The EU Cohesion Policy:
Factors conditioning economic growth and impact evaluation

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Abstract

The European Union's Cohesion Policy is one of the most important regional development programmes in the world. However, there is no consensus in the academic literature as to its impact on the economic opportunities and developmental trajectories of the EU's most disadvantaged areas. This thesis aims to contribute towards the on-going policy and academic debate on post-2013 EU Regional Policy by identifying the factors conditioning the relationship between EU Regional Policy and economic growth (i.e. policy Contextualisation) and assessing the policy's net impact upon territorial cohesion (i.e. identification of causality links). The econometric analysis of EU regional growth dynamics shows that EU Regional Policy expenditure is positively associated with regional economic growth in all regions. However, the link is stronger in the regions with better pre-existing socio-economic conditions. Furthermore, EU Regional Policy closely interacts 'on the ground' with other EU policies: its correlation with regional growth is maximised when its expenditure is complemented by Rural Development and Common Agricultural Policy (CAP) funds. In addition, it can offset the CAP spending's potentially negative territorial impact and reinforce the positive effect of Rural Development spending. The positive effect of EU Regional Policy has been confirmed within an impact evaluation framework. Regression Discontinuity Design results - based on an innovative spatial approach - suggest a net positive impact of EU Regional Policy on the local economic development experienced by Italian municipalities. The policy increased employment in the economic sectors directly targeted by the policy measures (i.e. manufacturing, construction and tourism). In addition, there is no evidence of a displacement effect on the richer areas in the North in favour of the South of Italy. When a similar approach is applied to the cases of Spain, Germany and the United Kingdom - thus disentangling the influence of different country-specific contextual conditions - the policy impact on employment in 'policy-eligible' areas remains generally positive and significant but with heterogeneous effects depending on the characteristics of the countries in question. These results suggest that part of the controversy on the EU's Regional Policy impact can be clarified by developing appropriate counterfactuals for policy evaluation and by taking country-specific differences into account.

"Cohesion policy can enable the EU to respond to the expectation of the European citizens that everyone, irrespective of where she/he lives, is able to benefit from the economic gains from unification, to have equal access to the opportunities so created as well as an equal possibility of coping with the risks and threats"
(Barca Report, 2009 p. VII).

"The aim must be to assist regions to find their place in these global markets, and ensure equality of opportunity right across the entire Union in order to achieve the principal ambition of promoting economic and social cohesion. It is a policy which addresses opportunities for the future, by mobilizing underexploited potential, rather than compensating for problems of the past"
(Bradley, Untiedt and Mitze, 2007).

Index

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INTRODUCTION

The thesis aims to contribute towards the debate on the Cohesion (or Regional) Policy of the European Union (EU) by focusing, first, on the factors conditioning its influence on European regional economic growth and, second, on its impact upon growth and employment.

The aim of EU Regional Policy is to reduce disparities in economic development, employment and opportunities as between the most advanced and the most disadvantaged areas of the Union (Art. 158 of the Treaty of the European Union). In its current form, this policy is not only aimed at inter-regional income redistribution but also at creating the basis for long-term sustainable development in the most disadvantaged areas (Rodríguez-Pose and Fratesi, 2004). It represents an essential pillar in the process of European economic integration together with the actions to support the development of the single market, the single currency and the progressive decrease in national-level influence on economic development processes (Barca, 2009; European Commission, 2013). In terms of financial allocation, the resources devoted by the Union to territorial cohesion have more than doubled since 1975. The EU Cohesion Policy alone accounts for roughly 1/3 of the EU's budgetary resources for the 2014-2020 programming period.

Despite the political emphasis placed on the 'economic convergence' objective, and the substantial amount of financial resources devoted to the EU Regional Policy, the EU's economic development geography remains highly uneven. In the last two decades, regional disparities in income levels, employment rates, economic structures, comparative advantages and development patterns (Esteban, 2000; Martin, 2001; Midelfart-Knarvik and Overman, 2002; Overman and Puga, 2002; Puga, 1999; Puga, 2002) have increased. Today, territorial disparities within the EU are significantly higher than disparities within the United States (Farole, Rodríguez-Pose, Storper, 2009; 5th Cohesion Report, 2010; Rodríguez-Pose and Gill, 2004). The EU is characterized by "increasing economic integration among nation-states with relatively similar levels of development" coupled with "different social, institutional, and technological features in regions" (Barca, McCann and Rodríguez-Pose, 2012, p. 143).

In response to the growth of developmental challenges inside and outside the Union the conceptual foundations and approach of the EU Regional Policy have also improved since the policy was first introduced. The reliance on processes of 'automatic' economic convergence (Solow, 1957) was questioned as soon as it became apparent that the search for the drivers of economic growth could not be limited to market imperfections and capital allocation (Bennedsen, Malchow-Moller, and Vinten, 2005). Imperfect competition and increasing returns became progressively more central to economic analysis thus making it possible to uncover new mechanisms underlying the genesis of economic growth: space, agglomeration economies and transaction costs (Fujita, Krugman, and Venables, 1999) together with human capital, skills and innovation (Grossman and Helpman, 1991; Lucas, 1988; Romer, 1986).The

"absolute" economic convergence became "conditioned", implying the existence of "convergence clubs" (Baumol et al., 1989) among economies with similar "structural" characteristics. In such a scenario, the poor regions became poorer, the rich areas richer and the middle-income units simply vanished (Quah, 1996). At the same time, the analysis of long-term economic performance progressively uncovered the importance of institutional factors as key catalysts and shapers of economic activity in different contexts (Acemoglu and Robinson, 2000; Acemoglu and Johnson, 2006; Rodrik, 2007). When institutional theories of economic performance are given a fully spatial and territorial dimension, additional endogenous aspects are recognised to characterise local-level economic development : "proximities" (Boschma, 2005), "spillovers" (Jaffe, 1989), "meso-level relations" (Iammarino, 2005), "relational capital" (Capello and Faggian, 2005), "local and translocal linkages" (Storper, 2007). The combination, cross-fertilisation and the interaction of these drivers within a "diversified relational space" (Capello, 2007) provided the foundations for "integrated frameworks" with which to analyse regional economic performance and the design of territorial development policies (Barca, 2009; Barca, McCann and Rodríguez-Pose, 2012; Crescenzi and Rodríguez-Pose, 2011; McCann and Ortega, 2011). The use of more holistic and 'integrated' frameworks as diagnostic tools for analysing local conditions (Rodrik, 2007) have recently –at least in principle – permeated regional and local policy-making practices. In this sense, the 'New Regional Policy' paradigm (OECD, 2009) suggests that all European policies, irrespective of whether they are 'spatially targeted' or 'spatially blind' (Duhr et al, 2010) can support territorial cohesion and promote growth in 'all regions' (including economically disadvantaged areas) by means deploying a 'place-based' approach. In this perspective, regional policies should be tailored to local social, institutional and cultural conditions and support the development of systematic links between local and external actors (OECD, 2009). 'Place-based' policies are based on a bottom-up approach that places empowered local actors at the very centre of policy design, implementation and monitoring, along with full 'local ownership' of development strategy (Canzanelli, 2001; Barca, 2009).

The internal and external conditions influencing EU regions' growth trajectories have changed dramatically over the past twenty years. At the same time, as discussed above, the conceptual foundations of local and regional development policies have also changed. However, in sharp contrast to this developing scenario, the literature on the evaluation of EU Regional Policy impact and the analysis of its conditioning factors has remained relatively limited, and often hindered by a one-sided approach that pays little attention to context-specific factors in sharp contrast with the enhanced knowledge basis requirements of the 'new' EU Regional Policy. In the literature, the attention given to the role played by contextual conditions and other factors that condition the link between policy and its intended objectives, has often been ignored in the development of appropriate counterfactuals. Similarly, counterfactual approaches have often delivered 'black & white' policy evaluations with limited indications of potential remedies.

In order to contribute towards overcoming these limitations in the literature, this thesis aims to bridge the gap between the analysis of contextual conditions and conditioning factors and counterfactual analyses by viewing the EU Regional Policy as part of a broader 'integrated territorial system'. Consequently, the thesis sets out to assess the EU Regional Policy by a) taking account of the 'conditioning' role played by territorial contextual conditions (and other EU policies) on determining its successes and failures; b) evaluating its impact against a suitable counterfactual able to disentangle the impact of the policy from the impact of interconnections with other territorial elements.
Following this line of reasoning the thesis will address three main research questions that are highly relevant to the on-going debate on the future of EU Regional Policy (EU Commission, 2013; Garretsen et al., 2013):

1. How do contextual conditions and other EU policies influence and shape the link between the EU Regional Policy and Territorial Cohesion?
2. Can we determine the policy's net impact on regional economic and employment performance when assessed against an appropriate counterfactual?
3. Does the policy's net impact vary according to the diverse institutional and policy implementation conditions of the various countries?

Addressing the first research question requires the *Contextualisation* of the policy within a fully 'integrated territorial system' whereby the EU Regional Policy interacts with different socio-economic conditions as well as with other EU policies. The second research question necessitates an *Identification* strategy capable of isolating the policy's impact from the influence of other co-existing factors that - from a statistical point of view - generate endogeneity bias. The third research question requires that the heterogeneity implicit in the policy's impact be initially broken down into two areas: the influence of territorial "conditioning factors" (netted-out by the counterfactual analysis) and higher-level country-specific differences (singled out by comparing the net-impact across different countries) (*Identification* and *Contextualisation*).

In order to answer the foregoing research questions the thesis is organized around four main chapters. Chapter 1 reviews existing literature in order to identify relevant gaps and build the foundations for subsequent empirical analyses. On the one hand, it analyses works that have studied the policy in relation to other factors such as territorial context and other EU territorial and sectoral policies (*Contextualisation*), and on the other, it analyses the literature that have evaluated the impact of EU Regional Policy using a counterfactual policy-evaluation framework (*Identification*). The analysis of the literature on "conditioning factors" will reveal that the different contributions focused on separate factors, and that the cross-fertilisation between complementary theories and approaches was limited. Counterfactual analyses aimed at identifying policy impacts by comparing treated observations with their

counterfactual: in non-randomized contexts (such as the EU Regional Policy evaluation), different methodologies (e.g., Regression Discontinuity Design - RDD; Propensity Score Matching - PSM; Differences-In-Difference – DID; Synthetic Control) have been applied to create a scenario in which the randomized properties still hold (Blundell and Costa Dias, 2002). The analysis of both streams of literature suggests, first, that these results and conclusions are highly dependent upon the conceptual approach adopted by the various authors, and hence their assumptions and methodological choices and, second, that the interaction between these two areas of research remains very limited.

Chapter 2 focuses on the *Contextualisation* of the EU Regional Policy. The policy is analysed as part of an 'integrated territorial system' which, in its turn, is based upon the identification of the key drivers of regional economic performance and their interactions. These regional growth drivers include structural socio-economic territorial characteristics (the "territory" subsystem) and the EU policies operating in a given geographical unit (the "policy" subsystem). The regional growth drivers within the 'territory' subsystem include physical (Aschauer, 2000) and human capital (Lucas, 1988), demographic, local labour market and productive structures (Crescenzi and Rodríguez-Pose, 2011), innovative activities (Iammarino, 2005), agglomeration and the specialisation of the economy (Krugman, 1999). The 'policy' subsystem, instead, comprises all EU policies with spatial implications: the EU Regional Policy, other 'spatially targeted' policies such as the EU Rural Development Policy and the Common Agricultural Policy (CAP) that influences territorial cohesion notwithstanding its sectoral nature (Duhr et al. 2010; Esposti, 2007). These various components interact with one another: structural contextual conditions influence and are influenced by EU policies (interaction between 'territory' and 'policy') and different policy areas can generate synergies or conflicts (policy structure). The relative importance of the regional growth determinants in the various subsystems is assessed by means of a two-way fixed-effect panel data analysis covering all the regions of the European Union. The analysis is based on a dataset that includes information on regional GDP growth, economic and socio-economic conditions and regional-level expenditure for EU Regional Policy, Rural Development and the CAP. Traditional and spatial econometrics tools are then applied to minimize omitted variable and reverse causality biases.
This chapter shows that the contribution of the EU Regional Policy to EU economic growth is positive irrespective of territorial contextual conditions. However, benefits are maximized in regions with stronger pre-existing socio-economic conditions and where there is a synergistic interaction with other EU policies, whether 'spatially targeted' (RDP) or 'spatially blind' (CAP).

