Does Cohesion policy work? Meta-Review of Research on the Effectiveness of Cohesion policy

Sara Davies

European Policy Research paper No. 99

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University of
Strathclyde
Glasgow

EPRC
EUROPEAN POLICIES RESEARCH CENTRE

European Policies Research Centre
School of Government & Public Policy
University of Strathclyde
40 George Street
Glasgow G1 1QE
United Kingdom

Tel: +44 (0) 141 548 3061
Fax: +44 (0) 141 548 4898

e-mail:
sara.davies@strath.ac.uk

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SUMMARY

The impact of Cohesion policy has been evaluated using four main methodological approaches. All methods face fundamental challenges, notably the poor availability of regional data on socio-economic indicators and Cohesion policy spending, as well as the intractability of comparing outcomes with a genuine, counterfactual, policy-off situation. Most of the research examined – with the exception of some econometric regression analyses – indicates that Cohesion policy has yielded positive results and contributed to core political goals, although there is considerable variation in the extent and types of the results ascribed to the policy.

- The three main macroeconomic models applied to ESIF funding – QUEST, HERMIN and RHOMOLO - find clear positive effects in the net recipient Member States (where ESIF accounts for a discernible percentage of domestic GDP), both during the periods of programme implementation and in the longer term (i.e. once spending has ceased). The QUEST ex post evaluation of the 2007-13 period estimates cumulative multipliers, which indicate that ESIF funding of one percent of GDP may generate an increase of 0.78 percent in the GDP of the EU27 by 2015, and an increase of 2.74 percent by 2023. The RHOMOLO ex post evaluation examines differential impacts across NUTS 2 regions, finding the strongest effects for Cohesion policy expenditure in the main net recipient Member States and regions, including regions in Hungary, Slovakia, Poland and Lithuania.

- Econometric regression analyses typically test for the effect of ESIF funding on convergence, defined as faster GDP per capita growth by poorer regions, leading to catching-up in terms of GDP per capita. Results vary widely, depending on the specific technical specifications applied, and the time series and country/regional data-sets used. Some studies find evidence that ESIF funding has a positive and statistically significant effect on convergence, while others find no statistically significant impact, or that impact is conditional on exogenous factors (such as the quality of national institutions or macro-economic policies) or on the time-series or geographical data used.

- Micro-economic studies using control groups have tended to report positive, but differing, results. A number of recent studies have shown that recipients of ESIF funding under particular schemes have enjoyed stronger outcomes than those experienced by control groups (e.g. in terms of the leveraging of private sector investment, business productivity, net jobs creation).

- Lastly, case study evaluations combine data from interviews, programme monitoring systems and sometimes also quantitative analysis in order to investigate the effects of ESIF funding at regional, programme or project level. These studies generally show positive effects, although these are often stated in gross terms (rather than net of multiplier, deadweight, displacement and substitution effects). In addition to ex-post evaluations of previous programme periods, important recent evaluations include: a study on the cumulative effects of ESIF funding in 15 regions, and an assessment of the long-term effects of ten major infrastructure projects.

Overall, the majority of studies using the four different approaches suggest that ESIF funding has a positive impact on national and regional economic development. The exceptions are some of the studies using regression analysis, which find no statistically significant evidence that regions receiving

higher ESIF funding have seen higher rates of growth in GDP per capita than other regions. However, all four approaches are affected to varying degrees by weaknesses in data on ESIF funding and regional socio-economic indicators, as well as methodological constraints (notably the challenge of comparing actual outcomes with a counterfactual 'policy-off' situation). It is not therefore possible to draw definitive conclusions from the studies on the scale of impacts, or on the factors which condition the effectiveness of ESIF funding across Member States and regions. Nevertheless, overall evidence suggests that Cohesion policy does indeed 'work'.

1. INTRODUCTION

Debates are underway on the future of the European Structural and Investment Funds (ESIF) after 2020, in the context of significant challenges for the European Union (EU) – notably ongoing constraints on EU economic growth, concerns over inequality and social divides (including linked to the refugee crisis), and the political and budgetary implications of Brexit. Key questions for ESIF concern the overall level of funding from the EU budget; its distribution between Member States, regions and themes; the reform of management and implementation; and the effectiveness of ESIF in contributing to core economic and societal goals, including growth and employment, cohesion, and mitigation of climate change.

The impact and effectiveness of the ESIF, particularly Cohesion policy, remains controversial. The EU Treaty sets the following goal for Cohesion policy: 'In order to promote its overall harmonious development, the Union shall develop and pursue its actions leading to the strengthening of its economic, social and territorial cohesion. // In particular, the Union shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions' (European Union 2010a, Article 174). Further goals are defined in the Fund regulations and programme documents, and are set out in the Europe 2020 strategy for smart, sustainable and inclusive growth, to which Cohesion policy contributes (European Commission 2013a).

Historically, the effectiveness of Cohesion Policy was hard to establish with poor-quality data on outputs and results, and many studies questioned the performance of the Funds. However, during the 2000s, there have been significant improvements in the quality of programming and, importantly, in the monitoring and evaluation of the Funds with better data and a wider range of methods employed, albeit unevenly across Member States. This paper examines the evidence on the impact and effectiveness of ESIF, drawing on a wide range of studies, covering the four main methodologies used to analyse the effectiveness of ESIF, namely:

- macroeconomic modelling,
- regression analysis,
- micro-economic studies of beneficiaries and control groups, and
- qualitative case studies.

The results of studies vary, depending e.g. on the underlying assumptions of the different approaches, as well as on the Member States / regions and time-series data included in the analysis. Moreover, variations result from the degree to which different methodologies are able to account for positive and negative economy-wide spillover effects; to isolate the effects of ESIF funding from other economic influences; and to deal with endogeneity issues (e.g. that Cohesion policy investment in human and knowledge capital may have a stronger effect when an economy is expanding because there is greater scope to use the new productive capacity effectively).

All methods face fundamental difficulties in terms of:

- inadequate data on ESIF (regional and thematic) funding (especially ex-post payments), and the challenges of providing an accurate regional disaggregation of spending data, especially in poorer Member States where significant funding is channelled through multi-regional

sectoral programmes, and where Cohesion Fund resources are allocated nationally rather than regionally;

- poor data on programme outputs, and weak reliability of data on actual achievements; even when data are available, they often cannot be aggregated at regional or even programme level due to the varied measurements and indicators used;

- a lack of consistent, historical, regional time-series of data on socio-economic indicators;

- shifts between programme periods in terms of regional eligibility, funding allocations and thematic focus;

- the challenge of comparing actual achievements with a counter-factual, policy-off situation. Selection problems usually mean that evaluation results are biased downwards (WWC, 2016) i.e. regions eligible for higher levels of Cohesion policy funding by definition have weaker economies, and so there is a risk that studies may attribute low impact to programme ineffectiveness, whereas in fact it may be related to the region's underlying socio-economic conditions. (Conversely, if funding is targeted on more successful regions, the evaluations may find positive outcomes which are mainly due to broader conditions rather than to the programme.) Studies aim to address this issue by constructing counterfactual situations; however, this is challenging and varies in terms of plausibility.

- the divergent economic, social and institutional situation and developmental trajectories of EU Member States and regions.

2. MACROECONOMIC MODELLING

A number of macroeconomic models have been used to evaluate the impact of ESIF funding. These are sophisticated models which employ blocks of equations representing different components of the economy, the behaviour of economic actors, and interactions between various economies processes. All models find that ESIF funding brings net economic benefits to the main net recipient Member States (e.g. in terms of higher GDP per capita and higher employment), with some models also finding net gains for some net contributing Member States. However, the models' results vary in terms of the scale and longevity of impact due to their differing underlying assumptions.

2.1   Strengths and weaknesses

The key strengths of macroeconomic modelling are that it can simulate the effects of policy intervention in comparison with a counterfactual 'policy-off' situation, and also that it can incorporate the impact of a range of economy-wide positive and negative externalities and spillovers related to ESIF expenditure. The weaknesses of this approach, however, are that:

- it is only useful where EU funding accounts for a significant percentage of total GDP (i.e. not generally in wealthier Member States) or the results will be too small to be detected;
- each model is based on a wide range of theoretical assumptions about how economies function and how economic actors behave – and views differ on the plausibility of certain assumptions underpinning each model;
- these models are best applied at national (rather than regional) level, due to the complexities of modelling interregional linkages and leakages through flows of labour, capital and goods;
- this approach generally assumes that funding is fully absorbed and is spent efficiently on good quality projects, which may not be the case in all countries/regions.

2.2   Methodologies

Three main macroeconomic models have been applied to ESIF (with periodical technical updating and extensions), namely:

- HERMIN (Bradley, Untiedt and Mitze, 2007; Bradley and Untiedt 2009) - a series of macro-econometric models of individual Member States, which incorporates Keynesian short-term effects with neoclassical features on the supply side (see Box 1), and
- QUEST (developed by the European Commission's DG Economic and Financial Affairs) (in t'Veld 2007; Varga and in 'tVeld 2009; Varga and in t'Veld 2010; Roeger, Varga and in t'Veld 2008) - a New-Keynesian micro-founded dynamic stochastic general equilibrium (DSGE) model of the EU economy, incorporating endogenous growth (see Box 2).
- RHOMOLO (developed more recently by the Joint Research Centre of the European Commission, specifically for DG Regional and Urban Policy) (Brandsma, Kancs, Montfort and Rillaers 2013) - a dynamic spatial general equilibrium model whose structure is aligned with QUEST but which allows for simulations at NUTS 2 regional level (see Box 3).

Other models applied to ESIF funding include: an input-output model (Beutel 2002), a dynamic-recursive computable general equilibrium (CGE) model (EcoMod) (Bayar 2007), and the IMF's dynamic general equilibrium model (GIMF) (Allard, Choueiri, Schadler and van Elkan 2008). The

technical features of each model differ, although they largely share the main assumptions of contemporary mainstream economics. See Box 4 below for more details.

Results differ between HERMIN, QUEST and RHOMOLO due to differing theoretical assumptions about the structure and functioning of the economy, notably in relation to:

- Short-term demand-side effects: All models allow for the ESIF-fuelled demand stimulus to increase consumption but also crowd out private sector investment and activity through higher wage rates and prices, which reduce international competitiveness and raise imports. However, QUEST and RHOMOLO show stronger crowding-out, as it is based on microeconomic foundations about optimising agents whose current decisions are affected by expectations about the future. QUEST also has a more sophisticated modelling of international interactions, so that ESIF spending is seen to generate a real appreciation of exchange rates in countries outside the euro zone, thus reducing international competitiveness.
- Longer-term supply-side effects: While all models assume that ESIF investment in human capital, R&D and public infrastructure expand productive capacity and increase efficiency, QUEST and RHOMOLO show stronger effects because of their more explicit modelling of the long-run, endogenous growth effects of expenditure on R&D and human capital.
- The national/regional focus, with QUEST focusing only at national level, HERMIN at national or macro-regional level, and RHOMOLO at NUTS 2 regional level (also incorporating spatial spillover effects between regions).

All models assume that ESIF funding is spent efficiently on appropriate projects and so do not take account of differences in Member States' administrative capacity. In these analyses, the key factors which shape differences in results between Member States are:

- the level of ESIF funding relative to GDP;
- the composition of funding between physical infrastructure, human capital, R&D and business support (as well as between types of infrastructure, in the case of RHOMOLO); and
- the structure of individual economies, with stronger impacts seen in economies with larger, more productive and more export-oriented manufacturing sectors.

