between EU Cohesion Policy spending and economic growth is stronger in relatively richer and faster growing areas. This finding suggests that although the policy's role is generally positive, it is not working completely in line with its main aim, namely to remedy the gaps between the disadvantaged and the relatively more dynamic areas of the Union (Crescenzi, 2009). The strength of the relationship between the EU Cohesion Policy and growth is maximised in the already best performing EU regions.

Robustness checks

The robustness of the results is tested in a number of ways, and the corresponding additional tables are included in Appendix A available online.

Measurement error and endogeneity bias

In order to test for measurement error problems, the analysis was reproduced with the use of an alternative measure for the key independent variable of interest. The policy variable adopted in the main analysis (whole period commitments) is replaced by annual payments. Whole-period commitments are considered in the literature more reliable policy indicators than annual Payments (Mohl and Hagen, 2010; OECD, 2009a). Whole-period averages are more accurate than annual data given that annual payments largely reflect reporting and accounting rules rather than actual expenditure patterns. In addition, whole-period commitments are more exogenous with respect to external shocks that can simultaneously influence both economic growth and expenditure. The key regressions have been replicated with a specification, sample and time period that enable us to make comparisons as between the results of the estimation of equation (1) obtained by using commitments (as in previous tables) and actual payments. Further details on these additional estimations are reported in online Appendix A. The additional regressions confirm that the impact of the EU Cohesion Policy on regional economic growth is positive and significant when payments are used as an alternative policy measure, provided that their endogeneity is appropriately accounted for in an IV framework.

In order to address any potential endogeneity issues, and identify the parameter of interest more accurately, we explicitly allow actual payments to be an endogenous variable and use commitments (decided a priori and well before actual economic growth is observable) as the corresponding instrument in an Instrumental Variable analysis. The choice of the instrument is confirmed by the first stage regression, and justified by the fact

that commitments, strongly correlated with Payments, only influence the economic performance of regions when transformed into expenditure (through the payments channel). Consequently, they represent an exogenous and relevant instrument to permit the model to correct the endogeneity bias likely to affect Payments.

The Hausman test confirms our intuition as concerns the 'endogeneity' of Payments. The IV regression that instruments Payments with the commitments is preferred to OLS, as the latter considers Payments exogenous. The results of the IV regression are set out in Table A.2 (column 3) in the online Appendix A.

Overall, these tests confirm the choice of our key policy variable. Commitments are not only capable of acting as a proxy for the policy by delivering the same results that would have been produced by considering the effective expenditure but also that the Payments by themselves are unlikely to account for policy in a coherent manner insofar as identified as endogenous by the Hausman test[13] for endogeneity.

Misspecification of the dependent variable

The specification of the model is in line with the standard panel data literature on regional economic growth and regional policy analysis (Mohl and Hagen, 2010; OECD, 2009a). In order to control for the robustness of the results with respect to the specification of the outcome variable, the model is re-estimated with an alternative version of the GDP growth rate. In particular, the main regression is re-estimated with a GDP growth rate computed as the natural logarithmic of average annual GDP growth rate over the first three years of each programming period t. This outcome variable is regressed on the independent variables taken at the time $t-1$ so that the GDP growth rate can be computed with respect to an initial period that is successive to the period to which the policy is related rather than coinciding with it. This eliminates any time overlap between the dependent and explanatory variable and reduce any simultaneity bias likely to affect the model: in this case, the idiosyncratic shocks occurred during the policy multiannual programming period $(t-1)$ do not enter in the computation of the GDP growth rate determined within the following policy multiannual programming period (t). These robustness tests confirm the results of the main analysis (Tables A.3.a and A.3.b in online Appendix A): even when the outcome variable is changed, the role of EU Cohesion Policy as well as that of overall European support remains positive and significant.