Chapter 3 focuses on *Identification* and aims to disentangle the impact of the EU Regional Policy from all other territorial elements that the *Contextualisation* analysis showed capable of influencing the policy's impact. This chapter is based on counterfactual analysis methods that identify the causal effect of policy benefits (i.e. eligibility for EU objective funds) by comparing survey groups (municipalities) with similar observable characteristics except for their policy-eligibility (Angrist and Imbens, 1994; Morton, 2009). In

this framework, the structural characteristics of the regions are not explicitly included in a regression model but they are, however, used to compare the *treatment* and control groups.
Although counterfactual methods were initially developed for randomized experiments, where specific conditions can be met, they can, nevertheless, be applied in non-randomized contexts. In this chapter a Regression Discontinuity Design (RDD) will estimate the impact of EU Regional Policy on employment in Italian Objective 1 regions. This tool identifies *treatment* discontinuity with reference to the administrative boundary between 'Objective 1' and 'non-Objective 1' regions and estimates net impact in an 'as good as random scenario' represented by the municipalities approaching this policy cut-off.
In contrast to basic OLS results, which are affected by endogeneity bias, the RDD model has found that the policy had a positive, significant and robust impact on employment variations in the municipalities in Objective 1 regions in Italy. This positive impact on treated areas seems to reflect a genuine process of local economic development. First of all, the policy does not displace economic activities from the richest (untreated/non-eligible) to the poorest (treated/eligible) Italian areas. Second, the most significant job creation takes place in sectors given special support by the policy insofar as directly linked to specifically local enterprises (i.e. manufacturing, tourism and construction).

Chapter 4 (*Identification* and *Contextualisation)* extends the policy impact evaluation presented in chapter 3 from the case of Italy to Spain, Germany and the UK i.e. to all other EU countries where a comparable "Objective 1"/"Non-Objective 1" discontinuity exists. The RDD model makes it possible to estimate the net policy impact in each country. Even though the EU Regional Policy follows the same set of rules and regulations throughout the EU, the literature suggests that its impact is highly differentiated across member states. This chapter aims to test to what extent this heterogeneity across member states depends on the different roles played by territorial 'conditioning factors' or whether, on the other hand, it reflects broader national-level factors. If substantial differences across countries survive even after controlling for endogeneity bias via RDD, they can be ascribed to country specific aspects originating at policy-design and implementation phases. In particular, the national level of governance is likely to be crucial in determining the ultimate policy impact.
The empirical analysis shows that a large part of the heterogeneity across member states disappears when appropriate counterfactual methods are adopted. In contrast to OLS estimations, the RDD estimates a generally positive net impact in all countries (heterogeneity due to endogeneity bias). However, different significance levels and magnitude of the coefficients still characterize the results suggesting that national effects do matter in shaping the policy's impact.

A final conclusive chapter summarizes the thesis' key findings and conclusions . Overall its findings confirm that the EU Regional Policy is an indispensable complement to traditional macroeconomic and structural policies and "represent a new frontier in the search for sustainable growth, convergence and cohesion" (Pezzini, 2003, p. 1). However, the evidence included in the thesis provides a number of

insights into factors that shape the policy's impact and the causal mechanisms linking it to regional economic performance.

1 THE ANALYSIS OF THE EU COHESION POLICY: CONCEPTUAL FRAMEWORK AND EMPIRICAL EVIDENCE

1.1 Introduction

This chapter aims to depict the conceptual framework of the thesis starting from the literature produced on the EU Regional Policy. In view of the policy's considerable importance it has become of subject of detailed analysis by many academics and Institutions. The studies hitherto undertaken have conducted in-depth analyses of policy structure, its relations to European growth patterns and the impact on convergence, GDP growth, employment, productivity and economic performance in general. Consequently, an extremely multifaceted picture emerges. Therefore, given the policy's importance for the European Budget (confirmed in the 2014-2020 programming period) and the correspondent lack of consensus on its impacts and cost-opportunity good reasons exist for an in-depth review of the ongoing debate.

This Chapter aims to identify the key gaps in the existing literature with reference to both the policy contextualisation and counterfactual impact evaluation in order to build the foundations for empirical analyses capable of contributing to the literature in both these directions (Contextualisation and Identification).

1.2 Characteristics and historical development

The European Union is one of the leading examples of economic and political integration in the world. The process of integration – by reducing transaction costs and facilitating the spatial adjustment of factors of production – has fostered income convergence between countries. However, in line with similar trends in other areas of the world (Kanbur and Venables, 2005), economic divergence within countries also occurs in Europe as economic disparities increase between regions (Di Taranto, 2008). Only a limited number cities and regions have been able to benefit from globalization while others remain stagnant, struggling to compete in the global arena (Farole, Rodríguez-Pose and Storper, 2009).

In order to offset the detrimental effects of the processes of economic globalization and European integration affecting the EU's less developed areas, regional policies and territorial cohesion are fundamental components of the European Union's common set of strategies and policies (Treaty of Rome, 1957).

During the initial stages of the process of European integration a "top-down" approach was adopted in the design and implementation of EU policies. The benefits of integration were expected to spread automatically and comprehensively among the union's areas and actors (Pike, Rodríguez-Pose and Tomaney, 2007). Similarly, EU policies were designed to support sectors considered strategic for the European Economy (e.g., agriculture) and which benefitted the European economy overall (Armstrong and Taylor, 2010; Manzella and Mendez, 2009). Although acknowledging a 'regional issue' in all European countries (Messina convention, 1955) and despite the fact that Italy (whose Mezzogiorno represented a territorial problem par excellence in post-war Europe) was one of the European Community's founding countries, most of the first EU policies remained strictly sectoral and a-spatial.

Specific resources to finance regional development were only funded in 1975 when the European Regional Development Fund – ERDF – was set up. Subsequently, it was merged with two other pre-existing EU financial instruments to form the Structural Funds (SF), i.e. the European Social Fund (ESF), the European Agricultural Guidance and Guarantee fund (EAGGF), which supported the Second Pillar of the CAP, and later with the Financial Instrument For Fisheries Guidance (FIFG) and the Cohesion Fund.

The increase in internal regional disparities within existing EU Member States (MS) coupled with subsequent enlargements of the Union to include less developed countries and regions progressively increased the spatial inequalities in the EU. In response to this development the Structural Funds saw their share of the EU budget increase in the 1980s in order to promote economic adjustment in structurally-weak regions and countries (Mairate, 2006; Padoa-schioppa, 1987). In 1986 (art. 158 Treaty of Rome) the principle of cohesion – i.e. the reduction in disparities in economic performance and opportunities amongst European regions – became one of the EU's key policies.

At the same time, and in line with the development of the concepts and theories of regional economic development and the failure of the 'top-down' sector policies to sustain the most marginalized sectors of the economy, the EU Regional Policy progressively adopted a "bottom-up" approach to policy (e.g., the experimental Integrated Mediterranean Programmes, 1995; and the Leader Programme, 1988). By defining a single programmatic framework for all the territorial measures[1] Agenda 2000 sets the scene for an integrated policy capable of promoting economic and social cohesion processes across Europe (de Filippis and Fugaro, 2005; Fanfani and Brasili, 2003; Manzella, 2009).

According to the strategy for 'smart, inclusive and sustainable' growth that would make Europe a leader economy in the world ("Lisbon Strategy" and "Europe 2020"), innovation, social inclusion and employment are to become the EU's core objectives (Mancha-Navarro and Garrido-Yserte, 2008). In this sense, the Cohesion Policy acquired a new approach by progressively becoming more focused on growth and employment (European Commission, 2009).

The increasingly strategic role played by the EU Regional Policy over the decades went hand-in-hand with the increase in it its share of the budget in the financial framework periods from 1988-1993, until 2007-2013 (European Commission, 2010).

Meanwhile, the policy's increasing bottom-up approach corresponded to a change in the composition of the measures financed. The main tools adopted during the earlier programming periods comprised investments in large infrastructures and incentives to enterprises (EU Commission, 1999). Almost half of the SF budget (€138.2 billion) was earmarked to business development (industrial investment support and SME development), and the 11% of the resources was allocated to physical infrastructure such as transport facilities, energy and environmental projects (Puigcerver-Peñalver, 2007). The other priorities varied widely from country to country. In the 2000-2006 period, SF expenditure further increased (to 195 billion euros), representing approximately one third of the total EU budget. In line with the new

1 Reg. n. 1260/99; Reg. n. 1261/99; Reg. n. 1262/99; Reg. n. 1263/99; Reg. n. 1257/99; Reg. n. 1750/99; Reg. n. 1257/99; Reg. n. 2603/99.

theoretical approaches, human capital support, innovation incentives and environmentally sustainable initiatives acquired greater prominence. Moreover, following the definition of the concepts of economic, social and territorial cohesion (Europe 2020) more attention began to be paid to territorial cooperation (across national borders and, through specific programmes, with the neighbouring countries) and to the urban dimension. In particular, as general principle emerged that the level of investment had to be adapted to the level of territorial development. The concentration of resources in favour of the most disadvantaged regions (i.e. regions whose GDP per capita was below 75% of the EU average, named "Objective 1" until 2006; "convergence" regions during the 2007-2013 period and "less developed" regions in the period 2014-2020) was another change in the same direction, and in successive programming periods this funding grew substantially. For the 1994-1999 period, "Objective 1" regions accounted for 68% of all SF resources. This meant that one third of the total resources of the Union's budget (€114 billion, in addition to a match-funding of national public and private resources of a further €95 billion), was targeted at 92 million inhabitants (one quarter of the total population of the EU as a whole).[2]

For the 2000-2006 period, more than two thirds (€137.80 billion) of the SF were earmarked to roughly fifty "Objective 1" regions throughout Europe, covering 27% of the European population (Puigcerver-Peñalver, 2007). The concentration of resources allocated to the most disadvantaged areas was further increased in the 2007-2013 period: 82% of SF resources were allocated to 35% of the EU's population ("convergence" regions). For the 2014-2020 period, the "less developed regions", where the 27% of the EU-27 population live, will receive 165 billion of the €325 billion devoted to cohesion by the SF and the Cohesion Fund. The other EU regions, "transition regions" (75-90% of the average Union GDP) and the "more developed" regions will also be targeted but at relatively lower funding levels.

Furthermore, in the course of the various policy periods, the measures of the EU Regional Policy became increasingly targeted and concentrated on fewer priorities. During the 2007-2013 period, when cohesion resources represented up to 35.7% of the total Community budget (European Commission, 2008), knowledge and innovation absorbed ¼ of the €347.41 billion committed to the SF, of which up to 60% was funded by the ERFD. The other ERDF priorities were transportation (roughly 20% of total SF), environmental protection and risk prevention. The ESF's core priority was represented by human resources: education, social inclusion, employment and training (EU Commission, 2008). For the current policy programming period (2014-2020) roughly 80% of the policy's total resources is concentrated on innovation and research, the digital agenda, support for small and medium enterprises, as well as trans-European transport links and key environmental/ infrastructural projects. For the ESF measures, the broad aim is to promote employment, followed by labour mobility, improved educational systems, the social inclusion of all minorities, and all categories of persons disadvantaged by the economic crisis, in

2 Almost 51% of the EU population was living in areas which are eligible under one of the Structural Funds' four regional objectives. "Objective 1" regions alone represent 26.6% of the EU population (more than in the previous period 1989-1993, when the share was of 21.7%).

addition to better public administration. All these priorities are place-based, verifiable and have EU-wide relevance.

Since questions concerning the effectiveness and the performance of the policy are now of great moment, EU Regional Policy is emphasising results and accountability, and in such a context, clear, transparent and measurable targets are enormously helpful. Furthermore, policy "conditionality" has nowadays a fundamental role in supporting policy to achieve its broad objective of cohesion.