2.3 The European Commission's ex-post evaluations in 2007-13

The European Commission's ex post evaluations for 2007-13 used QUEST and RHOMOLO (but not HERMIN) (Montfort, Piculescu, Rillaers, Stryczynski and Varga, 2016).

2.3.1 QUEST III estimates ex post 2007-13

Table 1 shows the QUEST III estimates of the cumulative multipliers for Cohesion policy expenditure in 2015 and 2023 for the EU12 (Member States which joined in 2004 or 2007), EU15 (Member States prior to 2004) and EU27 (the current EU28, excluding Croatia). Cumulative multipliers allow for a comparison between countries because they show how an input of ESIF funding of one percent of GDP leads to varying scales of output in different countries in terms of changes in GDP.

The cumulative multipliers show the cumulative annual increases in GDP which are found to be stimulated by ESIF funding, divided by the cumulative amount of ESIF funding as a share of GDP.

The cumulative multipliers indicate that an ESIF injection of one percent of GDP is estimated to have generated increases of GDP of 0.78 percent in the EU27 by 2015 and 2.74 percent by 2023.

Table 1: Cumulative multipliers of the Cohesion policy 2007-13 programmes in 2015 and 2023

	2015	**2023**
EU12	0.90	2.80
EU15	0.67	2.73
EU27	0.78	2.74

Source: Monfort P, Piculescu P, Rillaers A, Stryczynski K and Varga J (2016)

2.3.2 RHOMOLO estimates ex post 2007-13

The summary report of the RHOMOLO ex post evaluation of Cohesion policy spending in 2007-13 (DG REGIO and Joint Research Centre Seville, 2016) provides results for the impact of Cohesion policy in terms of the percentage change in GDP and employment, compared to the baseline, in 2015 and 2023, for the top 10 and bottom 10 regions in each case. Table 2 and Table 3 show the results for the percentage change in GDP for the top 10 and bottom 10 regions.

Table 2: Cohesion policy impact on GDP, percentage deviation from the baseline, 2015

Top 10 regions		**Bottom 10 regions**	
HU33	9.4	UKH1	0.0
HU32	8.5	UKJ3	0.0
HU23	7.8	UKH2	0.0
HU31	7.8	ITC4	0.0
SK03	7.4	UKJ1	0.0
PL32	7.1	UKJ4	0.0
PL34	7.1	UKJ2	0.0
LT00	7.1	UKI2	0.0
PL62	7.1	FR10	0.0
SK04	7.0	ITD5	0.0

Source: DG REGIO and Joint Research Centre Seville (2016)

Table 3: Cohesion policy impact on GDP, percentage deviation from the baseline, 2015

Top 10 regions		Bottom 10 regions	
SK03	5.9	UKH3	0.18
HU33	5.9	UKK2	0.18
SK04	5.9	UKH1	0.18
HU32	5.3	UKJ3	0.18
BG32	5.3	UKJ2	0.17
HU23	5.2	UKJ4	0.17
HU31	5.1	DK03	0.17
LT00	4.8	UKI2	0.17
BG31	4.7	DK04	0.17
PL62	4.7	DK02	0.16

Source: DG REGIO and Joint Research Centre Seville (2016)

2.4 The European Commission's ex-post evaluations in 2000-06

The European Commission's ex post evaluations for 2007-13 used HERMIN and QUEST only.

2.4.1 HERMIN estimates ex post 2000-06

The ex-post HERMIN assessment of the impact of the ESIF focused on the 2000-06 budget for Greece, Ireland, Portugal, Spain, eastern Germany and southern Italy in 2000-06, as well as the 2004-06 budget for Estonia, Latvia, Lithuania, Poland, the Czech Republic, Slovakia, Hungary, Slovenia, Cyprus and Malta (Bradley and Untiedt 2009). Table 4 shows the cumulative impact of ESIF funding on the level of GDP in these countries in both 2009 and 2020, as well as the cumulative multiplier (defined as the cumulative annual increases in GDP due to ESIF funding, divided by the accumulated amount of ESIF funding as a share of GDP). The cumulative multipliers indicate that an ESIF injection of one percent of GDP generates increases of GDP ranging from 1.4 percent in Portugal to 4.2 percent in Ireland in 2000-20 - with lower results for eastern Germany (1.1 percent) and southern Italy (1.2 percent) due to leakages to the rest of their respective national economies.

Table 4: HERMIN Cumulative ESIF multipliers for Cohesion policy spending in 2000-2006

	Cumulative multiplier in 2009	Cumulative multiplier in 2020
CY	1.30	1.89
CZ	1.85	3.49
EE	1.26	2.31
GR	1.29	1.66
ES	2.49	3.08
HU	2.24	3.19
IE	2.84	4.22
LT	1.26	2.14
LV	0.98	1.63
MT	1.61	3.03
PL	1.12	2.23
PT	1.02	1.43
SI	0.92	1.52
SK	1.24	2.29
DE east	0.79	1.07
IT south	0.89	1.18
EU16	1.58	2.11

Source: Bradley and Untiedt 2009, Table 5.3, p. 60, Table 5.5, p. 64 and Table 6.1, p. 79.

2.4.2 QUEST estimates ex post 2000-06

QUEST was used ex-post to assess the impact of the ESIF 2000-06 budget on net recipient Member States, plus Germany and Italy (due to the large funding allocations for their poorest eastern and southern regions respectively) (Varga and in 'tVeld 2009).

The QUEST evaluation endeavoured to take account of the costs of funding the ESIF for both net recipient and net contributor Member States (see Table 5). However, the evaluation only provides data on cumulative multipliers for the major net recipient countries (plus Germany and Italy). At the end of the implementation phase (in 2009), the cumulative multipliers in the net recipients ranged from 0.27 in Cyprus to 1.74 in Latvia, while in the longer term (by 2020), the multipliers varied from 1.96 in Italy to 6.13 in Latvia.

Table 5: QUEST Cumulative ESIF multipliers for 2000-2006 (ex-post)

	Cumulative multiplier in 2009	Cumulative multiplier in 2020
CZ	0.70	2.99
CY	0.27	2.37
DE	0.44	2.65
EE	0.68	2.33
GR	1.10	3.62
ES	1.49	4.67
HU	1.02	4.12
IE	0.75	3.12
IT	0.56	1.96
LT	1.31	4.91
LV	1.74	6.13
MT	0.44	2.85
PL	1.26	5.84
PT	1.01	3.21
SI	0.66	2.69
SK	0.68	2.72

Source: Varga and in't Veld 2009, Table 5, p. 25 and Table 6, p. 34.

Box 1: The Structure of the HERMIN model

HERMIN is a neo-Keynesian macro-econometric model, with different versions for each individual net recipient Member State. Short-term behaviour is based on Keynesian demand-side mechanisms, and long-term behaviour incorporates a range of neoclassical supply-side drivers. HERMIN disaggregates the supply side of the economy into five sectors (manufacturing, construction, market services, agriculture, and non-market services), which are affected differently by the varying categories of ESIF funding (in infrastructure, human capital, R&D and business support). There are two main channels through which ESIF funding affects the economy:

First, during the implementation phase, ESIF funding generates demand-side (Keynesian) multiplier effects, initially through higher public expenditure and then increased private consumption and investment, but also leads to a deterioration in the trade balance (due to higher imports). The demand stimulus implies a degree of crowding out of private sector activities, mainly due to labour market tightening, which raises wage rates, unit labour costs and domestic prices, and so reduces international competitiveness.

The second channel of impact concerns the supply-side, whereby ESIF funding enhances stocks of infrastructure, human capital and R&D, which generate two types of positive spillover both during and after the implementation phase. The first type of spillover leads to higher output due to increased foreign direct investment, and a strengthening of the capacity of indigenous firms to compete in

domestic and international markets. The second type of spillover increases productivity, leading to higher quality (or lower cost) factor inputs and improved operating conditions for businesses, as well as higher real incomes but also, negatively, to a reduction in labour demand.

HERMIN models private sector demand in Keynesian terms (e.g. with consumption seen as accounting for a fixed share of disposable income), rather than in the form of inter-temporal optimising behaviour, so that interest rates are exogenous to the model. In Member States outside the euro zone (i.e. with flexible exchange rates), increases in inflation triggers currency appreciation, leading to more limited wage rate increases than under fixed exchange rates, but also reducing price competitiveness and so introducing a limited muting of demand-side effects.

In HERMIN, the impacts of ESIF funding are largely determined by:
- the scale of ESIF funding as a share of GDP and the scale of the Keynesian multipliers;
- the composition of ESIF financial inputs across public infrastructure, human capital, R&D and business support (and the spillover effects estimated for each of these on output and productivity in the manufacturing and market service sectors);
- the calibration of the model's behavioural equations for each Member State.

HERMIN aims to assess the effects of ESIF in catching-up economies. Because of this focus on structural change, the modellers argue that long-run historical time-series data cannot be used to calibrate its parameters. The small number of observations available for calibration is seen to preclude more sophisticated types of econometric estimation and hypothesis-testing techniques. Instead, the modellers use ordinary least squares and a form of curve fitting, which relates the derived parameters to a range of estimates from other EU models where longer data-sets are available.

Box 2: The Structure of the QUEST III model

QUEST III is a dynamic stochastic general equilibrium (DSGE) global open economy model with micro foundations and constructs the economy as an integrated system of agents who take economic decisions by continuously re-optimising, subject to budgetary, technological and institutional constraints, with current decisions being affected by expectations about the future. The version used for the 2000-06 ex-post and the 2007-13 ex-ante evaluations includes the endogenous modelling of R&D and human capital accumulation (Jones 1995). It is a global model with one block representing each of the EU27 Member States plus one block representing the rest of the world; this approach allows cross-country trade linkages to be modelled, and thus the international effects of ESIF spillovers.

QUEST disaggregates ESIF funding into support for: infrastructure; human capital; R&D; business; and technical assistance. The main channels of impact of ESIF funding in the short-term are:
- All types of ESIF funding increase aggregate demand but effects are partly crowded out by

inflation and thus lower private consumption and private investment;

- A further part of the demand effects leaks abroad through higher imports; in addition, higher spending leads to a real currency appreciation in the net recipient States, thus reducing price competitiveness and exports, and worsening trade balances and current account deficits;
- Funding for R&D drives up the wages of researchers and reallocates highly skilled workers towards the R&D sector, with a negative effect on final goods production and output.

Two further channels of impact dominate in the longer-term:

- ESIF funding for human capital, infrastructure and R&D boosts productivity and output;
- Support for R&D and for business reduces fixed costs and capital costs, which in turn facilitates the market entry of new firms and products, and increases investment.

QUEST also takes account of the effects of Member States' contributions to the EU budget, and these lead to an increase in government indebtedness and thus taxation, with negative effects on employment. In net recipient States, however, these effects are outweighed by higher growth which raises tax revenues, leading to a reduction in public debt and lower taxes.