Spatial dependence and spatial panel data analysis

The main specification of the regional growth model presented in the paper includes the spatial lags of the key conditioning factors: after their inclusion, there is no evidence of residual spatial autocorrelation in the regression residuals. However, in order to further check the robustness of the proposed results, other forms of spatial autocorrelation are controlled for by means of alternative specifications of the model. The Spatial Autoregressive (SAR and DURBIN) specifications of model: (1) account for the spatial dynamics of the dependent variable with spatially lagged Y (Spatial lag models) coefficient. The Spatial Error Model will, instead, account for the dependence determining the spatially inter-correlation between the error terms. The technical details of these additional estimations are discussed in the online Appendix A, and Results are reported in online Table A.4. They support the key results of the analysis: spatial dependence related to Y is not statistically significant while signs and significance of the main coefficient of interest (Cohesion Policy) are all confirmed.

Conclusions

The results presented in the paper show that EU Cohesion Policy expenditure is associated with stronger regional growth rates in all regions. This key result emerges clearly in all specifications of the model and is robust to a large number of tests. However, the positive influence of the EU Cohesion Policy is stronger in the regions with the most favourable socio-economic environment and better overall economic performance. This reveals a potential paradox of the EU Cohesion Policy that works better in the relatively stronger (and better performing) regions with comparatively smaller (although still positive) gains for the most disadvantaged areas of the Union. The RDP, that is attracting increasing resources from the progressive reduction in funding of the more traditional market-based agricultural policies of the CAP, is not systematically linked with regional economic growth. Some positive influence of RDP only emerges in the most advanced and better endowed areas: the rural areas of the 'core' of the EU not the most disadvantaged and peripheral. The 'traditional' agricultural market-related CAP funding has also no direct link with regional growth. However, there is no evidence of a counter-treatment effect working against cohesion. Conversely, the influence of CAP on growth emerges in the most disadvantaged areas of the Union (those with a poor infrastructural endowment and less innovation). This result sends an important message on the possibility that traditional top-down policies (such as the CAP) might be capable to channel their funds towards the most deprived regions of the Union with some positive influence on economic growth. On the contrary, the complexity of the programming of bottom-up interventions might lead to a concentration of the benefits in stronger areas. Finally, the analysis also shows that policy coordination is of paramount importance: returns from the EU Cohesion Policy are maximised where funding from other policies is also concentrated.

Although robust to a large number of tests, some key limitations should be borne in mind when interpreting these results. First, regional economic growth is not the only outcome of interest for EU policies. All EU policies produce a number of other tangible and intangible outcomes (and public goods) that cannot be captured by the proposed analysis. Second, the analysis is unable to unveil causal links: a number of techniques and checks have been adopted to minimise any potential bias due to endogeneity, but still this is not a fully causal analysis. Third, the time period covered by the analysis remains relatively limited and more data will be need for more long-term analysis. The now completely digitalised and harmonised collection of expenditure data will make this possible in the near future.[14] However, additional efforts will be needed (by Statistical Offices, the European Commission as well as individual researchers) in order to develop better EU-wide regional-level proxies for some key regional characteristics. Especially relevant in this regard are more accurate proxies for regional physical capital endowments with special reference to infrastructure (and their quality).

Having acknowledged these limitations, it is still possible to make some relevant policy considerations based on the results presented in the paper. Understanding if and under what (territorial) conditions different policies can contribute to regional economic growth is key not only to the future of the EU policies but – more generally – to all countries and regions where similar policy tools co-exist and interact (e.g. in the USA). The reinforcement of the local socio-economic environment is a crucial pre-condition for the success of any regional policy. This is of fundamental importance in order to maximise the returns to Cohesion policy expenditure in the most deprived areas. Addressing this potential paradox is even more relevant to Rural Development interventions whose pro-growth potential is totally conditioned upon the pre-existing conditions of the target areas.