1.3 Empirical evidence and gaps

In view of the EU Regional Policy's increasingly strategic role and spending power, its impact and effects have become a subject of academic analysis.

As discussed above, the main objective of the EU Regional Policy is 'to promote the overall harmonious development' of the EU, reduce disparities between the development levels of the various regions, and strengthen their 'economic, social and territorial cohesion' (Art. 158 Treaty on European Union). Consequently, evaluation has focused on the capacity of the SF to promote economic growth and convergence among European regions and reduce the gap between advantaged and disadvantaged areas. Empirical studies on the EU Regional Policy not only share the same objective of evaluation but also have to meet the same challenges presented by the policy's nature and functioning (Baslé, 2006); and possibly such studies are also characterised by the same weaknesses (Mohl and Hagen, 2010).

First, the policy operates in very different local contexts and targets very heterogeneous economic and social features. Although it has a common regulatory framework, it must address different national and regional circumstances using different institutional arrangements.

Moreover, its operations comprise a multiplicity of measures, and a multiplicity of national, regional and local rules and systems (Bachtler and Michie, 2007). The programmes comprehend a range of interventions (physical and economic infrastructures, business and technological developments, human resources, innovation and environmental improvement) based on a mix of financial instruments for many types of beneficiaries. This multiplicity of targets and contextual conditions is per se a challenge for any evaluation exercise.

Furthermore, European expenditure is construed to be an addition to national expenditure but verifying to what extent this takes place is a very difficult matter to determine in practice (Bouvet and Dall'Erba, 2010).

Moreover, in terms of the timescales involved, policy-makers are often called to take decisions on policy changes and reforms well in advance of the availability of long-term evaluations of the status quo: decisions on each programming period are taken well before the previous expenditure cycle is concluded. Furthermore, as regards spatial analyses, the policy's mechanisms deploy different spatial levels, making it difficult to identify an 'optimal' spatial unit of analysis for impact evaluation.

Finally, the lack of data and heterogeneous definitions of relevant indicators further complicate the analysis. Both policy and economic performance/outcome indicators can be measured/proxied by

different variables, however, the choice of such proxies may have important implications for the results of the various analyses'[3] (Pastor, Pons and Serrano, 2006). In most cases, the variables studied are "payments" or "commitments" as concerns the policy and "GDP Growth Rate per capita" or "Employment Rate" as concerns economic performance (Mohl and Hagen, 2010). The choice of the policy variable can, in particular, be a discriminant for an analysis' design and ultimate results. By using "expenditure" data instead of "commitments", for instance, means having to take account of the time duration of a procedure, at whose conclusion the Commission will disburse payments. Depending on the administrative capacity of the various countries this procedure could be very different in length and effectiveness, resulting in higher actual expenditure in the most administratively efficient countries and regions. Consequently, the use of "payments" as a policy variable can entail endogeneity issues. On the other hand, "commitments" is just a proxy for the effective resources deployed by the policy. For reasons similar to those regarding payments (e.g., capacity to fully develop planned projects) the amounts may differ considerably from the amount actually spent.

Additional evaluation challenges are directly linked to policy design and implementation. First of all, there is the issue of the policy's eligibility criteria. Targeting policy only using GDP criteria may be misleading with respect to the broader aim of territorial policies, namely making all citizens capable of benefiting from the opportunities of EU integration (Sen, Fitoussi and Stiglitz, 2009). Moreover, focusing on GDP may be not the best option, even as concerns the evaluation of the impact of the policies themselves (Cuadraro-Roura, Garrido-Yserte and Marcos Calvo, 2004).

In addition to GDP eligibility criteria, we should also consider that the territorial level at which the policy is targeted and evaluated may be not be the most appropriate to measure its effects (Eurostat, 2007; OECD, 2009). In particular, "functional areas" are deemed a more valid recipient than administrative\statistical regions (Ladias and Stilianos, 2011).

An additional challenge for measuring the impact of the policy is linked to role of spillovers. By funding 'Objective 2'/more developed regions could generate spillovers of a different nature in poorer neighbouring 'Objective 1' areas and the latter could consequently benefit from positive externalities deriving from areas more capable of attracting investments. However, such indirect benefits are hard to conceptualize and account for in evaluation exercises (Baslè, 2002).

Finally, an evaluation of the SF needs necessarily consider the efficiency-equity trade-off; e.g., the achievement in reducing disparities (equity) at regional level may be accompanied by the abatement of the total output growth (efficiency) (Checherita, Nickel and Rother, 2009).

For all these reasons, the EU Cohesion Policy "cannot be judged purely on directly measurable outcomes, but needs to be judged on its contribution to the wider economic development effort and how it

3 Pastor, Pons and Serrano (2006) specify, in analyzing the Spanish case, that the assessment conclusions are strongly influenced by the variables chosen as dependent variables. They report a huge variety of suggestions in terms of "outcome variable" proposed by many studies on policy evaluation, and stressing particularly the different results that could arise by choosing "permanent income" as a dependent variable instead of "current income".

improves the strategic use of other policy instruments, with one source of added value being to push member states to follow good practice" (Begg, 2010, p. 85; Mairate, 2006).

If a number of intrinsic features of the policy and its objective challenge the identification of its impact, the often contradictory results produced by different studies (Mohl and Hagen, 2010) may be attributable to the approach taken. We can consider these factors in terms of two key dimensions:
i) *Contextualisation* of policy;
ii)The *Identification* strategy adopted to determine the net impact of the policy.
In the following section, the evidence produced by the existing literature on the impact and conditioning factors of EU Regional Policy will be reviewed and critically analysed in order to shed light on how different policy *Contextualisation* and *identification* strategies shape the conclusions reached by various analyses on policy effectiveness, value added and suggested improvements.

1.3.1 Contextualisation

Putting the EU Regional Policy in context means assessing its link to outcomes by taking full account of the direct and indirect influence of a broad set of territorial factors influencing and shaping this relationship. There is a consensus in the literature that the relationship between the EU Regional Policy and economic performance needs to consider a broad set of theoretically justified elements. However, different contributions have focused their attention upon a very heterogeneous set of territorial facts. These elements are different and proxied differently. The degree and the nature of *Contextualisation* that characterizes each empirical study strictly depend on the corresponding theoretical foundations. In contrast to the analyses based on a neoclassical framework (Boldrin and Canova, 2001),[4] later studies have explained economic growth as a result of a diversified set of determinants (e.g., research and development, human capital, institutional quality), non-linear processes/relations (e.g., innovation systems /institutional analyses) and the balancing of opposing forces (e.g., dispersion/agglomeration).[5] The analyses developed in all these different conceptual frameworks investigate the impact of the policy within a "conditioned" version of the convergence model (Mohl and Hagen, 2010).

From a methodological point of view, overlooking (some of) the elements that influence the relationship between the EU Regional Policy and regional economic performance, entails *omitted variable* and *reverse causality* biases.

4 They tested whether structural policies have any impact on the income disparities between countries and regions, investigating the behavior of the distribution of the regional per capita income for the period 1980-1996. They found that in 1996, there is still no real tendency for the regional per capita income to grow "to their central base of attraction". The gap between the upper and the lower part of the distribution did not really change over time confirming the absence of a systematic catching up of poor regions. Rich regions for the authors can be taxed more heavily for solidarity reasons but not in the hope that these transfers will foster the development of poor regions. The authors**,** conclusion reflects the implication that derives from their theoretical approach: according to the neo classical framework, labour and capital are the factors of the growth production, that in the long term, can be sustained only by technology, assumed here as an exogenous factor.

5 They are identified by three main literature branches: endogenous growth theories, new economic geography and institutional economics.

This bias can emerge because some territorial elements are not considered relevant in a specific conceptual framework. However, in some cases, they are simply not observable or unmeasurable. As a result, many analyses make allowance for the existence of an 'unobserved component' specific to each analysis' units by adopting a panel data approach.

The panel data approaches make it possible to partially control (although not directly identify) for unobserved factors affecting the causal relation between the policy and the outcome variable. Time-invariant 'unobserved specific components' (αi) of the regional growth process are isolated by exploiting the fact that data for the same observations are repeated over time. Since a region's characteristics accounted by the 'unobserved specific component' are likely to be correlated with other regional aspects[6] included in the model, the Fixed Effect (FE) methodology[7] is generally preferable to the Random Effect (RE) methodology (Rodríguez-Pose and Fratesi, 2004; Soukiazis and Antunes, 2006).

In order to further disentangle both dependent and independent variables from any additional source of endogeneity, FE Panel methods are integrated by different kinds of instrumental variable (IV) strategies.

Empirical analyses based on this approach have failed to reach a clear consensus on the impact of the policy. A static IV estimation provided by instrumenting policy with political variables and considering growth as exogenous (Bouvet, 2005) concluded that EU Regional Policy has a positive effect on both Total Factor Productivity (TFP) and employment.

Similar specifications have been tested by means of General Method of Moments (GMM)[8] analyses to remove endogeneity linked to the autoregressive pattern of the variables. Their conclusions indicated a 'conditioned' (Ederveen, Gorter Mooij and Nahuis, 2002; Ederveen, De Groot and Nahuis, 2006), limited (Esposti and Bussoletti, 2008) or non-significant (Crescenzi and Rodríguez-Pose, 2011) policy impact.

By instrumenting both policy and growth, Beugelsdijk and Effinger (2005) found that the policy has a positive impact on European regional growth while Percoco (2005) concluded that the EU Regional Policy decreases the volatility of growth rate in Italian Objective 1 regions (Percoco, 2005).

Another general feature of the estimation of the link between the EU Regional Policy and economic performance is 'spatial autocorrelation'. The performance and role of the policy can, in fact, be influenced by spatial dependences exhibited by spatial units for both dependent and explanatory variables. In this sense, spatial econometric techniques through the use of spatial filters derived from spatial weighted matrixes can explicitly account for the non-independence of neighbouring observations. Both spatial correlation in residuals and spatial interaction among variables and then the spatial spillover effects (Griffith, 2003) are hence cleaned out from the estimation.

6 The unobserved territorial characteristics are likely to belong to a "meso layer" (Iammarino, 2005) arising from the interactions among micro units (e.g. local actors) and macro trends (e.g. national economic and political institutions) within the "integrated territorial system".

7 They allow for the correlation between αi and the other regressors of the model.

8 The GMM can be computed both in a Difference (Arellano and Bond, 2001) or in a System (Blundell and Bond) version. The first case uses the lag of the dependent variable as instruments. In the second case the internal instruments are represented by the first differences of the dependent variable itself.

These specifications also make it possible the breakdown of regional growth into a global trend effect and a local effect (Montresor, Pecci and Pontarollo, 2011).
For these studies, the SF policy effect is generally non-significant (Mohl and Hagen, 2008). However, the existence of club convergence (Dall'Erba and Le Gallo, 2003) was recognised. Other studies also claim better performance for Objective 1 Funds (Bouayad-agha, Vedrine and Turpin, 2010; Dall'Erba and Le Gallo, 2008) and a faster convergence for cohesion country regions (Ramajo, Màrquez, Hewings and Salinas, 2008). According to findings based on these specifications, spatial spillovers originating from the policy are positive and significant. In fact, they can increase the impact of ERFD payments as happens for labour productivity in German labour markets (Alecke, Mitze and Untiedt, 2013).