QUEST is composed of a number of sectors, including households (divided into Ricardian and liquidity-constrained consumers); firms producing final and intermediate goods; a research sector; and also monetary and fiscal authorities. Firms producing final goods draw on domestic and imported intermediate goods and also labour which is low-, medium- or highly-skilled; these firms produce a range of goods which are imperfect substitutes for goods produced abroad. Firms producing intermediate goods are modelled as of monopolistically competitive firms drawing on inputs from rented capital using R&D designs licensed from the household sector. The R&D sector in turn produces new R&D and employs highly-skilled labour, using inputs in the form of domestic and international ideas. Technological change is modelled as increasing product variety (Dixit and Stiglitz 1977).

Box 3: The RHOMOLO model

RHOMOLO has been developed for the European Commission's DG Regional and Urban Policy and Joint Research Centre (2016). Its structure is fully aligned with the QUEST III model, so that the channels through which policy can influence the economy are similar. Key differences compared to QUEST are as follows:

- RHOMOLO provides results at the level of NUTS 2 regions and so can take account of regional variations in Cohesion policy funding allocations within individual Member States;
- The model includes a number of elements which are based on theories of economic geography, notably interregional spillover effects which reflect the impact that funding in one region has on other regions (e.g. due to interregional trade linkages, and the geographical dissemination of technology though diffusion and imitation);
- It differentiates between investment in transport infrastructure and investment in other forms of infrastructure. Investment in transport infrastructure is then assumed to reduce

transport costs both within and between regions, leading to improved access to EU markets and therefore increased exports and levels of economic activity, as well as lower prices for imported intermediate and consumer goods, which in turn is seen to reduce firms' production costs and to increase the real income of households.

Box 4: Other macroeconomic models applied to ESIF funding

Although HERMIN and QUEST are the main models used to evaluate ESIF effects, a number of other models are also applied.

First, an input-output model was used until the 2000-06 period, primarily to assess the demand-side effects of ESIF funding, although more recent studies also aimed to assess induced supply-side effects in terms of changes in technology, imports, labour and capital use (Beutel 2002). An ex-ante study of 2000-06 estimated that the level of GDP in 2006 in the net recipient Member States (Greece, Ireland, Portugal and Spain) and macro-regions (eastern Germany and southern Italy) would be between 0.8 percent lower (Ireland) and 7.5 percent lower (Portugal) in the absence of ESIF funding.

The other models applied at EU level all share core similarities with the QUEST model (although differ in technical details). They are: (1) a dynamic-recursive computable general equilibrium (CGE) model (EcoMod) (Bayar 2007), AND (2) the IMF's dynamic general equilibrium model (GIMF) (Allard, Choueiri, Schadler and van Elkan 2008).

EcoMod was used to generate a number of scenarios in an ex-ante analysis of the effects of ESIF funding on 13 net recipient Member States (plus eastern Germany and southern Italy) in 2007-13. The most likely scenario assumes the same annual profile of payments as in 2000-06, and a thematic distribution similar to 2000-06 but with five percent of funding shifted from Infrastructure and divided equally between enterprise/innovation and human resources. This scenario shows positive effects in all net recipient Member States and macro-regions, with increases in the level of GDP of between 0.4 percent (eastern Germany) and 22.3 percent (Lithuania) by 2020.

GIMF has been used to model the joint effects of ESIF and CAP funding in a two-country approach, with a hypothetical net recipient EU Member State and a hypothetical net contributor State. Results are presented as graphs to indicate trends, rather than numerically. The study finds that EU funding has positive effects on net recipient Member States and concludes that: (1) EU funds should be directed to investment rather than income support – in order to speed convergence without undue pressures on monetary policy or prices and to avoid Dutch disease. (2) Regardless of whether the net recipient has a fixed or floating exchange rate regime, EU funds would lead to a depreciation of the real equilibrium exchange rate in the medium-run (if funds were used to bolster supply) and the real interest rate would increase during the period of inflows. (3) To best accompany the EU funds inflows, the policy-mix should combine conservative and counter-cyclical fiscal policy with a strong commitment to the existing monetary regime.

3. REGRESSION ANALYSIS

Many studies – some of which are reviewed in the text to follow - use various forms of econometric regression analysis to assess the effects of ESIF on the convergence of levels of GDP per capita across EU regions. For a detailed review of studies and methods, see Mohl and Hagen (2010) and Hagen and Mohl (2009).The results vary widely, with some studies showing clear positive impact, while others demonstrate impact only conditional on factors such as institutional quality and macroeconomic stability, and others still find no real positive effects. Reasons for these inconsistent outcomes include: the use of different methodologies and technical adjustments, as well as data variations in terms of time periods, NUTS units and countries/regions included. Because of this diversity in approach and data, it is difficult to use these studies to provide a comparable view of ESIF impacts.

3.1 Strengths and weaknesses

A key advantage of convergence regression analysis is that it is a much simpler method than macroeconomic modelling (involving a single equation rather than the dozens of equations and parameters that make up macro models). In addition, this approach can deal with large datasets, test hypotheses in a straightforward way, and use these to generate fairly simple and clear results on ESIF effects. Further, it can incorporate various explanatory variables (e.g. institutional quality or industrial structure) that may help to explain the factors that influence policy impact. In addition, these methods can be employed in a relatively 'neutral' way and so are seen as relatively free from the bias and subjectivities of individual researchers.

This approach is, however, also characterised by a number of weaknesses:

- Theoretical adequacy: The convergence regressions used in most studies implicitly rely on a range of theoretical assumptions which do not hold true outside the realm of neoclassical economic theory. Two key assumptions which are especially problematical in studies focusing on economic growth are, first, that technology is universally and freely available and, second, that factors of production, especially capital, are subject to diminishing returns, and that poorer economies with lower levels of capital should therefore see higher growth rates, as investors seek higher returns, and that this will lead regions to converge towards a shared long-run steady-state (Solow 1956). These views are challenged by new endogenous growth theories (Romer 1990; Grossman and Helpman 1994) and the new economic geography (Fujita, Krugman and Venables 2001) (within the neoclassical tradition) where the stickiness of knowledge and the possibility that some forms of capital are subject to increasing returns are seen potentially to lead to permanent divergence between economies.
- 'Black box approach': The analysis does not provide insights into the complex processes, relationships and feedback mechanisms at work in individual regions and countries (Quah 1996) and reduces complex socio-economic relationships and processes to mathematically represented linear relationships.
- Data weaknesses: This method depends on the availability of good quality, consistent time series regional data on ESIF funding and socio-economic indicators – yet in practice there are significant data weaknesses. The lack of reliable payments data means that many studies either use on commitments data (and so neglect issues relating to absorption and timing) or simply use a dummy to represent regional eligibility for Convergence funding (with a value of

1 if the region is Objective 1 and zero otherwise). Similarly, although some financial data are available at NUTS 2 level, much of the financial data in poorer Member States cannot be disaggregated regionally, because significant funding is channelled through multi-regional sectoral programmes, and because Cohesion Fund resources are allocated nationally rather than regionally.

- Spatial heterogeneity: Many (but not all) studies assume that regions 'should' converge towards a single long-run steady state – even though this assumption does not hold even within a neoclassical theoretical framework if regions have different fundamentals (e.g. factor endowments and institutional frameworks). In such a case, regions will instead converge towards a number of different long-run steady states ('convergence clubs') (Quah 1996).

- Spatial autocorrelation: Some studies fail to take account of the possibility that regions within the same Member State, as well as regions in spatial proximity to each other, are likely to share growth trajectories; this means that the regression equation is skewed because individual regions are not independent of each other. However, some studies compensate for this by using country dummies (Cappelen, Castellacci, Fagerberg and Verspagen 2003) and/or controlling for spatial spillover effects (Mohl and Hagen 2010; Breidenbach, Mitze and Schmidt, 2016).

- Endogeneity issues (i.e. where causal direction between independent and dependent variables becomes confused), for instance if important explanatory variables are omitted (a likely risk due to the poor availability of regional data on growth factors such as human capital, innovation, and infrastructure quality), or because two of the explanatory variables in the regression equation (the scale of ESIF funding allocations, and the level of regional GDP per capita) are inversely related to each other. However, some studies use techniques to address this issue (Mohl and Hagen 2010; Dall'erba and Le Gallo 2008).

3.2   Methodologies

Most studies use neoclassical growth regressions or single equations representing a production function, where growth is seen as the function of a number of input factors (e.g. labour, capital, human capital, and R&D), augmented with variables reflecting ESIF funding. The aim of this approach is to assess whether funding is supporting convergence in terms of faster growth by poorer regions and thus catching-up towards the levels of GDP per capita in richer regions. Some studies use simple linear regression models and cross-sectional data, but others draw on panel data and more sophisticated methods that control for endogeneity, spatial spillover effects, country-specific effects, and the possibility that regions are converging towards a number of different long-run steady states.

An alternative single-equation growth regression equation is constructed by Cappelen et al. (2003), which is based on the technology-gap approach (and is also consistent with other endogenous growth theories) (Romer 1990; Grossman and Helpman 1994). In this approach, regional differences in growth rates are seen to be driven by innovation and the diffusion of technology, and also to depend on a range of regional contextual factors (e.g. industrial structure).

3.3   Brief overview of the results of selected studies

Some studies find evidence that ESIF funding has a positive and statistically significant effect:

- Mohl and Hagen (2010), using panel data on actual payments for Objectives 1, 2 and 3 in 126 NUTS 1 and NUTS 2 regions in 14 EU Member States (i.e. the EU15 minus Luxembourg) in 2000-06; the model includes spatial spillovers and controls for endogeneity; the results show a positive impact of Objective 1 payments but not of the total amount of Objectives 1, 2, and 3 funding;
- Ramajo et al. (2008), using cross-section data for 163 NUTS 2 regions in the EU12 in 1981-96, within a spatial lag model;
- Becker et al. (2010), using panel data for up to 3301 NUTS 3 regions in the EU12/25 in 1989-2006, using a dummy variable for Convergence regions (i.e. rather than actual funding);
- Falk and Sinabell (2008), using panel data for 1084 NUTS 3 regions in the EU15 in 1995-2005, using a dummy variable for Convergence regions (i.e. rather than actual funding);
- Dall'erba (2005), using cross-section data on a mixture of payments and commitments for 145 NUTS 2 regions in the EU12 in 1989-99; the model controls for spatial spillovers;
- Cappelen et al. (2003), using data for 95 NUTS 1 and NUTS 2 regions of nine EU Member States during the period 1980-97 (Belgium, Germany, Greece, Spain, France, Italy, Netherlands, Portugal and the UK), with stronger effects when country dummies are taken into account, and also stronger effects in 1989-97 than in 1980-88; further, their estimates suggest that growth in poorer regions is hampered by an unfavourable industrial structure (dominated by agriculture) and lack of R&D capabilities.
- Midelfart-Knarvik and Overman (2002), using data for Objective 1 regions in 1989-93, find that ESIF funding helps regions to attract higher levels of R&D-intensive industries, and argue that ESI thus operates counter to agglomeration forces and the comparative advantage of less-developed Member States with low endowments of skilled labour.

Other studies find positive but very small or not statistically significant effects:

- Esposti and Bussoletti (2008), using panel data on Objective 1 payments per capita for 206 NUTS 3 regions in the EU15 in 1989-99;
- Hagen and Mohl (2008), using panel data on a mixture of payments and commitments for 1995-2005 in 122 NUTS 1 and 2 regions in the EU15;
- Rodriguez-Pose and Fratesi (2004), using cross-section and panel data for 152 NUTS 2 regions in the EU8 in 1989-99, find a weak but positive and significant impact if ESIF funding as a whole is considered, but no impact when funding is divided into different Objectives.