In order to address the structural conditions of the most disadvantaged regions purely bottom-up tools might be insufficient. Tailoring the various policies to local needs is certainly crucial. However, the analysis of the territorial effect of 'traditional' top-down CAP expenditure unveils a relevant story: top-down interventions might be very effective in order to channel resources to the most deprived areas. Where institutions are weak, and local lobbies can form strong anti-growth coalitions the identification of local needs and the planning and implementation of bottom-up actions might be difficult. In these contexts, top-down policies might be more effective in earmarking resources to support basic investment in physical and human capital in the most deprived areas. As a consequence, a bottom-up approach to regional development policies is not necessarily the best possible solution for all regions. The experience of the EU suggests that it is necessary to carefully assess the best mix of bottom-up and top-down interventions to match the conditions of the various countries and regions. In the same vein, a national-level coordination and agenda-setting might also favour the coordination among the various policies on the ground: at the local-level conflicts and contrasts between the various agencies and offices might make this more difficult to achieve. The coordination between 'spatially targeted' and 'space blind' policies – that our analysis has shown to be key in order to maximise regional growth – might require the flexible integration of both bottom-up and top-down approaches.

Acknowledgements

The authors are grateful to Fabrizio De Filippis, Roberto Esposti, Vassilis Monastiriotis, Andrés Rodríguez-Pose and to participants in the seminars held in London, Rome and Palermo for their comments to earlier drafts of this paper. Support from the Manlio Rossi-Doria Centre for Economic and Social Research, Roma Tre University is gratefully acknowledged. The authors are solely responsible for any errors contained in the paper.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. Mohl and Hagen (2010) reviewed at least 15 other quantitative studies, which with similar approaches to those discussed above, reached altogether conflicting conclusions on the impact of the EU Cohesion Policies.
2. These potential distortions – linked to price support mechanisms – survived several reforms of the CAP, due to the reliance of many Member States on 'historical models' (since 2005) for the calculation of the 'new' de-coupled direct payments. Only following the 2013 CAP reform, 'flat rate' payments have been finally introduced together with convergence mechanisms that should lead to more homogenous payments across beneficiaries, regions and countries (Crescenzi and De Filippis, forthcoming).
3. For the sake of clarity, Beta coefficients reported in model (1) stand for vectors of coefficients. The model will estimate a separate coefficient for each variable included in each matrix.

4. Complete details on the variables included in the model are reported in Appendix B available online.
5. The proposed standardisation corrects for any potential bias linked to differences in surface of the EU regions. Even if this proxy is customary in the existing literature, it remains uninformative on the quality of infrastructure and does not reflect actual differences in construction and maintenance costs.
6. This combination of Eurostat NUTS regions corresponds to the TL2 classification developed by the OECD.
7. Due to lack of data on R&D Activities and on the variables composing the Social Filter Index finally, the effective number of observations in the analysis turned out to be 121.
8. Since data on the first pillar of the CAP are based on effective expenditure, they are available only until 2009. Therefore, for the 2007–2013 programming period, we have a partial coverage. This is not an issue in terms of the quantitative analysis because the policy variables enter the model only with one period of lag, i.e. the policy data related to the 2007–2013 period never enter the model.
9. Data on GDP Growth Rate for the Austrian and the Italian regions and data on Population density for the Spanish regions come from national sources because they are not available on the Eurostat System.
10. FE results were compared to RE's by applying the Hausman Tests (Hausman and Tylor, 1981). In addition, when comparing FE estimations to the 'Modified RE' estimator for CRE, it was concluded that the FE estimator captures all exogenous variability available in the model and that FE was not only a consistent but also an efficient estimator for the regression coefficients. These additional results are available upon request.
11. In the main tables, we report the standard panel data models in order to maximise comparability with other existing research and facilitate interpretation of the key coefficients.
12. More methodological details for these additional sections of the empirical analysis are reported in online Appendix A together with the key results.
13. The p value of the test is equal to 0.0041.
14. Due to data limitations at the regional level, we have been unable to include into the analysis EU expenditure under the Framework Programmes for Research and Technological Development to support and foster research in the European Research Area. The amount of resources absorbed by the Framework Programmes (55 billion euros in 2007–2013) is not comparable in magnitude to the funding for Cohesion Policy, RDP and the CAP considered in the analysis (roughly 90% of the total EU budget, i.e. approximately 900 billion euros in 2007–2013). However, the study of this complementary area of EU policy remains in our agenda for future research.

Supplemental material

The online [appendices/data supplements/whatever] are available at http://epn.sagepub.com/supplemental.

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