Panel data and spatial econometrics techniques make it possible to 'control' for unobserved components shaping the link between the policy and its outcomes. Controlling for these factors forms the basis for the Contextualisation of the analysis. However, various contributions have explicitly included in their analysis, and focused attention upon, a variety of other (time-variant) contextual conditions linked to both the 'Territory' (a) in which the policy works and the 'Policy' realm (b).

a) The most relevant territorial aspects investigated as factors conditioning the policy's impact are institutional and structural.
   With respect to the institutional elements, the EU Regional Policy impact is positively influenced by the degree of decentralization in the countries in which it is implemented (Bahr, 2008) as well as by the presence of national-level 'supportive Institutions' in terms of inflation controls, trust, openness and the lack of corrupt practices (Ederveen, De Groot and Nahuis, 2006), the degree of openness of the economies (Ederveen, Gorter Mooij and Nahuis, 2002) and national "institutional quality" in terms of the rule of law, corruption, bureaucracy, expropriation risk and governments' treatment of contracts (De Freitas, Pereira and Torres, 2003).
   With respect to the role played by regional structural characteristics for the impact of the EU Structural Funds (SFs), one of the discriminants is the geographical position of the beneficiary regions with respect to either the geographical 'core' of the European Union (Neven and Gouyette, 1995) or a country's decision-making centres (Soukiazis and Antunes, 2006[9]).
   Another discriminating factor refers to the initial conditions of the regions considered. The SF's effect is positive with regard to less developed European regions ('Objective 1' regions and cohesion-country regions). This has also been confirmed in terms of GDP per capita level, GDP growth, employment (Bouayad-agha, Turpin and Védrine, 2010; Esposti and Bussoletti, 2008; Mohl and Hagen, 2008; Ramajo, Màrquez, Hewings and Salinas, 2008) and cumulative job creation (Martin and Tyler, 2006). The same results were found by analyses performed at

9 Their analysis, performed at NUTS 3 level, showed that Portuguese coastal regions performed better than the interior ones.

national level (Leonardi, 2006) and analyses that pooled the regions of all the 27 European countries together (Becker, Egger, von Ehrlich and Fenge, 2008). However, despite the confirmation of the policy's positive role in 'Objective 1' Italian regions (Beutel, 2002), another study found no reduction in productivity differentials as between the Southern and Northern Italian regions (Aiello and Pupo, 2012). In addition, the Cohesion Fund's impact seemed to be positive in terms of GDP growth but non-significant for employment (Hagen and Mohl, 2009). Finally, one work finds no evidence of faster convergence by the poorest regions within the Union (De Freitas, Pereira and Torres, 2003).

Furthermore, country effects are also relevant. Once regions are clustered by country, the SFs' positive impact on convergence is not confirmed for Germany, Greece or Spain (Esposti and Bussoletti, 2008).

Regionally specific characteristics in terms of persistence and divergence together with a series of territorial aspects are also highly discriminating. The policy's impact is stronger in European areas with stronger absorptive capacity and weaker in the most disadvantaged areas (Cappelen, Castellacci, Fagerberg and Verspagen, 2003). In this sense, it might be better to limit the policy to specific localities rather than address large areas, such as those in the policy's objective (Stilianos and Ladias, 2011).

With respect to pre-existing productive structures and regional endowments the SFs can attract R&D intensive industries to countries without the right endowment of highly skilled workers (Midelfart-Knarvik and Overman, 2002). Furthermore, for economic structures dominated by agriculture and lacking R&D, the EU Regional Policy should be accompanied by long-term policies promoting structural changes in R&D capabilities (Cappelen et al., 2003). In this sense, a reallocation of skilled workers in favour of the R&D sector can stimulate increased growth, after a brief initial reduction (Varga and Vel, 2009).[10]

Finally, innovative capacity and Social Filters (broader regional socio-economic environment) are discriminants for European Territorial Infrastructural Policies (TEN-T) financed within the SFs. In their absence, the policy's impact is non-significant or even negative (Crescenzi and Rodríguez-Pose, 2008; Crescenzi and Rodríguez-Pose, 2012). This last piece of evidence confirms how, in contrast to neo-classical theories, the impact of infrastructural policies also depends on the characterisation of a territory in terms of social, cultural and institutional aspects.

b) Studies considering the conditioning role of "policy structure" analyzed the intrinsic characteristics of the EU Regional Policy and its relation to the other policies implemented in the

10 This evidence is provided by the QUEST III model extended to endogenous growth proposed in relation to the 2000-2006 financial period. A new version (Romolo) of this model has been recently rebuilt and it is now being retested by the EU Commission.

territory. These can have different levels of governance (European/ national/ regional), a different nature ("spatially targeted"/ "spatially blind") and/or a different rationale.

The effect of SFs total expenditure is not positive in absolute terms but individual areas of policy intervention may produce heterogeneous effects (Dall'erba, Guillain and Le Gallo, 2007). Only "education and human capital" investments have actually sustained medium term growth. Instead, support for "agriculture and rural promotion", "infrastructure" and "business" was ineffective (Rodríguez-Pose and Fratesi, 2004).

Moreover, the EU Regional Policy has, generally, been more effective after the 1989 Cohesion Reform (Cappelen, Castellacci, Fagerberg and Verspagen, 2003). However, the policy's positive role during the first post-reform programming period (1988-1993) was not carried over into subsequent periods (Puigcerver-Peñalver, 2004). The time effect can hence be relevant, especially when the years before and after this reform are included in analyses (Bradley and Untiedt, 2008).

The EU Regional Policy's relations with other EU policies - whether spatially targeted or sector policies with spatial impact[11] (e.g., the Common Agricultural Policy CAP and competitiveness policies) - can be extremely relevant (Duhr et al., 2010; OECD, 2009) for its impacts on territorial cohesion. The issue is even more important in a context of limited (and possibly decreasing) public resources.

During their respective developments, regional policy and the CAP have influenced one another. Together they represent roughly 80% of the total 2014-20 EU budget (EU Commission, 2013). For a long time, the CAP's market measures were at the core of EU policies. Instead, regional policy and the CAP's rural development pillar were underfunded and marginally developed (Crescenzi, de Filippis and Pierangeli, 2014; Saraceno, 2002). With the SFs Reform (1989) and Agenda 2000 CAP and regional policy become interdependent. In the 2000-2006 policy programming period, regional and rural development policies became part of a unique programmatic framework. Their different measures were implemented by the same Institutions (Fanfani and Brasili, 2003; Mairate, 2006; Manzella, 2009). In the 2007-2013 period they were separated from one another in term of programming and managing authorities. However, both EU institutions and researchers continue to stress their common contribution towards cohesion. In particular, the rural development policy's orientation towards cohesion is possible but not guaranteed by being incorporated in the "complex framework of cohesion policies" (Crescenzi, de Filippis and Pierangeli, 2014, p. 21).

Since they both are "spatially targeted", the strongest relation is found to be that between regional and rural development policies. However, it is increasingly recognized that the CAP's

11 "While some policies may be considered "space neutral" in terms of both their intent and outcomes– for example competition policies – others, albeit neutral in their intent – as in the case of the CAP – exhibit a considerable spatial impact (Crescenzi, de Filippis and Pierangeli, 2014, p. 6).

market measures have also spatial implications. In particular, they can also have a counter-treatment effect towards cohesion (European Commission, 2010). In line with the sector aim of agriculture support, CAP resources are 'captured' by dynamic, higher specialized and productive agriculture (Duhr et al., 2010). This feature of First Pillar CAP has a potentially perverse impact in terms of "distributive equity" by favouring the polarization of agricultural income (EU Commission, 1981) and preventing less developed areas from benefiting from its support (ESPON, 2005). Accordingly, academic literature shows how CAP payments impacted negatively on economic regional convergence during the 1990s (Bivand and Brundstad, 2003) and also more recently (Bureau and Mahè, 2008).

This counter-treatment effect on cohesion by the CAP's first pillar is not, however, completely supported in the literature. Some studies show that it can be mitigated by rural development measures (Shucksmith et al. 2005). Others found that the CAP does not counteract the impact of the SF (Esposti, 2007) and once regional characteristics are controlled for, its contribution to cohesion is even greater than "Objective 1" funds (Montresor, Pecci and Pontarollo, 2011).[12]

Apart from the CAP, other kinds of "spatially blind" EU policies can also influence EU territorial cohesion. For instance, competitiveness policies focused on R&D promotion cannot promote inter-regional convergence (Mancha-Navarro and Garrido-Yserte, 2008) unless accompanied by "educational" and "accessibility" policy efforts (Crescenzi, 2005).

Finally, also national policies operating simultaneously at local level can also be an influencing factor. Their role with respect to EU Regional Policy has been less studied but it seems they do have a countervailing effect on structural funds (Garcia-Mila' and McGuire, 2001).

In order to complete the review of the elements capable of shaping "policy structure", factors of political economy factors must also be considered.

Firstly, the political situation within a country and a region and the relations between various layers of governance influence the allocation process of the EU Regional Policy funds. Furthermore, the implications of the EU Regional policy in the balance between 'efficiency' and 'equity' differ as between countries with federal or centralized governments. For example, 'partisan politics strongholds' receive more investment in Spain and Italy, but this is not the case in either Germany or France. Votes to regional parties are positively correlated with regional investment in Spain, but not in Italy. Instead, left-wing parties are correlated with higher regional investments in both Italy and France, but not in Germany or Spain (Kemmerling and Stephan, 2009).

Moreover, also meta-political objectives concerning the organization of political and administrative power do influence regional investments (Albalate, Bel and Fagenda, 2011): in

12 The analysis shows how between 1995 and 2006 the CAP positively impacts on the convergence of 204 NUTS2 regions of the EU-15.

Spain, centralization rather than redistribution has been the driver behind the concentration of public investment. The distribution of funding for the development of infrastructure has followed a logic of concentration in favour of core areas rather than redistribution in favour of the most disadvantaged regions. Only the magnitude of investments in non-network-based infrastructure is positively correlated to the distance to the capital city. Conversely the distribution of funding for network-based infrastructure reflects the objective of concentrating resources in close proximity to the political Capital.

1.3.2 Identification

This Paragraph completes the review on the literature by considering studies whose main aim is to identify the policy's net impact. They estimate the policy's impact by comparing the policy outcome with a counterfactual scenario and contextual conditions highlighted in the literature reviewed above become simply instrumental for identifying counterfactuals.

This literature capitalises on the strength of experimental methods, originally developed for laboratory experiments: individual/units receiving treatment are randomly assigned to a 'treatment' group. Consequently, they only differ from the individuals/units that do not receive treatment (control group) in respect of the treatment itself. Under these conditions the effect of the treatment can be estimated reliably (Angrist and Pischke, 2009).

Such as situation (randomized-experiments), however, is not easily reproducible in the social sciences. In this case our interest refers not to a randomly assigned treatment but to natural events (natural experiments) or behaviour (non-natural experiments). In these conditions, the control group is no longer the direct "counterfactual scenario" of a treated groups, as the two groups could differ not only in respect of the treatment but also in respect of other elements that are neither randomly distributed nor identifiable (e.g., unobservable or un-measurable elements).

Fortunately, many methodologies (Regression Discontinuity Design - RDD; Propensity Score Matching - PSM; Differences-In-Difference – DID; Synthetic Control) can adapt randomized controlled trial methods to non-randomized scenarios. In contrast to a pure experimental evaluation, reserved for randomized studies, these all refer to a quasi-experimental design framework. Quasi-experimental designs cannot establish a counterfactual situation with the same level of confidence as randomization. Their challenge is to create an "as good as random" scenario within the non-randomized scenario that will be just sufficient to ensure unbiased estimations. There is, in fact, a reliable counterfactual that minimizes the effect of observable confounding or spurious variables. Here, randomized-experiment properties can be exploited to estimate the policy's impact in a framework free of any sources of endogeneity bias (Blundell and Costa Dias, 2002). The treatment could be effectively regarded as randomly assigned and the control group could represent the counterfactual with respect to the identifying policy effect.

According to their strengths, quasi-experimental designs are increasingly applied in very different fields of empirical economics. On the other hand, they have been far less used in the empirical literature on EU Regional Policy.

Applying the experimental approach in regional analysis entails some added difficulties with respect to micro level analysis. First, there are the difficulties of finding a perfectly statistical twin and utilising balancing properties. Second, these methods imply that there are no general equilibrium effects, which would be difficult to justify in a regional setting (Mitze, Paloyo and Alecke, 2012).