Others find that ESIF funding has no statistically significant impact on convergence:

- Breidenbach, Mitze and Schmidt (2016), using panel data (and incorporating spatial spillover effects) on Objective One payments per capita for 127 NUTS 1 and NUTS 2 regions in the EU15 (including whole-country data for Denmark, Finland, Ireland and Luxembourg) in 1997-2007. It is unclear whether payment data are only for regional programmes or also include multi-regional programmes, or how data for multi-regional programmes may have been disaggregated across regions.
- Dall'erba and Le Gallo (2008), using a mixture of ESIF payments and commitments for 145 NUTS 2 regions in the EU12 in 1989-99, using cross-section data and a spatial lag model;
- Boldrin and Canova (2001), using cross-section data for 185 NUTS 2 regions in the EU15 in 1980-1996;

- De Freitas et al. (2003) using cross-section data for 196 NUTS 2 regions in the EU15 in 1990-2001, using a dummy variable for Convergence regions (i.e. rather than actual funding).

A number of studies consider whether impact is conditional on the quality of national institutions and macro-economic policies. However, findings differ:

- Ederveen et al. (2006), using national-level panel data for 13 EU Member States (EU15 excluding Germany and Luxembourg) with five-year averages from 1960–65 to 1990–95, find that ERDF (sic) funding has a significant and positive effect on beta-convergence only when conditioning variables that proxy openness, corruption and inflation are included;
- Tomova et al. (2013), using national data for the EU27 in 1980-2010, find that ESIF funding has positive effects on socio-economic objectives (proxied by a composite indicator reflecting the quality of infrastructure, human capital, employment and environmental sustainability), particularly in Member States with sound macroeconomic policies (proxied by low levels of government debt to potential GDP and low ratios of net foreign liabilities to GDP);
- In contrast, Beugelsdijk and Eijffinger (2005), using national data for the EU15 in 1995-2005, find evidence of unconditional beta-convergence i.e. that poorer Member States experienced catching-up whether or not they had sound institutions (proxied by an index of corruption).

Some find positive results for some time series data sets but negative results for others:

- Rodriguez-Pose and Novak (2013), using data on 133 NUTS 1 and NUTS 2 regions in 1994-2006, find no significant impact of ESIF funding in 1994-99 once they control for factor endowments, initial conditions and institutional quality, but they do find a positive and statistically significant impact for the 2000-06 period;
- Puigcerver-Peñalver (2007), using panel data for 41 NUTS 2 regions in Belgium, Germany, Spain, France, Italy, the Netherlands, Portugal and the United Kingdom, as well as Greece and Ireland at national level, in 1989-99, find a positive impact on growth rates in 1989–93 but not in 1993–99;
- Cappelen et al. (2003), using data for 95 NUTS 1 and NUTS 2 regions of the nine EU Member States above mentioned during the 1980-97 period, find stronger effects in 1989-97 than in 1980-88, even controlling for the lower level of ESIF funding in 1980-88. They hypothesise that this may be due to a rise in the efficiency of support in those Member States included in the study which were in the EU throughout 1980-97 (i.e. Belgium, western Germany, the Netherlands, the UK, France and Italy), following the radical reform of EU Cohesion policy in 1988.

Finally, some studies show varied results for different countries and regions:

- Ederveen et al. (2003), using panel data for 183 NUTS 2 regions in 1990-2001, find positive effects on the assumption that all regions will catch-up to the same long-run steady state, but no positive effect if they instead test for convergence within individual countries.
- Rodriguez-Pose and Novak (2013) find that ESIF funding in 2000-06 has a stronger impact in wealthier Member States and in wealthier regions, which they hypothesise may be due to policy learning effects, leading to enhanced policy design and implementation, as well as shifts in the allocation funding away from transport infrastructure and direct business support towards funding for other forms of infrastructure and human resources.

- Rodriguez-Pose and Fratesi (2004) find that thematic funding allocations (which differ between countries and regions) also shape impact, with ESIF funding for education and human capital showing a positive effect in the medium term, whereas funding for infrastructure and business support has no effects, and funding for agriculture has only short-term positive effects.

4. MICRO-ECONOMIC STUDIES USING CONTROL GROUPS

The European Commission and individual national/regional authorities have funded microeconomic impact evaluations of specific instruments, which compare outcomes (e.g. in terms of jobs created) for the recipients of ESIF funding with outcomes for a control group or comparison group of firms or individuals with similar characteristics. These studies aim to estimate how recipients would have fared in the absence of ESIF funding. This section focuses on ERDF studies of support for business, R&D and innovation, although similar studies have also been undertaken of ERDF funding for urban development (ECOTEC 2010), as well as ESF funding for e.g. training schemes or wage subsidies. Studies generally show positive results, although there is strong variation, depending on the specific methods used, the time frame of the study and the Member States and schemes evaluated.

4.1 Strengths and weaknesses

The key strength of this approach is that it allows for an in-depth, detailed evaluation of individual instruments within a specific national/regional economic and socio-institutional context, which incorporates a partial assessment of the counter-factual (policy-off) situation. It can therefore help in analysing the elements of any changes which are due to ESIF funding, rather than to exogenous factors. If applied in a consistent way, this approach also provides a useful means of comparing the effects of different instruments (or the same instrument applied to different target groups).

There are also, however, a number of challenges related to this approach (University of Glasgow Training and Employment Research Unit and Metis 2012), notably:

- difficulties in identifying, recruiting and maintaining genuine control groups, which should be made up of firms/individuals with very similar structural characteristics to the recipients, and which would also in principle be eligible for ESIF funding;
- the desirability of linear causalities linking ESIF funding with unambiguous outcomes, rather than a situation where outcomes are complex and potentially affected by multiple exogenous factors in addition to funding;
- the need for the instrument to be implemented consistently for the duration of the evaluation, and for key factors affecting the control group also to be stable for this period;
- the lack of wider applicability i.e. this approach provides evidence on whether a specific instrument has had an impact in a particular set of circumstances but it may not be so effective elsewhere;
- the inability of this approach to take account of economy-wide spillovers and interactions and, related to this, its inability to provide an assessment of effects at programme, regional or national levels, given that the focus is on individual instruments;
- the importance of high quality data, not only on ESIF recipients but also on members of the control group (which can be particularly challenging, given that members of the control group have no incentive or obligation to provide data to the evaluators).

4.2 Methodologies

Evaluations generally start by developing two data-sets. The first includes information on the recipients of funding from a particular ESIF scheme; depending on programme monitoring systems, it may be relatively straightforward to collect this information, or it may involve additional ad hoc surveys

of recipients (e.g. to collect data on whether recipients have found a job within six months, or whether firms maintain higher levels of employment a year after the project has ended). The second data-set is generally collected on an ad hoc basis, drawing on existing large databases or datasets of a broader population of individuals or firms, from which the evaluators then select entities which share similar characteristics with the recipient entities.

Evaluators then typically use a combination of descriptive statistical analysis and econometric regression analysis to provide an overview of outcomes and, in particular, to compare the performance of the group of recipients with a wider population with similar characteristics, sometimes over a relatively long time horizon. The comparison with the control group allows the evaluators to draw approximate conclusions on the extent to which ESIF funding has had an additional effect, in contrast to what happened to similar firms or individuals which did not receive such funding.

Studies vary in terms of the indicators on which they focus e.g. leverage of private sector investment, job creation, or improvements in productivity, innovation or wage levels.

4.3 Results

4.3.1 European Commission's ex post evaluations for 2007-13

As part of its ex post evaluation of the 2007-13 period, the European Commission funded two studies that used counterfactual methods to assess the impact of funding in Convergence regions (NUTS 2), one using Regression Discontinuity Design (RDD) and the other using Propensity Score Matching (PSM) (Bondonio and Pellegrini, 2016a, 2016b, 2016c, Ward, 2016). Both methods involve the creation of a control group of non-aided regions which are similar to the aided regions in terms of shared characteristics that may affect their growth performance (Ward, 2016). In the case of the RDD design, the comparison is between aided regions with GDP per capita at 70-74 percent of the EU average and non-aided regions with GDP per capita at 76-80 percent of the EU average. The growth of the two groups of regions is then compared, and any difference in growth rates between the two groups of regions is seen to be due to Cohesion policy funding (see Table 6).

Table 6: Impact of Cohesion policy funding on annual average growth in GDP per capita in Convergence regions, in terms of percentage points

	Regression Discontinuity Design (RDD)	Propensity Score Matching (PSM)
EU15 1994-2006	0.7 – 1.1	0.3 – 1.0
EU27 1994-2011	0.4	0.5 – 0.7

Source: Bondonio and Pellegrini, 2016c

The lower results for the EU27 are likely to be due to the inclusion of data for 2007-11, as the financial and economic crisis and subsequent downturn have had varying effects across regions. The authors note a number of limitations, including:

- The lack of robust data on the thematic composition of Cohesion policy spending (e.g. infrastructure versus business support), or on the time needed to implement and spend funding, or on the level of national/regional public investment across regions – all of which are likely to lead to varying impacts across regions.

- Cohesion policy programmes have multiple objectives (e.g. employment, social inclusion, innovation, climate change), which are reflected in the composition of expenditure. Therefore, although GDP per capita is an important impact indicator, a number of other indicators should also be used to measure Cohesion policy impact.

4.3.2 European Commission review of existing studies

Table 7 provides an overview of selected recent studies and their outcomes (Bondonio and Martini 2012; Czarnitzki, Ebersberger and Fier 2007; Criscuolo, Martin, Overman and Van Reenen 2012; Alecke, Blien, Frieg, Otto and Untiedt 2010; Hart and Bonner 2011; Trzciński 2011). It also provides an indication of the more rigorous results that can be obtained by using control groups, as opposed to simply focusing on the performance of recipient firms or individuals.

First, Table 7 summarises data on the leverage effects of ESIF and associated domestic public expenditure. The use of control groups allows for a more rigorous definition of leverage than that which is usually applied:

- without control groups, studies tend to calculate leverage as 'total public and private investment divided by total public investment' – and therefore implicitly assume that no private investment would have occurred in the absence of ESIF and domestic funding;
- with control groups, studies can instead calculate leverage as 'total public investment plus the additional private investment seen in comparison to the control group, divided by total public investment' – and therefore implicitly acknowledge that a proportion of the private investment is likely to have occurred even without ESIF and domestic funding.

Second, Table 7 shows the effects on production levels and productivity. The studies not only examine whether data for these indicators show increases over time but also the extent to which any changes are statistically significant, when compared with the control groups of firms.

Third, Table 7 offers an overview of net jobs created in the recipient firms, also taking account of the level of job creation in the control groups, on the assumption that the recipient firms would anyway have seen similar levels of job creation as did the control group, even without ESIF and associated domestic public support. The studies show positive effects in terms of net job creation in comparison with the control groups but also indicate that this more stringent definition of job creation generates much lower estimates than those derived for gross jobs from monitoring data. For example, a study of an instrument in eastern Germany that provided investment grants and loans totalling €9.6 billion of grant equivalent in 2000-06 estimated the number of net jobs created at 27,000 (Alecke, Blien, Frieg, Otto and Untiedt, 2010). This compared with aggregated outcome data of 107,000 gross jobs created plus 439,000 gross jobs safeguarded.

Moreover, these studies take a stricter approach to accounting for deadweight, displacement and substitution effects than that used in studies without control groups. For example, based on the control group approach, Bondonio and Martini's (2012) study of an investment grant scheme in Italy estimated that 12,000 net jobs were created in recipient firms, in addition to the number of new jobs created in both the control group and the recipient firms. They also used a more conventional approach (using a survey of beneficiaries) to estimate jobs net of deadweight, displacement and

substitution effects, finding a higher figure of 36,000 net jobs created. Both figures were significantly lower than the 82,000 gross jobs created estimated based on outcome data.

Table 7: Outcomes of selected micro-economic evaluations using control groups

Authors	Member States	Instruments	Leverage	Impact on production	Impact on productivity	Jobs created (Evaluation results)	Gross jobs (monitoring data)
Bondonio & Martini (2012)	Italy	(1) Law 488 (investment grants). Focus on 6189 firms which each received an average grant of €419,777 in 2000-06 (2) SME loans, grants, interest rate subsidies in Piedmont. Focus on 10,526 SMEs which each received an average net grant equivalent of €10,830 in 2005-09	(1) 0.5-0.7 (2) 1.3	(1) Rises in line with employment (2) Rises at least in line with employment	(1) No change (2) Small increase for loans but not grants	(1) 12,000	(1) 82,000 created
Czarnitzki *et al.* (2007)	Finland, Germany	R&D support: subsidies, networking, collaboration and mixed packages	1.7				
Criscuolo *et al.* (2012)	UK	Regional Selective Assistance to 136,000 firms in 1986-2004. The average grant was c. £125,000		Rises by more than employment	Increase is statistically insignificant		
Alecke *et al.* (2010)	Germany (eastern regions)	(1) Investment grants/loans of €9.6 billion grant equivalent in 2000-2006 (2) R&D grants and loans in the eastern Land of Thuringia in 2000-06	(1) 1.4-1.5 (2) 0.9-1.0			(1) 27,000	(1) 107,000 created plus 439,000 safeguarded
Hart & Bonner (2011)	UK (Northern Ireland)	All schemes (grants, advice, networking, etc.) offered in 2001-08		Small, but statistically significant	Small, but statistically significant		
Trzciński (2011)	Poland	Investment grants to 2,800 SMEs in 2004-06. The average grant was PLN 532 000 (c.€133,000)	0.8	Rises in line with employment	No greater increase than in control groups	10,500	25,000 created

Source: Mouqué 2012.

Notes: (1) Outcomes are not comparable across studies due to different methods and datasets used. (2) Leverage is defined as 'total public (EU and domestic) investment plus the additional private investment seen in comparison to the control group, divided by the total public investment'. A leverage effect of 1.7 indicates that, for each unit (e.g. euro or pound sterling) of total public spending (EU and domestic), the recipient firms invested an additional 0.7 euros or pounds i.e. on top of the amount of private money invested by firms in the control group. Similarly, a leverage effect of 1.0 indicates that, for each unit of total EU and domestic public spending, the recipient firms invested the same amount of private money as that invested by firms in the control group.

4.3.3 UK's What Works Centre's review of existing studies

The United Kingdom's What Works Centre for Local Economic Growth (2016) has undertaken a comprehensive screening and assessment of studies on the impact of area-based policies, including Cohesion policy, starting with over 2100 evaluations, of which 190 were on Cohesion policy. However, the final report focuses on the 18 studies which were deemed sufficiently robust in methodological terms (based on the Maryland Scientific Methods Scale) i.e. where the evaluations succeeded in establishing a reasonable degree of certainty in terms of the causal links between the funding and the outcomes for different regions. Four of the evaluations assessed included quasi-randomised controls, while the remaining 14 studies used variations of difference-in-difference and panel methods. The WWC assessment of these 18 evaluations found mixed results, as shown in Table 8.

Table 8: Key results of the studies assessed by the What Works Centre

	Number of studies that focused on this indicator	Number of studies showing positive impact	Number of studies showing mixed impact	Number of studies showing zero impact
GDP per capita	11	5	4	2
Employment	4	2	1	1

Source: What Works Centre for Local Economic Growth (2016)

Other findings of the assessment include:

- Evidence on other outcomes (e.g. labour productivity, public investment, innovation…) is mixed, with each other indicator assessed by only one study;
- Five studies consider differences across regions, and four of these suggest that impact is greater in relatively more developed regions;
- Two studies examine changes in impact over time, but suggest no clear results;
- Three studies assess the appropriate intensity of support, and two of these make suggestions on 'optimum' levels of expenditure
- The studies do not provide evidence on whether or how different components of spending (e.g. on infrastructure versus business support or human capital) affect policy impact.

Studies included in this assessment are: Aiello and Pupo (2009), Akcomak and Ter Weel (2007), Becker, Egger and Von Ehrlich (2010, 2011, 2012), Bondonio and Greenbaum (2006, 2014), Bouayad-Agha, Turpin and Vedrine (2013), Breidenbach, Mitze and Schmidt (2011), Fantino and Cannone (2013), Hagen and Mohl (2010), Katsaitis and Doulos (2009), Midelfart-Knarvik and Overman (2002), Mohl and Hagen (2010, 2011), Pellegrini, Terribile, Tarola, Muccigrosso and Busillo (2013), and Puigcerver-Penalver (2007).

4.3.4 Other studies

Ferrara, McCann, Pellegrini, Stelder and Terribile (2016) use the Regression Discontinuity Design technique to assess the impact of actual Cohesion policy expenditure on research, technological development and innovation (RTDI) in 1999-2010 (with impact measured in terms of changes in patent applications per million inhabitants), and the impact of expenditure on transport infrastructure

in 2000-2012 (with impact measured in terms of changes in an indicator or road accessibility). The focus is on EU15 NUTS 2 regions which had Convergence status in both 1994-99 and 2000-06 (compared to regions without this status in both regions). The study provides a range of results (e.g. across different time intervals). It shows that Cohesion policy expenditure on both RTDI and transport infrastructure had a clear and statistically significant impact on patent applications and road accessibility respectively.

5. CASE STUDIES OF PROGRAMMES, INSTRUMENTS AND MAJOR PROJECTS

Both the European Commission and individual Member States and regions have funded case study evaluations of the effects of ESIF funding at regional, programme or project level, drawing on monitoring data on, interviews and sometimes also quantitative analysis. These studies generally show positive effects, which may either be stated in gross terms which aggregate output data, or may make more sophisticated estimates of impact net of multiplier, deadweight, displacement and substitution effects. In either case, results tend to involve an element of subjective assessment.

5.1 Strengths and weaknesses

The main strength of case studies is that they allow for an in-depth, rich exploration of the effects of individual instruments and/or entire programmes within a specific national/regional economic and socio-institutional context, and the reasons for success, failure or intermediate outcomes. They also allow different stakeholders' views of policy effectiveness and impact to be taken into account. This approach is, however, characterised by a number of difficulties, notably:

- the lack of a counterfactual (policy-off) comparison, so that the effects of ESIF funding cannot be separated from other socio-economic processes, particularly in the case of evaluations that aim to extrapolate from simple outputs (e.g. number of firms assisted or length of road built) to indicators related to employment, GDP per capita, productivity, social cohesion or well-being;
- their results are complex, qualitative and often unwieldy (reflecting the complexity of ESIF programmes and socio-economic processes) and so may not provide a coherent or succinct message on success or failure;
- results cannot be generalised or transferred from the case study regions to other regions, due to structural socio-economic, institutional and programming differences between places;
- studies depend on the high quality, comparable (and aggregable) programme data on outputs, as well as data for a variety of other socio-economic indicators; the quality and comparability of programme data has improved significantly in 2007-13 (see Box 5) but was significantly weaker in previous periods; even in 2007-13, data are not always comparable, and evaluators face challenges in managing and aggregating the mass of data available from monitoring systems;
- evaluations are open to bias due to the subjective assessments of the evaluators, which implies the need for an explicit, conceptually-rooted and clearly structured analytical framework setting out the factors that drive or shape impact, as well as evaluators with sound experience and expertise.

5.2 Methodologies

This approach takes a bottom-up perspective, aggregating project-level monitoring data on physical output and result indicators, as well as primary research in the form of interviews with beneficiaries and staff involved in implementation, and other forms of secondary data. In addition, evaluations may undertake some form of quantitative analysis (e.g. cost-benefit analysis or simple regression analysis, possibly using qualitative data as inputs).

DG Regional Policy and (to a lesser extent) DG Employment have funded a wide range of evaluations of different dimensions and themes of Cohesion policy. In addition, DG Regional Policy and DG Employment each funds a network of expert external evaluators, which annually produce country reports plus a synthesis report on a particular theme, and sometimes also country reports and a synthesis report on ESIF achievements. The ERDF network has produced papers on the topic of job creation as an ERDF indicator (2013), financial engineering (2012), renewable energy and energy efficiency in residential housing (2011), good practice in evaluation (2011), and innovation (2010). The ESF network was set up more recently and has produced country reports and a synthesis report on the theme of access to employment (University of Glasgow Training and Employment Research Unit and Metis 2012).

Box 5: Strategic report 2013 on programme implementation: EU-level achievements

For the ERDF (data published by mid-2012):
- The creation of c.400,000 jobs, including c.15,600 research jobs and c.167,000 jobs in SMEs, notably in the UK, Italy, Germany, Spain, Poland and Hungary.
- Support for 53,240 RTD projects; 16,000 co-operation projects between firms and research institutions; and 53,160 start-ups, mostly in the EU15 but also in Hungary and Poland.
- New broadband access for 1.9 million people (mainly in Spain, France, Ireland and Italy).
- 1,222 megawatts of electricity generation capacity from renewables mostly in the EU15.
- Water supply projects for 2.6 million people and waste water projects for 5.7 million people.
- c.5,000 transport projects, generating 460 km of TEN-T roads and 334 km of TEN-T rail, and improving access to urban transport for 3.4 million people.
- Support for c.19,000 educational infrastructure projects, benefiting 3.4 million students, mostly in Italy, but also in Bulgaria, Spain and Greece.

For the ESF (data from 2007 to the end of 2011):
- 12.5 million participants in ESF actions supporting access to employment through training etc. two thirds of whom were previously inactive or unemployed. 2.4 million found a job within 6 months of completing the intervention.
- 15 million participants were under 24 years. In Germany, France and Hungary, young people account for 40 percent or more of all participants.
- Nearly half (46 percent) of participants have lower secondary education at most. Over 14.5 million final recipients benefited from support for social inclusion.
- About 700,000 participants, notably civil servants, have upgraded their skills.
- Over half of ESF participants (52 percent) are women, reaching over 60 percent in Cyprus, Estonia, Lithuania and Latvia.

Source: European Commission 2013b.

5.3   Results of selected studies

5.3.1   *Ex-post evaluations of the 1989-93, 1994-99 and 2000-06 periods*

The European Commission funded ex-post evaluations of previous periods, based on monitoring data, as well as information from interviews with programme implementers. The sophistication of

methods and the quality and availability of monitoring data have generally improved with each programme period. In terms of economic impact, the evaluations provide economy-level results only in terms of the numbers of jobs created or safeguarded (rather than e.g. changes in GDP per capita). They also included qualitative assessments of the effects of programmes or thematic interventions.