However, they represent a valuable alternative to classical regression tools. While the latter are valid for the exploration of the policy environment and contextual conditions they are unable to assess the policy's exogenous impact. This criticism is particularly significant for territorial policies as they are inter-dependent upon one another within the context in which they work. Experimental methods, by contrast, can deal with the methodological problem of endogeneity deriving from the interdependencies of the policy with respect to the context.

The following section reviews the major results that the literature on EU Regional Policy furnishes on the 'exogenous' impact of the policy.

The GDP criteria that mainly determine the Policy's assignment are often exploited as a discontinuity to estimate the impact of the transfers to 'Objective 1' regions. In this case, the 'as good as random' scenario comprises regions with GDP values closest to the assignment threshold value.[13] These regions are considered randomly assigned to treatment or not-treatment group. According to the Regression Discontinuity Design (RDD) 'Objective 1' regions were able to grow more than the others (Becker, Egger, von Ehrlich and Fenge, 2010; Pellegrini et al., 2013). In addition, there is a level of GDP per capita growth that maximizes the SF transfers. According to this level, there are regions receiving too much and regions receiving too little funding (Becker and Hegger, 2010). Finally, the policy impact appears greater when measured by parametric estimations rather than non-parametric estimations (Pellegrini et al., 2013).

Some other RDD analyses control for the policy's heterogeneous-treatment effects (heterogeneous local average treatment effect estimator). According to these studies, "absorptive capacity" (as measured by the quality of regional institutions and the stock of human capital) is a relevant discriminant for differences in outcomes (Becker, Egger, von Ehrlich and Fenge, 2011). However, the impact of Cohesion Policy is attenuated when the economy is characterized by a large service sector (Percoco, 2012).[14] Finally, as the SF targets regions whose local public assets are relatively inefficient they can also have the effect of compromising local endowments of trust and cooperation (Accetturo, de Blasio and Ricci, forthcoming).

The positive policy effects of the Regional SF (Hagen and Mohl, 2008), the CAP and the Rural Development Policy (Esposti, 2007) are also confirmed by propensity score matching analyses. In the

13 The threshold the 75% of the European average GDP in purchasing power parity.

14 The analysis look at the Italian NUTS-3.

German case, a binary PSM approach found higher labour productivity growth in regions funded by the "Joint Task for the Improvement of Regional Economic Structures" (GRW) (to which ERFD belongs) compared to non-funded regions (Mitze, Paloyo, and Alecke, 2012). This is the result of higher treatment intensities with a funding concentration of up to approximately two-thirds of the regional distribution of GRW payments (Mitze, Paloyo, and Alecke, 2012).

The greatest advantages of experimental methods are obtained in a micro framework. In this case, the properties of randomized experiments can be fully exploited. Thus, the "as good as random" scenario can be identified on the basis of the distribution of micro rather than macro observable and unobservable elements. However, notwithstanding such advantages only a few studies have actually used the methodology to assess territorial policies, and even fewer have assessed EU Cohesion Policy.

With respect to territorial policies, many papers make use of enterprises to study the effectiveness of public grants to promote technology and R&D. Some of them conclude that financial incentives have a positive effect in general upon corporate investments (de Blasio et al., 2011). Other RDD applications show that incentives have only been effective for small enterprises (Bronzini and Iachini, 2011 in the case of R&D incentives in Italian region of Emilia Romagna) and that the positive effect of Italian Law 488 on the recipient enterprises was at the expense of ineligible enterprises (Bronzini and de Blasio, 2006). Furthermore, although R&D expenditure in Italy is lower than international standards, external sources of innovation, such as proximity to top research centres, are relevant for smaller enterprises (Fantino et al., 2012). Other micro-based experimental methods have shown that the activities of foreign enterprises are positively correlated with domestic activities, and that the correlation is even higher for the domestic highly-skilled workforce and for enterprises that have adopted complex strategies of internationalization (Bronzini, 2010). In this sense, transferring part of production abroad does not disadvantage MNEs (Barba Navaretti et al., 2010). In addition, these analyses claim that enterprises in Southern Italian regions are strongly dependent on public support (Atzeni and Carboni, 2007). Finally, being situated in an industrial district is no longer an advantage in terms of productivity and export (Foresti et al., 2012).

Furthermore, with respect to EU Cohesion Policy, 'Territorial Pacts' were not found to stimulate growth (Accetturo and de Blasio, 2011) whereas "Contratti di Programma/ Agreements between public and private enterprises" did (Andini and de Blasio, 2012).[15] Finally, programmes offering incentives to enterprises in the Italian Piedmont region had a positive impact on employment; the greater the economic value of the incentives, the greater the effects. There is no significant difference as between the employment impact generated by co-founded ERDF and national/regional programmes (Bondonio and Greenbaum, 2012).[16]

15 The unit of analysis here is the Italian municipality.

16 The unit of analysis here is the firm.

1.4 Conclusions

This chapter has reviewed and critically analysed the existing literature on the factors conditioning the EU Regional Policy and its impact. The literature has been classified in terms of the focus on contextual conditions and conditioning factors (Contextualisation) or counterfactual methods (Identification). In analyses focused on policy Contextualisation, panel data methods and spatial econometrics have been extensively used in order to capture unobservable components and possibly minimize omitted variable bias. As concerns the nature of factors explicitly analysed in the literature, it is possible to identify both 'territorial' factors and 'policy' structure conditions linked to both EU Regional Policy and other EU policies.

The literature based on counterfactual methods has made use of a variety of features of the policy in order to build appropriate counterfactuals for assessing its net impact.

The following chapters will build upon both streams of literature and contribute towards: a) an improved *Contextualisation* of the policy by using panel and spatial panel data to analyse the 'territorial' and 'policy' factors shaping EU Regional Policy's link to economic performance; b) a clear *identification* of causal relationships by means of an innovative application of RDD methods; c) the interaction between the two streams of literature by extending RDD analysis to several different contexts.

2 COHESION AND ECONOMIC GROWTH: HOW CONTEXTUAL CONDITIONS AND OTHER EU POLICIES SHAPE THE IMPACT OF THE EU REGIONAL POLICY

2.1 Introduction

This chapter develops a *contextualised* analysis of the relationship between the EU Regional Policy and economic growth and aims to answer the following research question: How do contextual conditions and other EU policies influence and shape the link between EU regional policy and territorial cohesion?

In order to answer this question the analysis of the genesis of regional economic performance needs to take account of the 'systemic' nature of the context in which this phenomenon interacts with the EU regional policy. In particular, the analysis will examine the EU regional policy within an 'integrated territorial system' (OECD, 2009) where its linkages to economic growth are influenced by a set of territorial factors (the 'territory' subsystem) and (other) EU policies structures and characteristics ('policy' subsystem). The components of the 'territory' subsystem are identified by cross-fertilizing different streams of regional economics and economic geography literature with a holistic theory-driven approach (Crescenzi and Rodríguez-Pose, 2011). From this perspective, regional disparities in economic performance and the heterogeneous impact of the EU Regional Policy are driven by (a) innovation and geography; (b) the geographical integration of markets, combined with greater organizational and geographical fragmentation of production; and (c) persistent socio-institutional differences between places (Farole, Rodriguez-Pose and Storper, 2010). These factors will be operationalised by examining: (a) regional innovation efforts and their geography (proxied by extra-regional innovation activities) in line with the predicament of endogenous growth theories (Romer 1990); (b) agglomeration and specialization of the regional economy (Martin, 1999; Puga, 2002) and (c) local 'social filter' conditions as the combination of three main domains: educational achievements (Bramanti and Riggi, 2009; Lundvall, 1992; Malecki, 1997), the productive employment of human resources (Riggi and Maggioni, 2009) and demographic structures (Fagerberg et al. 1997; Rodríguez-Pose 1999). The interaction of these three components shapes the capability of each region to translate innovation efforts and external knowledge into economic growth (Crescenzi and Rodríguez-Pose, 2008; Rodríguez-Pose, 1999).

The 'policy' subsystem will instead comprise both EU 'spatially targeted' policies - i.e. the EU Regional Policy and EU Rural Development Policy – and the EU 'spatially blind' policy with territorial implications (Duhr et al, 2010). i.e. the Common Agricultural Policy (CAP), overall accounting for almost 90% of total EU public policy expenditure. For both Regional and Rural development policies the territorial aim is explicit (Barca, 2009; European Commission, 2010) and their relevance with respect to cohesion is direct. However, they interact 'on the ground' with CAP funding and with relevant spatial implications (OECD, 2009).

This chapter will focus on two key types of interactions: those between the 'territory' and 'policy' subsystems and those between the various components of the "policy" subsystem. The first set of

interactions will shed light on the role of the territory in conditioning the policy's impact (and addresses the first part of the research question as regards the role of contextual conditions). The second set, internal to the "policy" subsystem, will investigate the role of the EU policy structure overall in terms the synergistic actions of policies having different nature/sector and/or potential counter-treatment effects (and addresses the second part of the research question with reference to the link to other EU policies). This is an innovative approach as existing contributions in the literature – as highlighted in Chapter 1 – have only focused on one of the two subsystems separately and paid very limited attention to their interactions.

In line with this analytical framework, the empirical analysis will combine different EU policies in order to assess how their synergies and/or conflicts influence regional economic outcomes in different socio-economic contexts. The analysis will be based on panel data covering the EU15 regions over the 1994-2009 period.

Given that the relevant empirical literature on the factors conditioning and shaping the impact of EU Regional Policy has been reviewed in the previous chapter (see chapter 1.2), the rest of this chapter is structured as follows: paragraph 2.2 discusses how this chapter can improve upon the existing contextualisation of EU Regional Policy and presents a model of empirical analysis. Paragraph 2.3 presents the empirical results and paragraph 2.4 performs some robustness checks. Finally, the conclusions are presented in paragraph 2.5.

2.2 The *Contextualisation* of the EU Regional Policy. Territory and policy subsystems combined in one model of empirical analysis

In order to develop a fully contextualised analysis of the factors influencing the link between the EU Regional Policy and regional growth the 'territory' and 'policy' subsystems have to be translated into a model of empirical analysis along with their interactions:

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

Where:

ΔY is the regional GDP average growth rate over the period from t-1 to t;

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

X1 is the policy subsystem matrix;

X2 is the territory subsystem matrix;

X3 is the interaction matrix;

WX is the spatially-lagged variables matrix;

C is the control variables matrix;

ε is idiosyncratic error
and where *i* represents the unit of analysis and *t* the policy programming period (1994-1999; 2000-2006; 2007-2013/09).

In greater detail, the variables included in the model are as follows:

Regional GDP Growth rate per capita: the growth rate of regional GDP is the dependent variable and used as a proxy for regional economic performance. It is computed as the logarithmic ratio between average GDP per capita for the first three years of the period t and the correspondent value for the period t-1 (Eurostat, 2012). As is customary in growth analyses, GDP growth rate is hence computed over multiannual periods rather than on a yearly basis in order to minimize the influence of external macro trends and shocks.

Level of regional GDP per capita: the "initial conditions" of the regions are obtained by including the log-level of GDP per capita (Eurostat, 2012) at the beginning of each period (OECD, 2009).

'Policy subsystem' matrix:
The matrix allows us to examine the EU Regional Policy in relation to other EU territorial policies operating in a region ('Policy' Subsystem) and how the relations between them could depend on the policy's nature ('spatially blind'/ 'spatially targeted' or 'regional'/'rural' development)
The role of EU policies in regional growth dynamics is captured by examining the corresponding expenditure of EU Funds committed in each region for the entire EU budget programming periods 1994-99; 2000-06 and 2007-13 for Regional Policy, Rural Development Policy ('spatially targeted' policies) and CAP ('spatially blind' policy with territorial implications) (European Commission, 2008).
Although the increasing scarcity of public resources and government funding appears to require that all these policies should work together to promote sustainable cohesion (European Commission, 2010), few analyses have examined them in a correspondently integrated manner (Esposti, 2007; Montresor, Pecci and Pontarollo, 2011). These contributions highlight how, in the absence of proper coordination and a common place-based approach, there could also be a counter-treatment effect on overall economic growth whereby one policy area may counterbalance the pro-cohesion effects of the other (Barca, 2009; European Commission, 2010; Duhr et al., 2010). Sectoral policies such as the CAP are designed to sustain a strategic sector rather than to promote cohesion. And the former objective could have a completely countervailing effect on the second (Bivand e Brundstad, 2003). This potential mismatch between sectoral and territorial objectives applies more to first-pillar CAP incentives than to rural development policies, which, on the contrary, can minimize the critical effects of CAP market measures (Shucksmith et al., 2005). However, this potentially very critical effect is still unclear as attempts to evaluate it in the

literature are few and far between. Regional and agrarian economist very rarely work together in this direction and sometimes this lack of cooperation is exacerbated by the difficulty of integrating different data sources as also by the sharp division in responsibilities between different administrations (Kilkenny, 2010). These considerations, therefore, seem to be of fundamental importance in attempts to review these policies in integrated manner and also in their evaluation, and hopefully will be incorporated into their future definition and implementation (Agenda 2000).[17]

Territory subsystem matrix:

This matrix aims to include the key regional features that shape economic performance: "socio economic conditions" in terms of population, productive structure and the labour market as well as regional innovative capacity and infrastructural endowment.