The ex-post evaluation of the 1989-93 (ERDF and ESF) Objective 2 programmes calculated that ESIF funding either created, safeguarded or redistributed around 850,000 gross jobs, and also estimated the number of net additional jobs at around 450,000-500,000 (Ernst and Young 1997).

The ex-post evaluation of the Objective 1 (ERDF and ESF) 1994-99 programmes noted the lack of systematic data but also found that at least 798,000 jobs had been created, notably through support for productive investment (ECOTEC 2003a). Similarly, the 1994-99 ex-post evaluation of the Objective 2 (ERDF and ESF) programmes calculated that around 700,000 gross jobs were created, and estimated that around 560,000 net jobs were created (or 1.4 million jobs in net terms, also taking account of 'jobs safeguarded' and 'jobs redistributed') (Centre for Strategy and Evaluation Services (CSES) 2003).

The ex-post evaluation of the 2000-06 ERDF programmes found that around one million new jobs were created in Objective 1 and Objective 2 regions due to support for productive investment (Ward and Wolleb 2010). Further, the evaluators estimated that the average employment rate rose more strongly in the assisted areas of the EU15 than in non-assisted regions (from 55.5 percent of the working-age population in 2000 to 60.1 percent in 2006 in assisted areas, compared to a rise from 69.1 percent to 70.3 percent in non-assisted regions).

The ex-post evaluation of the 2000-06 ESF programmes did not estimate effects in terms of jobs created or other socio-economic indicators (LSE Enterprise Ltd, Vision & Value, Red2Red Consultores, Expanzió Consulting Ltd and Deutschland Denken! e.V. 2010). Instead, it noted that a total of around €120 billion in public and private funding was channelled through the programmes to around 75.5 million individuals and 1.7 million organisations. ESF funding accounted for 52 percent of total resources, with 42 percent from Member State funding and 6 percent from the private sector.

The ex-post evaluation of the Cohesion Fund (including the former ISPA) in 2000-06 found the EU funding has contributed significantly to extending and improving the transport network and environmental infrastructure (Ward, Greunz and Botti 2012). Transport funding had facilitated the construction of 1,286 km of new motorways in 16 Member States; the improvement of 3,013 km of roads within the Trans-European Transport Network in the EU12; the construction of 912 km of new railway line in 4 Member States and the upgrading of 455 km of line in Portugal; and the upgrading of 3,675 km of railway line in the EU12. Environmental funding had significantly assisted eligible Member States to comply with EU Directives on water supply, wastewater treatment and solid waste management, and they were thus seen to have clearly contributed to environmental protection and pollution reduction.

5.3.2   Evaluation of the cumulative effects of programmes in 15 regions

A 2013 evaluation assessed the cumulative achievements of ERDF programmes in 15 regions in 1989-2012, including one region in each of Austria, Finland, Greece and the United Kingdom; Ireland; and, and two regions in each of France, Germany, Italy, Portugal and Spain (Bachtler, Begg, Polverari

and Charles 2013). The case study teams drew on a range of data (from regional statistics, reported expenditure and quantified achievements from the programmes' monitoring systems, and qualitative data from interviews) to provide qualitative assessments of the programmes' effectiveness and utility. To appraise achievements the study relied on a dataset built from (imperfect) programme databases; it did thus not address explicitly additionality or displacement. However, with its predominantly qualitative approach, the study provides insights on the change introduced to each region, thanks to the programmes, across selected fields (e.g. innovation, enterprise, structural change etc.). It also offers an analysis of the evolution of relative productivity and employment over the period (without imputing this directly and solely to Cohesion policy. See Figure 1).

Figure 1: Relative productivity and employment growth, 1991-2008, in 15 selected EU regions
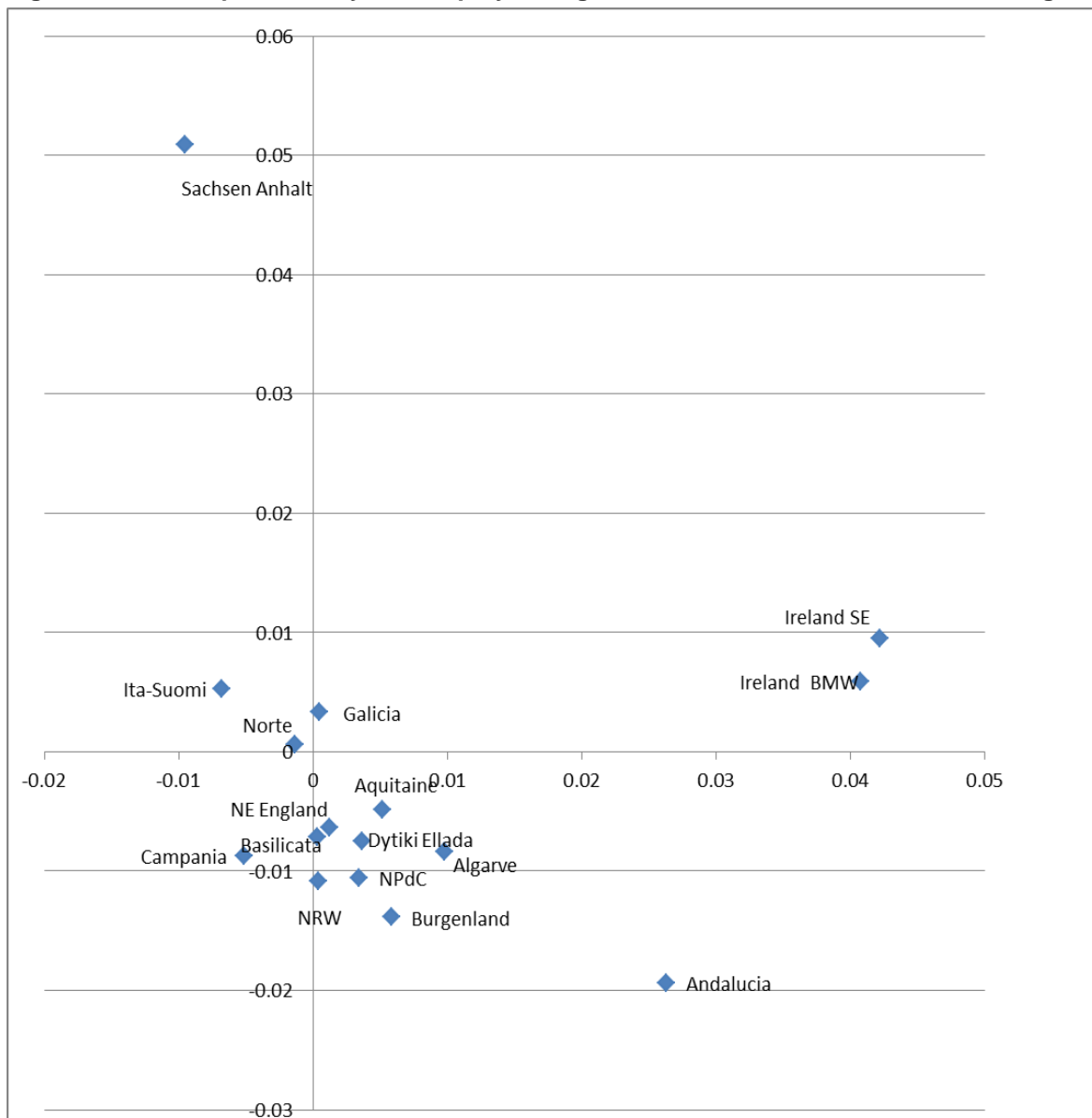
Source: Bachtler, Begg, Polverari and Charles 2013, p. 13.

The case study teams gave broadly positive assessments of the programmes' effectiveness in terms of their achievements of stated objectives (see Table 9), although with variation between regions and priority axes.

Table 9: Qualitative assessments of programme effectiveness

Region	Objective	1989-1993	1994-1999	2000-2006
Algarve	Phasing-out	3	3	3
Andalucía	Convergence	4	4	4
Aquitaine	RCE	3	3	3
Basilicata	Phasing-out	3	3	3
Burgenland	Phasing-out	n.a.	3	4
Campania	Convergence	2	3	2
Dytiki Ellada	Convergence	2	3	4
Galicia	Convergence		3	4
Ireland	Phasing-out	4	4	1
Itä-Suomi	Phasing-out	n.a.	-	4
Nord-Pas-de-Calais	Phasing-out	3	3	3
Nordrhein-Westfalen	RCE	-	3	1
Norte	Convergence	1	1	1
North-East England	RCE	-	1	4
Sachsen-Anhalt	Convergence	5	1	5

Source: Bachtler et al. (2013) p. 80.

Key: 5: strongly exceeded objectives, 4: exceeded objectives, 3: met objectives, 2: under-performed against objectives, 1: strongly underperformed against objectives, -: insufficient data, N/A: not in the EU at that time.

In addition, the evaluation assessed the programmes' utility – or their contribution to broader socio-economic goals, which were not defined on the basis of programme objectives but instead in terms of the case study teams' perceptions of the regions' key developmental needs. It found a positive and statistically significant correlation between these needs and actual achievements, again with some variation between priority axes and regions. More broadly, the evaluation found that programmes in most of the Convergence regions successfully improved infrastructure, which in turn enhanced quality of life, but did not contribute so strongly to self-sustaining growth or structural change via support for enterprise or innovation. The picture for the Phasing-out regions was found to be less clear-cut, due to the wide differences in the regions' economic structures and trajectories. The RCE regions all faced the need for industrial restructuring, and saw success in rehabilitating the environment in areas affected by industrial closures, but there was a more mixed picture in progress on converting the economic base to new knowledge-based activities, and only limited success in addressing the social consequences of deindustrialisation.

5.3.3 Evaluation of the long-term effects of major infrastructure projects

A 2012 evaluation assessed the long-term effects of 10 major transport (motorways, ports, metro lines) and environmental projects (water and waste water facilities, solid waste treatment plants) which were co-financed in the 1994-99 period in Greece, Ireland, Italy, Portugal and Spain (Centre for Industrial Studies (CSIL) and DKM Economic Consultants 2012). Together, the projects cost around €5 billion in EU funding and a total of over €10 billion.

The methods included ex-post cost-benefit analysis of the projects' long-term effects, which included a risk analysis of the range of possible variations in results, depending on different assumptions relating to key variables. Further, the cost-benefit analysis provided an analytical framework for identifying the factors which shaped investment decisions, project implementation, performance and final outcomes. In addition, qualitative techniques, including personal interviews (with public authorities, infrastructure operators, experts, and associations of users), documentary analysis and searches of EU, government and newspaper archives, were used to assess why effects were generated and to identify the nuances between a project's success or failure.

The study found that all the projects had positive economic and social impacts, notably in terms of direct welfare and economic growth, endogenous development dynamics, social cohesion, environmental effects, territorial cohesion, institutional quality, and social happiness or well-being. It also demonstrated that it takes at least five years for the effects of major infrastructure projects to stabilise sufficiently to be evaluated. In addition, the evaluation identified a series of 'development drivers' that shape the effectiveness of such projects, namely: appropriateness to the existing context; project design; financial sustainability; forecasting capacity; project governance; managerial responses; and the type of involvement of the European Commission (and sometimes the European Investment Bank).