In particular, socio economic conditions are captured by a social filter index - a composite index extensively used in existing studies on innovation and regional growth (Crescenzi and Rodríguez-Pose 2009 and 2011) combining a set of proxies for structural preconditions conducive to favourable environments for the genesis of innovation and its translation into economic growth in relation to two main domains: educational achievement (Crescenzi, 2005; Iammarino, 2005; Lucas, 1988; Lundvall, 1992; Malecki, 1997; Rodríguez-Pose and Crescenzi, 2008) and the productive employment of human resources (Fagerberg et al., 1997; Rodríguez-Pose, 1999).

With reference to the first domain, the index accounts for human capital accumulation (share of tertiary educated population in relation to the population aged 15+) and the skilled labour force (share of tertiary educated employees in relation to total employees). For the second domain, employment in agriculture is included in order to account for the composition of the local productive structure. The long-term component of regional unemployment (long-term unemployment percentage) is included in the index in order to account for such local labour market conditions as the rigidity of local labour markets and the stratification of inadequate skills (Gordon, 2001) that hamper innovation and economic growth.

The index is calculated by using principal component analysis and accounts (considering only its first component) for around 50% of the total variance in the single variables that it synthetizes (Tables 8.a and 8.b, Annex I). It prevents collinearity problems potentially generated by the simultaneous inclusion of all the variables in the model (Duntenam, 1989; Esposti et al., 2013). The four variables considered enter the composite index with the expected sign : human capital and skilled labour force – which also displays the greatest relative weighting – have a positive sign, while long-term unemployment and the agricultural share of employment, by contrast, figure in the social filter index with a negative sign.

As discussed above, another aspect of the "territory" subsystem, which the matrix can also account for, is the level of R&D activities (R&D's share of GDP at the territorial unit level, Eurostat 2012). It could be

17 Agenda 2000 proposed a unique programmatic framework for EARDF ERDF and ESF as Structural Funds, while meanwhile regulating their relations with other policies.

assumed to be a proxy for "the allocation of resources to research and other information generating activities in response to perceived profit opportunities" (Grossman and Helpman, 1991, p. 6). It is "able to capture the existence of a system of incentives (in the public and the private sector) for intentional innovative activities" (Crescenzi and Rodríguez-Pose, 2011, p. 14).

Finally, the matrix includes the level of regional infrastructural endowment. In particular, regional kilometers (Kms) of motorways standardized by 'total regional surface' (Crescenzi and Rodríguez-Pose, 2011) are here considered a proxy for a region's endowment of transport infrastructure and hence is held to be capable of capturing the role of physical capital in terms of growth accounting. The standardisation proposed is used in order to purge potential biases linked to the different geographical sizes of the EU regions. Even if it is customary to use this proxy in the literature, it should be stressed that it says nothing about the quality and condition of the infrastructures themselves and nor does it reflect differences in construction and maintenance costs.

Interactions matrix:
This matrix includes two key types of interaction: interactions between the individual components of the "policy" subsystem matrix – in order to capture synergies or trade offs between different EU policies – and interactions between the 'policy' and the 'territory' matrices in order to identify factors conditioning the policy's impact. The elements of this interactions matrix capture the relations within and between the two subsystems of the 'integrated territorial system'. They can capture the existence of synergetic/countervailing forces able to influence the policy's impact by augmenting or diminishing its magnitude. In particular, according to conditioned impact literature (Ederveen, Gorter Mooij and Nahuis, 2002; Ederveen, De Groot and Nahuis, 2006), the overall impact of the policy should be evaluated by summing the marginal effect of the policy itself (coefficient of the variable of interest indicated in the 'policy matrix') to the marginal effect of the policy in respect of identified conditioning factors (coefficient of the interaction). In this sense, this matrix represents a crucial contribution towards *Contextualisation* analysis since it allows us to study the policy's impact "within" the "Integrated territorial system" by considering how the characterisation of subsystems can be a discriminating factor in policy action.

Spatially lagged matrix:
In order to account for interactions between neighbouring regions, this additional matrix introduces the spatially lagged values of "territory" subsystem variables into the model. These values enable us to explicitly model spatially-mediated inter-regional spillovers while, at the same time, minimising the spatial autocorrelation of the residuals. In particular, the spatially lagged variables included in the model are calculated by multiplying each territorial variable by a spatial matrix computed with the k-nearest neighbours (with k=4) criterion, which can minimize not only 'endogeneity' induced by travel-time

distance weighting but also potential bias due to differences in the number of neighbours as between central and peripheral European regions. In particular, the 'spatially lagged matrix' includes the spatially lagged value of the social filter index, spatially lagged R&D activities and the spatially lagged infrastructural endowment.

These spatially lagged indicators place each region in the broader European space, thus making it possible to assess their interactions with neighbouring regions. They can capture spillovers of various kinds influenced by geographical accessibility or peripherality. Favourable socio-economic conditions in neighbouring regions (spatially lagged social filter index) influence indigenous economic performance thought imitative effects and the mobility/movement of human capital/skills facilitated by geographical proximity. Accessibility to extra-regional innovative activities (spatially lagged R&D variable) can also influence internal economic performance through localised knowledge spillovers while the infrastructural endowment of neighbouring regions insures adequate accessibility to the region and the lack of transport bottlenecks.

Control matrix:

This matrix is included in each specification of the model as it contains a set of variables accounting for those structural characteristics of territorial units that are helpful in making the analysis homogeneous. They are related to economic, productive and demographic aspects.

In particular, the national annual growth rate is considered capable of minimizing the effect of spatial autocorrelation (i.e. the lack of independence among the error terms of neighbouring observations) by accounting for some of the common trends that characterize groups of territorial units; the Krugman index of specialization controls for the specialisation in local employment (Midelfart-Knarvik and Overman, 2002) by giving territorial unit *i* a zero rating if it has an industrial structure identical to other units, and by attributing a maximum value of 2 if it has no industries in common with other territorial units, and finally the population density controls for the local economy's degree of agglomeration.

2.2.1 Data and Sample

The sample used by the analysis is characterized by a temporal and spatial dimension in line with those generally proposed by the literature on European policies (OECD, 2009).

In terms of geographical units the analysis is based on a combination of NUTS-1 and NUTS-2 regions in order to maximise the homogeneity of the territorial units in terms of the degree of autonomy and administrative roles as also to capture the relevant target area in which the policy under analysis (Crescenzi and Rodríguez-Pose, 2012) is being implemented.

Consequently, the sample contains NUTS-1 regions for Belgium, Germany and the United Kingdom and NUTS-2 for the other European countries (Austria, Finland, France, Greece, Italy, the Netherlands, Portugal, Spain and Sweden). Denmark, Ireland and Luxembourg are excluded from the analysis because they have no equivalent sub-national regions for the whole period of the analysis. In addition, lack of

data prevents the French Départments d'Outre-Mer (FR9) and of Trentino-Alto Adige from being introduced, while, given the introduction of spatially-lagged variables, remote islands or enclaves could not be included. The analysis is necessarily limited to the EU-15 countries that have been recipients of EU Regional Policy, Rural Development and CAP funding for a sufficiently long time span.
Therefore, the final database comprises 139 territorial units (European NUTS-1 and NUTS-2) belonging to 12 European EU-15 countries (Austria, Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom).[18] The analysis has been performed over 3 EU-Budget programming periods (1994-1999; 2000-2006; 2007-2013).

The data come from different sources.
Structural Fund (ERDF and ESF) data (per capita 'commitments' for each policy programming period) derived from an ad hoc dataset provided to Crescenzi, de Filippis and Pierangeli (2014) by the Directorate General for Regional Policy of the European Commission (DG REGIO) in May 2009.
Also the data referring to Rural Development Policy are based on per capita 'commitments' for each policy programming period and are provided by the same authors. In particular, the sources are DG REGIO, for data on EAGGF Guidance; DG AGRI, for data on EAGGF-Guarantee; the "programmes for rural development" of the EU15[19] for the 2007-2013 data.
The first-pillar CAP data are, instead, based on actual expenditure. They come from the innovative dataset computed in Crescenzi, de Filippis and Pierangeli (2014): in order to overcome the difficulties in obtaining consolidated data at a regional level for relatively long time intervals, the authors calculated total regional expenditure for first-pillar CAP by starting from CAP total subsidies on crops and on livestock and CAP decoupled payments included in the Farm Accountancy Data Network (FADN).
The data for all territorial variables (dependent and independent) come from EUROSTAT.[20] The values assigned to each of the three periods are computed as the average of their annual values over the policy programming period itself. With respect to the latest programming periods (2007-2013) all the territorial data are computed as an average of their annual values from 2007 to 2009, as 2009 is the last year for which data are available.
The period covered by the analysis therefore is from 1994 to 2009.

The choice of aggregating all expenditure/commitment data by programming period is customary in the literature due to the lack of reliability of annual expenditure data, in its turn a consequence of the complexity of EU budgetary and reporting rules: i.e. expenditure reported in a specific year might not necessarily be spent in that year. In addition, this choice allows us to minimize reverse causality (Mohl

18 Due to lack of data on R&D Activities and on the variables composing the Social Filter Index finally, the effective number of observations in the analysis turned out to be 121.

19 (http://ec.europa.eu/agriculture/rur/countries/index_en.htm).

20 Data on GDP Growth Rate for the Austrian and the Italian regions and data on Population density for the Spanish regions come from national sources because they are not available on the Eurostat System.

and Hagen, 2009) much more effectively than with annual data. Whole-period commitments are in fact assigned at the beginning of a multiannual period and, consequently, they do not depend on any subsequent shock (e.g., economic macro trend) that could occur over the period under analysis, thus leading to adjustments to annual expenditure. The same multiannual specification is also generally preferred for the "regional growth rate", which instead of being computed as the ratio between the level of GDP per capita in two consecutive years, is usually considered as the ratio between average GDP per capita levels over a period of at least 5-years (OECD, 2009). The analysis conforms strictly to the literature and in this sense adopts the most common specification for the model: regional growth rate between time t and time t-1 is regressed on the policy at time t-1, where t stands for the policy programming periods.

2.3 Empirical Results

The model specified in Equation 1 is estimated by means of Fixed Effect panel data (FE). In estimating the model, Fixed Effect-FE were found to be preferable to both Random Effect-RE and Correlated Random Effect-CRE specifications[21] (Wooldridge, 2000). Classical tests (such as Wald, R-squared and F-test) were carried out on the estimated FE model. Moreover, the model controls for heteroschedasticity and the spatial autocorrelation of residuals by computing robust and clustered standard errors and by comparing Moran's I tests computed on residuals obtained by classical and spatially-lagged versions of the regressions. Finally, the time trend has been captured by including 'time dummies' in the analysis after obtaining evidence on their joint significance.