5.3.4 Studies on added value

Studies have also aimed to assess the broader 'added value' of ESIF (Bachtler, Mendez and Wishlade 2013). These analyses have, for example, focused on the policy's contribution to EU political goals associated with the Lisbon and Europe 2020 strategies (Mendez 2011; Ferry, Mendez and Bachtler 2008; Bachtler and Mendez 2007; Ekins and Medhurst 2003); the leverage effect of EU funding on domestic public and private sources (Bachtler and Taylor 2003; Österreichisches Institut für Raumplanung (ÖIR) 2006; ECOTEC 2003b); and the spillover of implementation methods such as multi-annual programming, partnership, monitoring and evaluation on domestic systems, as well as the wider exchange of experience (Tavistock Institute and ECOTEC 1999; Österreichisches Institut für Raumplanung (ÖIR), LRDP and IDOM et al. 2003; Bachtler, Polverari and McMaster 2009). The rigour and usefulness of this concept have, however, been questioned (Tarschys 2005), partly because it focuses only on positive effects and neglects negative effects (e.g. associated with the administrative burden of E SIF funding (Österreichisches Institut für Raumplanung (ÖIR), LRDP and IDOM et al. 2003).

6. CONCLUSIONS

Four main methodological approaches are used to analyse the effectiveness of ESIF funding, its socio-economic impact and added value, namely macroeconomic modelling, regression analysis, micro-economic studies using control groups, and qualitative case studies. Each approach has strengths and weaknesses, although all methods face fundamental challenges, notably in terms of the poor availability of regional data on socio-economic indicators and ESIF spending, as well as the intractability of comparing outcomes with a genuine, counterfactual, policy-off situation.

The three main macroeconomic models applied to ESIF funding all find clear positive effects, both during the periods of programme implementation and also in the longer term (i.e. once spending has ceased). These results are due to a combination of demand-side effects during implementation and supply-side effects both during and after the spending period.

The QUEST ex post evaluation of the 2007-13 period estimates cumulative multipliers, which indicate that ESIF funding of one percent of GDP may generate an increase of 0.78 percent in the GDP of the EU27 by 2015, and an increase of 2.74 percent by 2023. The RHOMOLO ex post evaluation examines differential impacts across NUTS 2 regions, finding the strongest effects for Cohesion policy expenditure in the main net recipient Member States and regions, including regions in Hungary, Slovakia, Poland and Lithuania.

Studies using econometric regression analysis typically test for the effect of ESIF funding on convergence, defined as faster growth by poorer regions, leading to catching-up in terms of GDP per capita. Results vary widely, depending on the specific technical specifications applied, and the time series and country/regional data-sets used. Some studies find evidence that ESIF funding has a positive and statistically significant effect on convergence, while others find no statistically significant impact, or that impact is conditional on exogenous factors (such as the quality of national institutions or macro-economic policies) or on the time-series or geographical data used.

Micro-economic studies using control groups compare outcomes for the recipients of ESIF funding with outcomes for a control group of firms or individuals with similar characteristics. Results are generally positive but differ, depending on the specific methods applied, the schemes evaluated, and the time series and national/regional data-sets used. A number of recent studies have shown that recipients of ESIF funding under particular schemes have enjoyed stronger outcomes than those experienced by control groups (e.g. in terms of the leveraging of private sector investment, the effects on business productivity, or the number of net jobs created).

Last, case study evaluations combine data from interviews, programme monitoring systems and sometimes also quantitative analysis in order to investigate the effects of ESIF funding at regional, programme or project level. These studies generally show positive effects, although these are often stated in gross terms (rather than net of multiplier, deadweight, displacement and substitution effects). In addition to ex-post evaluations of previous programme periods, important recent evaluations include: a study on the cumulative effects of ESIF funding in 15 regions, and an assessment of the long-term effects of ten major infrastructure projects.

Overall, the majority of studies using the four different approaches suggest that ESIF funding has a positive impact on national and regional economic development. The exceptions are some of the

studies using regression analysis, which find no statistically significant evidence that regions receiving higher ESIF funding have seen higher rates of growth in GDP per capita than other regions. However, all four approaches are affected to varying degrees by weaknesses in data on ESIF funding and regional socio-economic indicators, as well as methodological constraints (notably the challenge of comparing actual outcomes with a counterfactual 'policy-off' situation). It is not therefore possible to draw definitive conclusions from the studies on the scale of impacts, or on the factors which condition the effectiveness of ESIF funding across Member States and regions. Nevertheless, overall evidence suggests that Cohesion policy does indeed 'work'.

7. BIBLIOGRAPHY

Aiello, F and Pupo, V (2009) Structural Funds and Economic Divide in Italy, Journal of Policy Modelling 34(3), 403-418

Akcomak, IS and Ter Weel, B (2007). How do Social Capital and Government Support Affect Innovation and Growth? Evidence from the EU Regional Support Programmes. United Nations University Working Paper 2007-009.

Alecke, B, Blien, U, Frieg, I, Otto, A and Untiedt, G (2010) Ex post evaluation of Cohesion Policy programmes 2000-2006 financed by the ERDF: Enterprise Support - an exploratory study using counterfactual methods on available data from Germany, Final report to the European Commission (DG Regional Policy), GEFRA, Münster and IAB: Nürnberg.

Allard, C, Choueiri, N, Schadler, S and van Elkan, R (2008) Macroeconomic effects of EU transfers in new Member States, IMF Working Paper No.08/223, Washington DC.

Allen, D (2010) The Structural Funds and Cohesion Policy, in Wallace, E, Pollack, M A and Young, A R (2010) Policy-Making in the European Union, Oxford University Press, Oxford (Sixth Edition), pp. 227-252.

Bachtler, J and Mendez, C (2007) Who governs EU Cohesion policy? Deconstructing the reforms of the Structural Funds, Journal of Common Market Studies 45, pp. 535-564.

Bachtler, J and Taylor, S (2003) The added value of the Structural Funds: A regional Perspective, IQ-Net Thematic Paper on the Future of the Structural Funds, European Policies Research Centre, Strathclyde University: Glasgow.

Bachtler, J, Begg, I, Polverari, L and Charles, D (2013) Evaluation of the Main Achievements of Cohesion Policy Programmes and Projects over the Longer Term in 15 Selected Regions (from 1989-1993 Programme Period to the Present (2011.CE.16.B.AT.015), Final Report to the European Commission (DG Regio), European Policies Research Centre, University of Strathclyde: Glasgow and London School of Economics: London.

Bachtler, J, Mendez, C and Wishlade, F (2013) EU Cohesion Policy and European Integration: The Dynamics of EU Budget and Regional Policy Reform, Ashgate: Farnham, pp. 135-138.

Bachtler, J, Polverari, L and McMaster, I (2009) The 'added value' of Cohesion Policy (2000-06) in the EU15; Comparative report (Task 3), Ex Post Evaluation of Cohesion Policy Programmes 2000-2006 Co-financed by the ERDF (Objective 1 and 2), Work Package 11: Management and Implementation Systems for Cohesion Policy (No. 2007 CE 16 0 AT 034); final report to the European Commission (DG Regio): Brussels, 7 August 2009.

Bayar, J (2007) Study on the economic impacts of Convergence interventions 2007-2013, report to the European Commission (DG Regional Policy): Brussels.

Becker, S, Egger, P and Ehrlich, M (2010) Going NUTS: The effect of EU Structural Funds on regional performance, Journal of Public Economics 94, pp. 578–590.

Becker, SO; Egger, PH and 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

Becker, SO; Egger, PH and Von Ehrlich, M (2011). Absorptive Capacity and the Growth Effects of Regional transfers: A Regression Discontinuity Design with Heterogenous Treatment Effects. American Economic Journal: Economic Policy. 5(4), 29-77.

Becker, SO; Egger, PH and Von Ehrlich, M (2010). Going NUTS: The Effect of EU Structural Funds on Regional Performance. Journal of Public Economics. 94(9-10), 578-590.

Beugelsdijk, M and Eijffinger, S (2005) The effectiveness of structural policy in the European Union: An empirical analysis for the EU-15 in 1995-2001, Journal of Common Market Studies 40, pp. 37-51.

Beutel, J (2002) The economic impact of Objective 1 interventions for the period 2000-2006, report to the European Commission (DG Regional Policy): Brussels.

Boldrin, M and Canova, F (2001) Europe's regions: Income disparities and regional policies, Economic Policy 32, pp. 207-253.

Bondonio, D and Greenbaum, RT (2006) Do Business Investment Incentives Promote Employment in Declining Areas? Evidence from EU Objective-2 Regions. European Urban and Regional Studies 13(3), 225-244

Bondonio, D and Greenbaum, RT (2014). Revitalizing Regional Economies through Enterprise Support: An Impact Evaluation of Multiple Instruments. European Urban and Regional Studies. 21(1), 79-103

Bondonio, D and Martini, A (2012) Counterfactual impact evaluation of Cohesion policy: Impact and cost-effectiveness of investment subsidies in Italy, final report to the European Commission (DG Regional Policy): Torino.

D. Bondonio and G. Pellegrini (2016a) Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF): Work Package 14c: Regression discontinuity design, Report to the European Commission, DG for Regional and Urban Policy

D. Bondonio and G. Pellegrini (2016b) Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF): Work Package 14d: Propensity score matching, Report to the European Commission, DG for Regional and Urban Policy

Bondonio D and Pellegrini G (2016c) Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF): Macro-economic effects of Cohesion policy funding in 2007-2013, Work Package 14c: Regression discontinuity design and Work Package 14d: Propensity score matching: Executive Summary, Report to the European Commission DG for Regional and Urban Policy

Bouayad-Agha, S; Turpin, N and Vedrine, L (2013) Fostering the Development of European Regions: A Spatial Dynamic Panel Data Analysis of the Impact of Cohesion Policy. Regional Studies. 49(9), 1573-1593

Bradley, J and Untiedt, G (2009) Analysis of EU Cohesion policy 2000-2006 using the CSHM: aggregate impacts and inter-country comparisons, report to the European Commission (DG Regional Policy): Dublin.

Bradley, J, Untiedt, G and Mitze, T (2007) Analysis of the impact of Cohesion policy: A note explaining the HERMIN-based simulations, report to the European Commission (DG Regional Policy): Dublin.

Brandsma, A, Kancs, d'A, Montfort, P and Rillaers, A (2013) RHOMOLO: a dynamic spatial general equilibrium model for assessing the impact of Cohesion policy, Working paper of the European Commission (DG Regional Policy) No.1/2013: Brussels.

Breidenbach, P, Mitze, T and Schmidt, C M (2016) EU Structural Funds and Regional Income Convergence – A sobering experience, Ruhr Economic Papers #608

Breidenbach, P; Mitze, T and Schmidt, CM (2011). Evaluating EU Regional policy: Many Empirical Specifications, One (Unpleasant) Result. Working Paper

Bundesministerium für Wirtschaft und Energie (2015) Regionale Wirtschaftsförderung. Gutachten des Wissenschaftlichen Beirats beim Bundesministerium für Wirtschaft und Energie, Berlin

Cappelen, A, Castellacci, F, Fagerberg, J and Verspagen, B (2003) The impact of EU regional support on growth and convergence in the European Union, Journal of Common Market Studies 41, pp. 621–644.