The results presented in Table 2.2 include total commitments/expenditure for all EU policies (regional, rural development and CAP) while table 2.3 include commitments/expenditure for each policy separately. The results included in both tables (Tables 2.2 and 2.3) are organized as follows: the first specification (column 1) relates the dependent variable to the policy variable(s), the 'territory' subsystem matrix variables (social filter index, R&D activities, infrastructural endowment) and the control variables.[22] The specification in column 2 also accounts for the spatially lagged social filter index, R&D activities and infrastructure. Columns 3, 4 and 5 show the results obtained by considering the interactions between the "policy" and the "territory" subsystems (in particular, column 3 shows the interaction between the policy variable(s) and the social filter index; column 4 shows the policy's interaction with R&D Activities; column 5 shows the policy's interaction with the infrastructural endowment). Finally, column 6 in Table 2.3 shows the results obtained by considering the interactions

21 FE results were compared to RE's by applying classical Hausman Tests (Hausman and Tylor, 1991). In addition, when comparing FE estimations to the "Modified Random Effect" estimator (Hajivassiliou, 2011) for CRE it was concluded that the FE estimator captures all exogenous variability available in the model and that FE was not only a consistent but also an efficient estimator for the regression coefficients (Hajivassiliou, 2011). These additional results are available upon request.

22 In particular, the National Annual Growth Rate controls for spatial Autocorrelation; the Krugman Index controls for the specialization of the local economy; the Population density controls for economy's agglomeration.

within the “policy” subsystem referring to interactions between the regional, the rural development and the common agricultural policies.

The test statistics carried out for each of the two versions of the model (reported at the bottom of the tables) confirm the significance of the regressions (F-test) and their predictive capacity (R Squared). Furthermore, the classical Wald test checked not only the significance of the single coefficients but also the joint significance of the coefficients of the variable of interest (policy) and the “terms of interaction” coefficients (Ederveen, De Groot and Nahuis, 2006).

By looking at the amount and distribution of the policies’ commitments over time, before shifting to the empirical results provided, it appears that the largest part of the total commitments is represented by the CAP and Regional Policy. The Rural Development Policy’s role in terms of the amount of resources is relatively small (Table 2.1).

Table 2.1. Policy Commitments (per capita) and Regional Growth (average rate). Financial Periods 1994-1999; 2000-2006 and 2007-2013.

		Mean	Std. dev
CAP	1994-99	813.47	631.47
	2000-06	1118.44	847.91
	2007-13	1042.24	834.57
Regional Policy	1994-99	413.61	481.23
	2000-06	652.84	707.95
	2007-13	531.17	540.32
Rural Development Policy	1994-99	78.82	95.52
	2000-06	202.25	213.91
	2007-13	206.26	181.36
Regional GDP per capita average growth rate	1994-99	0.0198	0.0017
	2000-06	0.0255	0.0010
	2007-13	-0.0124	0.0026

Source: authors’ elaboration using European Commission Data

Moreover, CAP and Regional Policy Commitments increased from the first to the second programming period but underwent a reduction in the latest period (2007-2013). Commitments for Rural Development Policy increased over the whole period studied (1994-1999; 2000-2006 and 2007-2013).
The trend in GDP growth rate is completely in line with the trend in the two biggest policies. In contrast to the positive trend registered across the first two policy programming periods, the growth rate during the period 2007-2013 diminished, and actually turned negative. As expected, the correlation between the policy commitments (considered as a whole) and GDP growth rate was also positive (0.6) and significant. In considering the negative sign for GDP growth rate over the period 2007-2013, account must, of course, be taken of the major economic crisis that has befallen the European and the world economy since 2007, which most likely driving the general economic growth downward.

For all specifications included in Tables 2.2. and .2.3, the coefficient of initial conditions (level of GDP at the beginning of the period) is negative and highly significant, detecting a process of conditional regional convergence.

When considering total committed expenditure for EU Regional Policy (ERFD and ESF), the Rural Development Policy and the CAP together, the impact on regional economic growth is positive and significant.

Table 2.2. FE estimation of model (1), overall European support.

Dependent variable: GDP per capita Average Growth Rate					
	1	2	3	4	5
Ln of initial GDP p.c.	-0.802***	-0.757***	-0.761***	-0.753***	-0.745***
	(0.676)	(0.0670)	(0.0708)	(0.0687)	(0.0672)
Policy	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.000)
Social Filter Index	0.019*	-0.001	-0.001	-0.002	0.001
	(0.0102)	(0.0177)	(0.0174)	(0. 1860)	(0.0177)
R&D Activities	0.005	0.007	0.007	0.017	0.008
	(0.0208)	(0.0195)	(0.0195)	(0.0261)	(0.0189)
Infrastructural endowment	1.522	0.842	0.831	0.892	1.471
	(1.1194)	(0.9630)	(0.9848)	(0.9493)	(0.9620)
Spatially Lagged Social Filter		0.025	0.025	0.025	0.022
		(0.0168)	(0.0170)	(0.0174)	(0.0166)
Spatially lagged R&D Activities		0.033**	0.032*	0.035*	0.086***
		(0.0167)	(0.0182)	(0.0175)	(0.0262)
Spatially lagged Infrastructure		2.139	2.103	1.984	2.378*
		(1.4234)	(1.5114)	(1.4487)	(1.3888)
Social Filter Index*Policy			-0.000		
			(0.000)		
R&D Activities*Policy				-0.001	
				(0.000)	
Infrastructure*Policy					-0.001**
					(0.0003)
Constant	7.773***	7.237***	7.280***	7.189***	7.099***
	(0.6841)	(0.6717)	(0.7276)	(0.6925)	(0.6742)
National Growth Rate	0.127***	0.135***	0.135***	0.134***	0.135***
	(0.0141)	(0.0147)	(0.0148)	(0.0148)	(0.0145)
Krugman Index	-0.067**	-0.077**	-0.077**	-0.072**	-0.062**
	(0.0286)	(0.0304)	(0.0301)	(0.0324)	(0.0313)
Population Density	0.001	0.001*	0.001**	0.001*	0.001**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Obs	242	242	242	242	242
R squared	0.902	0.908	0.908	0.909	0.910
Prob>F	0.000	0.000	0.000	0.000	0.000

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

After examining the corresponding results presented in Table 2.3 it emerges that the positive influence of overall European support should be attributed to the positive and significant role played by Regional Policy: the coefficients of both Rural Development Policy and CAP are not-significant.

EU Regional Policy is the only EU budget heading delivering a positive impact on regional growth. The 'spatially targeted' approach of EU Regional Policy – notwithstanding the limitations shown by the initial programming periods that still suffer from unbalanced strategies and limited attention to territorial conditions- has been successful in supporting regional growth. Conversely, the CAP – notwithstanding the relevance of the financial resources distributed in each region – has not produced any relevant influence on regional growth. Furthermore, the results for rural development are not more encouraging: even if rural development policies should, in principle, combine an emphasis on rural areas with a bottom-up approach, they seem unable to do better than 'traditional' CAP interventions in terms of territorial cohesion.

Table 2.3. FE estimation of model (1), Regional Policy plus Rural Development Policy and CAP.

Dependent variable: GDP per capita Average Growth Rate						
	1	2	3	4	5	6
Ln of initial GDP p.c.	-0.791***	-0.732***	-0.806***	-0.732***	-0.671***	-0.735***
	(0.0754)	(0.0786)	(0.0760)	(0.0778)	(0.0847)	(0.0778)
Regional Policy	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	-0.0001
	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0001)
Rural Development Policy	0.00001	-0.000003	0.00002	-0.0001	-0.00004	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
CAP	0.00005	0.00003	0.00002	0.0001	0.00005*	-0.00001
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Social Filter Index	0.0188*	-0.001	-0.007	-0.006	0.001	-0.003
	(0.0101)	(0.0161)	(0.0137)	(0.0171)	(0.0161)	(0.0171)
R&D Activities	0.008	0.010	0.004	0.031	0.014	0.014
	(0.0211)	(0.0195)	(0.0225)	(0.0286)	(0.0190)	(0.0190)
Infrastructural endowment	1.603	0.803	0.431	0.799	2.522*	1.024
	(1.1042)	(0.9198)	(0.9997)	(0.9957)	(1.4711)	(0.8387)
Spatially Lagged Social Filter		0.024	0.025*	0.031*	0.019	0.032**
		(0. 0149)	(0.0133)	(0.0168)	(0.0151)	(0.0164)
Spatially lagged R&D Activities		0.039**	0.041**	0.042***	0.036***	0.057***
		(0.0152)	(0.0187)	(0.0160)	(0.0140)	(0.0150)
Spatially lagged infrastructure		2.281**	1.196	2.661**	3.013**	2.273**
		(1.0979)	(1.4411)	(1.1745)	(1.3198)	(1.0101)
Social Filter Index*Regional Policy			0.0001**			
			(0.0001)			
Social Filter Index*Rural Development Policy			0.00001			
			(0.0000)			
Social Filter Index*CAP			-0.00001			
			(0.0000)			
R&D Activities*Regional Policy				-0.000001		
				(0.0000)		

R&D Activities*Rural Development Policy				0.0001***		
				(0.0001)		
R&D Activities*CAP				-0.00004**		
				(0.0000)		
Infrastructure*Regional Policy					-0.002	
					(0.0016)	
Infrastructure*Rural Development Policy					0.004**	
					(0.0015)	
Infrastructure*CAP					-0.003**	
					(0.0012)	
Regional Policy* Rural Development Policy						0.000001**
						(0.0000)
Regional Policy*CAP						0.000001**
						(0.0000)
Rural Development Policy*CAP						-0.000000*
						(0.0000)
Constant	7.657***	6.971***	7.777***	6.931***	6.321***	7.061***
	(0.7598)	(0.7904)	(0.7896)	(0.7891)	(0.8544)	(0.7750)
National Growth Rate	0.122***	0.131***	0.122***	0.126***	0.135***	0.120***
	(0.0132)	(0.0136)	(0.0145)	(0.0144)	(0.0145)	(0.0130)
Krugman Index	-0.040	-0.043	-0.063	-0.040	-0.005	-0.017
	(0.0397)	(0.0406)	(0.0433)	(0.0398)	(0.0449)	(0.0401)
Population Density	0.000004	0.00001*	0.00001*	0.000005**	0.00001**	0.000002
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Obs	242	242	242	242	242	242
R squared	0.905	0.913	0.921	0.916	0.917	0.922
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000

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

Among the territorial predictors of economic growth, social filter conditions alone seem to be relevant. R&D efforts and infrastructural endowment, instead, exhibit insignificant coefficients.

Favourable 'socio economic conditions' and policy support represent two relevant determinants for regional convergence across Europe. In particular, by reminding us of the aspects accounted for by the Social Filter Index, it could be argued here that well-endowed regions, in terms of human capital, well-balanced labour market conditions and productive economic structure, have been able to grow more than the other regions. Consequently, the regions that exhibited the fastest growth over the period 1994-2009 are: the poorest regions ("initial conditions'" coefficient negative and significant), those with a better social filter index and those receiving most support from EU Regional Policy.

Spatially lagged terms have been introduced in column 2 in each table. The socio-economic conditions in the neighbouring regions, accounted for by the spatially-lagged social filter index, do not exert any influence on internal regional growth (coefficients are positive but not significant). Instead, both 'accessibility' to the innovative activities of neighbouring regions - captured by spatially lagged R&D - and infrastructural spillovers - captured by the spatially-lagged Infrastructural endowment - are significant and relevant growth predictors. The corresponding coefficients are, in fact, positive (Table 2.2) and significant (Table 2.3). Being able to access neighbouring areas' incentives for innovation and/or having

at least physical access to them represents growth opportunities for a region. In line with other studies investigating the role of neighbouring socio-economic conditions (Crescenzi, 2005), the circumstance of being surrounded by virtuous areas is apparently more difficult to exploit. Finally, the inclusion of the spatially lagged variables allows us to remove spatial autocorrelation with no impact on the significance of the Regional Policy variable.[23]

In columns 3, 4, 5 (and 6 in Table 2.3) the model has been fully specified by including all relevant interaction terms as regards links between territorial characteristics and the corresponding policies operating in the same area.