Centre for Industrial Studies (CSIL) and DKM Economic Consultants (2012) Ex post evaluation of investment projects co-financed by the ERDF or Cohesion Fund in the period 1994-1999: Ten projects observed, final report to the European Commission (DG Regional Policy): Milan and Dublin.

Centre for Strategy and Evaluation Services (CSES) (2003) Ex-post evaluation of 1994-99 Objective 2 programmes, synthesis report to the European Commission (DG Regional Policy): Sevenoaks.

Council of the European Union (2006) Decision of 6 October 2006 on Community Strategic Guidelines on Cohesion, Official Journal of the European Union L291, 21.10.2006, Annex, para. 1.

Criscuolo, C, Martin, R, Overman, H and Van Reenen, J (2012) The causal effects of an industrial policy, London School of Economics and Political Science, Centre for Economic Performance (CEP) Discussion Paper No 1113: London.

Czarnitzki, D, Ebersberger, B and Fier, A (2007) The relationship between R&D collaboration, subsidies and R&D performance: empirical evidence from Finland and Germany, Journal of Applied Econometrics 22, pp. 1347-66.

Dall'erba, S (2005) Distribution of regional income and regional funds in Europe 1989-1999: An exploratory spatial data analysis, The Annals of Regional Science 39: pp. 121-148.

de Freitas, M, Pereira, F and Torres, F (2003) Convergence among EU regions, 1990-2001; Quality of national institutions and Objective 1 status, Intereconomics, pp. 270-275.

DG REGIO and Joint Research Centre Seville (2016) Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF): Work package 146: The impact of cohesion policy 2007-2013: model simulations with RHOMOLO, European Commission DG Regional and Urban Policy

Dixit, A and Stiglitz, J (1977) Monopolistic competition and optimum product diversity, American Economic Review 67, pp. 297-308.

ECOTEC (2010) Ex-Post evaluation of Cohesion policy programmes 2000-06: the URBAN Community Initiative 2001-2006, Final Report to the European Commission (DG Regional Policy).

ECOTEC (2003a) Ex-post evaluation Objective 1, 1994-99, Final Report to the European Commission (DG Regional Policy): Birmingham.

ECOTEC (2003b), Evaluation of the added value and costs of the European Structural Funds in the UK, Report to the DTI and ODPM: London.

Ederveen, S, de Groot, H and Nahuis, R (2006) Fertile soil for Structural Funds? A panel data analysis of the conditional effectiveness of European Cohesion policy, Kyklos 59, pp. 17-42.

Ederveen, S, Gorter, j, de Mooij, R and Nahuis, R (2003) Funds and games. The economics of European Cohesion Policy, ENEPRI Occasional Paper No. 3: The Hague.

Ekins, P and Medhurst, J (2003) Evaluating the contribution of the European Structural Funds to sustainable development: Methodology, indicators and results, Paper presented at the Fifth European Conference on Evaluation of the Structural Funds: Budapest.

Ernst and Young (1997) Ex-post evaluation of the 1989-93 Objective 2 programmes, Final Report to the European Commission (DG Regional Policy): Brussels.

Esposti, R and Bussoletti, S (2008) Impact of Objective 1 funds on regional growth convergence in the European Union: A panel-data approach, Regional Studies 42(2), pp. 159-173.

European Commission (2013a) Amended proposal for a regulation of the European Parliament and of the Council laying down common provisions on the ERDF, the ESF, the Cohesion Fund, the EAFRD and the EMFF covered by the Common Strategic Framework and laying down general provisions on the ERDF, the ESF and the Cohesion Fund and repealing Council Regulation (EC) No 1083/2006: Brussels, 22.4.2013, COM 246, Article 9.

European Commission (2013b) Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Cohesion policy: Strategic report 2013 on programme implementation 2007-2013: Brussels, 18.4.2013, COM(2013) 210 final.

European Union (2010b) Investing in Europe's future, Fifth report on economic, social and territorial cohesion, Report from the Commission, November 2010.

European Union (2010a) Consolidated version of the Treaty on the Functioning of the European Union, Official Journal of the European Union C83, 30.10.2010.

Falk, M and Sinabell, F (2008) The effectiveness of Objective 1 Structural Funds in the EU15: New empirical evidence from NUTS 3 regions, WIFO Working Papers No. 310.

Fantino, D and Cannone, G (2013). Evaluating the Efficacy of European Regional Funds for R&D. Banca D'Italia Eurosistema Working Paper 902

Ferry, M, Mendez, C and Bachtler J (2008) From environmental sustainability to sustainable development? Making concepts tangible in Structural Funds programmes, IQ-Net Thematic Paper 22(2), European Policies Research Centre, University of Strathclyde: Glasgow.

Fujita, M, Krugman, P and Venables, A (2001) The Spatial Economy: Cities, Regions, and International Trade, Cambridge MA and London: MIT Press.

Grossman, G and Helpman, E (1994) Endogenous Innovation in the theory of growth, Journal of Economic Perspectives 8(1), pp. 23-44.

Hagen, T and Mohl, P (2009) Econometric evaluation of EU Cohesion Policy: a survey, ZEW Discussion Papers No. 09-052.

Hagen, T and Mohl, P (2009). How Does EU Cohesion Policy Work? Evaluating its Effects on Fiscal Outcome Variables. ZEW Discussion Paper 09-051.

Hagen, T, and Mohl, P (2008) Which is the right dose of EU Cohesion Policy for economic growth? ZEW Discussion Paper No. 08-104.

Hart, M and Bonner, K (2011) Data-Linking and Impact Evaluation in Northern Ireland, Final report to the European Commission (DG Regional Policy): Birmingham.

in t'Veld, J (2007) The potential impact of the fiscal transfers under the EU Cohesion policy programme, European Economy Economic Papers No. 293: Brussels.

Jones, C (1995) R&D-based models of economic growth, Journal of Political Economy 103, pp. 759-784.

Katsaitis, O and Doulos, D (2009). The Impact of EU Structural Funds on FDI. Kyklos International Review for Social Sciences. 62(4), 563-578.

LSE Enterprise Ltd, Vision & Value, Red2Red Consultores, Expanzió Consulting Ltd and Deutschland Denken! (2010) The ex post evaluation of the European Social Fund (2000–2006), Final report to the European Commission: London.

Mendez, C (2011) The Lisbonization of EU Cohesion Policy: A Successful Case of Experimentalist Governance? European Planning Studies 19(3), pp. 519-537.

Midelfart-Knarvik, H and Overman, H (2002) Delocation and European integration: is structural spending justified?, Economic Policy 17, pp. 322–359.

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

Monfort P, Piculescu P, Rillaers A, Stryczynski K and Varga J (2016) Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF): Work Package 14a: The impact of cohesion policy 2007-2013: model simulations with Quest III, European Commission DG Regional and Urban Policy

Mouqué, D (2012) What are counterfactual impact evaluations teaching us about enterprise and innovation support? Regional Focus 2/2012, European Commission (DG Regional Policy)

Österreichisches Institut für Raumplanung (ÖIR) (2006) The leverage effect of the European cohesion policy under the Structural Funds, final report to the Committee of the Regions.

Österreichisches Institut für Raumplanung (ÖIR), LRDP and IDOM et al. (2003) A study on the efficiency of implementation structures for Structural Funds, final report to the European Commission (DG REGIO): Vienna, London and Bilbao.

Pellegrini, G; Terribile, F; Tarola, O; Muccigrosso, T and Busillo, F (2013). Measuring the Effects of European Policy on Economic Growth: A Regression Discontinuity Approach. Papers in Regional Science. 92(1), 217-233

Puigcerver-Peñalver, M (2007) The impact of structural funds policy on European regions' growth. A theoretical and empirical approach, The European Journal of Comparative Economics 4(2), pp. 179-208.

Quah, D (1996) Twin peaks: growth and convergence in models of distribution dynamics, The Economic Journal 106, pp. 1045-1055.

Rodríguez-Pose, A and Fratesi, U (2004) Between development and social policies: The impact of European structural funds in Objective 1 regions, Regional Studies 38(1), pp. 97-113.

Rodríguez-Pose, A and Novak, K (2013) Learning processes and economic returns in European Cohesion policy, Investigaciones Regionales 25: pp. 7-26.

Roeger, W, Varga, J and in t'Veld, J (2008) QUEST III: an estimated open-economy DSGE model of the Euro area with fiscal and monetary policy, Economic Modelling 26, pp. 222-233.

Romer, P (1990) Endogenous technological change, Journal of Political Economy 98(5), pp. 97-103.

Solow, R (1956) A contribution to the theory of economic growth, Quarterly Journal of Economics 70, pp. 65-94.

Tarschys, D (2005) The Enigma of European Added Value: Setting Priorities for the European Union, Swedish Institute for European Policy Studies: Stockholm.

Tavistock Institute and ECOTEC (1999) Thematic evaluation report of the partnership principle, Report to the European Commission (DG Regional Policy).

Tomova, M, Rezessy, A, Lenkowski, A and Maincent, M (2013) EU governance and EU funds - testing the effectiveness of EU funds in a sound macroeconomic framework, European Economy Economic Papers No. 510.

Trzciński, R (2011) Impact of direct subsidies on SMEs, in J. Pokorski (ed.) Towards Innovative Economy: Effects of Grants to Enterprises in Poland, Polish Agency for Enterprise Development: Warsaw, pp. 215-224.

University of Glasgow Training and Employment Research Unit and Metis (2012) Final synthesis report on access to employment, Report to the ESF Expert Evaluation Network: Glasgow and Vienna.

Untiedt G, Karl H, Rosche J, Kersting M and Alecke B (2016) Aufgaben, Struktur und mögliche Ausgestaltung eines gesamtdeutschen Systems zur Förderung von strukturschwachen Regionen ab 2020, Münster/Bochum: Report by GEFRA and RUFIS to Germany's Federal Ministry for Economic Affairs and Energy

Varga, J and in t'Veld, J (2010) The potential impact of EU Cohesion policy spending in the 2007-13 programming period a model-based analysis, European Economy Economic Papers No. 422.

Varga, J and in 'tVeld, J (2009) A model-based analysis of the impact of Cohesion policy expenditure 2000-06: simulations with the QUEST III endogenous R&D model, European Economy Economic Papers No. 387.

Ward T, assisted by L Greunz, R Fornoni, F Liberati, F Sanoussi, E Wolleb, A Naldini, A Ciffolilli and M Pompili (2016) Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF): WP1: Synthesis report by Applica and ISMERI Europa to the European Commission DG for Regional and Urban Policy

Ward, T, Greunz, L and Botti, S (2012) Ex-post evaluation of the Cohesion Fund (including former ISPA) in the 2000-2006 period, Synthesis report to the European Commission (DG Regional Policy), Applica.

Ward, T and Wolleb, E (2010) Ex-post evaluation of Cohesion policy programmes 2000-2006 financed by the European Regional Development Fund in Objective 1 and 2 Regions, Synthesis Report to the European Commission (DG Regional Policy).

What Works Centre for Local Economic Growth (2016) Assessment of Area-Based Policies: EU programmes, Evidence-Based Review No. 10, London