This approach allows us i) to illustrate how the role of regional policy depends on the characterisation of the 'territory' and the 'policy' subsystems; ii) to disentangle the role that territorial conditions play in terms of innovative capacity, social filter and infrastructural endowment as growth determinants from the role they play in influencing the policies' impact and iii) to capture potential synergies or conflicts between regional and other EU policies.

The links between policy structure ('policy') and socio-economic contextual conditions ('Territory') are depicted by the interaction terms between the policies' variables and the social filter index. The corresponding results are reported in column 3 of Tables 2.2 and 2.3. Socio-economic conditions turn out to be a positive conditioning factor for regional policy impact. When Regional Policy is considered by itself (Table 2.3) its relationship to regional growth is found to be greater for areas with more favourable socio-economic conditions: both the coefficients of the policy and those for the term of interaction 'policy*social filter index' are positive. Thus, regional policy generally supports growth but with stronger benefits for areas with favourable socio-economic conditions. It also emerges that the 'territory' subsystem's characterisation in terms of socio -economic conditions is totally independent of other policies: their impact is not significant generally and nor is it conditioned by the socio-economic conditions of the regions. By examining the model's other covariates it appears that their signs are broadly the same as the previous specifications. However, except for initial conditions and the spatially-lagged Social Filter Index, they turn out to be generally insignificant.

The interactions between EU policies and regional R&D activities and infrastructural endowment are presented in columns 4 and 5 respectively. The coefficients of the corresponding interaction terms suggest that the role of both R&D activities and infrastructural endowments as conditioning factors for the policy's impact do not seem to be significant (Table 2.2). However, Table 2.3 shows that both R&D activities and infrastructure matter when Rural Development and CAP funds are considered separately.

23 Moran's Indexes computed for the spatially lagged specification residuals' (regression in column 2) are in fact, by contrast to the correspondent one computed for the specification in column 1, not significant showing that all Spatial Autocorrelation of the dependent variable have been controlled by the analysis.

In particular, Rural Development funds might influence economic growth when targeted at relatively stronger regions with a comparatively stronger innovative and infrastructural environment. Conversely, CAP funds – with their spatially blind approach, uninfluenced by the a priori quality of the region in the allocation of the funds – work better in the most disadvantaged areas, characterised by limited infrastructural and innovation endowment. This section of the analysis, therefore, confirms that 'spatially blind' policies do have spatial implications. Given that CAP funding is not influenced by the capabilities of the different regions to 'bargain' for resources - these are allocated in a top-down fashion by means of subsidies largely linked to 'historical' production data[24] – they are able to exert a positive influence on economic growth in most of the structurally disadvantaged regions. In addition, CAP and Rural Development policy, even if funded by the same financial source, work in opposite ways with respect to the "territory" subsystem's characterisation. In this sense, Rural Development policy behaves in a manner more in line with "spatially targeted" policy (Regional Policy). The effectiveness of both of the latter policies is, in fact, enhanced by the presence of better contextual conditions, in terms of socio-economic conditions for the Regional Policy and R&D infrastructural conditions for the Rural Development Policy.

The results in column 6 of Table 2.3 provide additional evidence for the links within the 'policy subsystem': the model' specification now includes the terms of interaction between Regional Policy and the other EU policies . As proposed by 'New Regional Policy' paradigm (OECD, 2009) synergies between policies would also enable the latter to target the 'territory' subsystem in a complementary fashion.
And, in point of fact, our results confirm this proposal. Regional Policy's role is positively conditioned by synergies with all other policies. All the coefficients of the term of interactions, although very small, are significant and capture the marginal impact of the policies on cohesion determined by such synergies. Instead, the interaction between the two 'agricultural' policies (CAP and Rural Development policy) shows a negative effect on regional economic performance. In other words, when both CAP and Rural Development funds are targeted at regions that also benefit from more generous EU Regional Policy resources, the impact of growth is - ceteris paribus – maximised. But the same is not true for the interaction between Rural Development and CAP: when both 'agricultural' policies channel a high level of funding to the same region they tend to generate sectoral distortions detrimental to long-term economic growth. Consequently, it seems to be that synergistic use of different sources of funding and tools of a diversified nature can boost economic growth, while 'specialisation' in one single policy area is likely to generate decreasing returns and inconsistencies.

24 If the aim of the CAP is to contribute towards the achievement of the EU's long-term objectives, it does appear necessary to revisit the distributive criteria by taking greater account of the economic and territorial disadvantages that characterise the context in which agricultural activity is performed. The progressive de-coupling of support from production introduced since 2003 by the so called Fischler Reform and the further move of the CAP 2014-2020 toward a firs pillar decoupled support, progressively based on a flat rate per hectare goin this direction (Crescenzi, de Filippis and Pierangeli, 2014).

In this sense, the contextualized perspective adopted in this thesis fully supports the focus of the "New Regional Policy" paradigm on the need to characterise policies as "place-based" (Barca, 2009) so that they may pursue the objective of cohesion and also prevent "spatially blind" policies from producing a counter-treatment effect. Thus, our results confirm the suggestion in the "New Regional Policy" paradigm as concerns the "integrated" characterisation and actions that all policies should have with respect to the other policies implemented in the same territory.

2.4 Robustness checks

2.4.1 Are "Commitments" a good proxy for policy action? Challenging the quality of the explanatory variables and testing for endogeneity

In order to test the quality and reliability of our explanatory variables the analysis was reproduced with the use of a different measure for the independent variable under examination. The policy variable adopted in the main analysis (whole period Commitments) was substituted by annual payments in order to determine if Commitments, rather than Payments, could function as a good proxy for policy funding. As remarked in paragraph 2.3 whole-period Commitments are considered more valid than annual Payments on account of their exogeneity with respect to external shocks, as the latter could influence both growth and the expenditure. However, they cannot capture actual expenditure as Payments can.

In order to guarantee that results obtained are not the result of a misguided policy variable choice, and that the same results will be forthcoming, irrespectively of the policy proxy used, the results obtained from the use of Commitments are compared to those obtained from the use of Payments. Thus, the main analysis has been replicated here with a specification, sample and time period, that enables us to make comparisons as between the results of the estimation of equation 1 obtained by using Commitments (as in previous tables) and actual payments.

The dataset including actual payment data refers to all the NUTS-2 of the European Union 27 and includes annual Commitments and Payments for the 'spatially targeted policies (as a whole) over the period 2000-2009.

Since regional growth literature suggests that the use of annualised data in growth analyses should be avoided and multiannual periods, (composed of at least 5 years), preferred, (OECD, 2009), annual policy data from 2000 to 2009 were summed up, and the model was estimated on this dataset as a cross section, where the regional growth rate of GDP per capita over the period 2007-2009 was regressed onto the 'spatially targeted' policies' payments over the 2000-2009 period. The same model was estimated by making use of Commitment data from the previous analysis by linking the regional growth rate of GDP per capita over the period 2007-2009 with "spatially targeted" policies' Commitments for the last two programming periods (2000-2006 and 2007-2013).

The results of the model estimated on both datasets are shown in Table I.1. In particular, the first column of the table shows the results obtained by running the model on the main dataset of the analysis (and as a consequence policy data refer to the whole period of Commitments). The second column shows the corresponding results obtained by running the model on the actual payments dataset. Finally, column 3 sets out the results obtained by considering Payments as endogenous and, consequently, instrumented by the corresponding Commitments.
The check conducted on the main dataset confirms the impact of "spatially targeted" policies[25] on regional growth: i.e. the coefficient of the "spatially targeted" policies is positive and significant.

At first glance, it would seem that when Payments are used rather than Commitments, the positive influence of the EU Regional Policy on economic performance is unconfirmed. The policy variable coefficient in column 2 is positive but not significant. However, the territorial units of the two datasets upon which these results are being compared are not the same. While the analysis' main dataset refers to 139 NUTS-1 and NUTS-2 of the older European countries, the dataset used as a check refers to all the NUTS-2 of the European Union of 27. Moreover, it should be remembered that the use of actual payments under the EU Regional Policy (rather than commitments as in our main analysis) is more likely to be affected by endogeneity bias due to unobservable regional characteristics or external shocks (omitted variable) that determines not only spending capacity (leading to higher actual payments) but also economic capacity. In order to address this potential endogeneity issue, and identify the parameter of interest more accurately, we explicitly allow actual payments to be an endogenous variable and use commitments (decided a priori and well before actual economic growth is observable) as the corresponding instrument in an Instrumental Variable analysis. The choice of the instrument is confirmed by the first stage regression, and justified by the fact that Commitments, strongly correlated with Payments, only influence the economic performance of regions when transformed into expenditure (through the payments channel). Consequently, they represent an exogenous and relevant instrument to permit the model to correct the endogeneity bias likely to affect Payments.
The Hausman test confirms our intuition as concerns the 'endogeneity' of Payments. The IV regression that instruments Payments with the Commitments is preferred to OLS, as the latter considers Payments exogenous. The results of the IV regression, considered definitively as the most reliable of the two, are set out in column 3. Interestingly, they confirm the evidence found by both column 1 and the main analysis: - the coefficient of the policy variable (here Payments instrumented by Commitments) is positive and significant, and thus can capture the positive impact of the "spatially targeted" policies on regional growth. Although bearing in mind that this finding relates to a dataset structured differently in terms of both time and spatial dimension, it could be argued that the results obtained by the main

25 "Spatially targeted" policies are considered here as a whole and not as disaggregated by Regional and Rural Development policy in order to guarantee homogeneity with the variable of the other dataset.

analysis are robust. Moreover, it appears that Commitments are not only capable of acting as a proxy for the policy by delivering the same results that would have been collected by considering the effective expenditure, but also that the Payments by themselves are unlikely to account for policy in a coherent manner insofar as identified as endogenous by the Hausman test[26] for "endogeneity".
It seems, therefore, that Commitments used in the paper's analysis have delivered the same results as would have been yielded by an exogenous version of Payments, and, moreover, that such results are robust.

2.4.2 Do results depend on the regional growth rate specification? Challenging the dependent variable

As already mentioned in paragraph 2.3, the augmented growth model - contextualized here in terms of an integrated perspective - is built upon a shared and common temporal and space specification employed by the Regional Policy panel data literature (OECD, 2009). In this sense, the regional GDP growth rate was computed as the ratio between average GDP per capita over the first three years of each programming period (t) and the correspondent level for the previous programming period (t-1). All independent variables were considered with a lag of one programming period with respect to the dependent periods, so that both policies' variables and other covariates are related to the initial period on which the GDP growth rate is computed. This specification is the most commonly used in panel data literature (OECD, 2009) and has also been adopted in other versions of the GDP regional growth rate (Hagen and Mohl, 2010). In order to control for the robustness of the results with respect to the specification of the outcome variable, the second robustness check adopts an alternative version of the GDP growth rate to conduct a further control on reverse causality bias. Thus, the forenamed check changes the dependent but not the independent variables.

In particular, the main analysis was re-estimated with a GDP growth rate computed as the natural logarithmic of average annual GDP growth rate over the first three years of each programming period t. Such a specified outcome variable was regressed onto the dependent variables taken at the time t-1 so that the GDP growth rate can be computed with respect to an initial period that is successive to the period to which the policy is related rather than coinciding with it. This should further reduce any reverse causality bias likely to affect the model: in this case, the idiosyncratic shocks occurred during the policy multiannual programming period (t-1) could not enter in the computation of the GDP growth rate determined within the following policy multiannual programming period (t).

These robustness verifications confirm the results of the main analysis (Tables I.2.a and I.2.b. in the Annex): even when the outcome variable is changed, the role of EU Regional Policy as well as that of

26 The p value of the test is equal to 0.0041.

overall European support remains positive and significant. The signs of the key variables are confirmed in almost all cases, as also those for the covariates related to the 'Territory' Subsystem and for Spatially lagged variables. The results of the main analysis, obtained by adopting the most customary specification in literature, are robust also in relation to the choice of an alternative dependent variable.

2.4.3 Is a linear model a proper specification? Looking into the distribution of the dependent variable

The robustness check proposed here applies to "quantile regression" methods used to ascertain if the policy's role on regional growth changes with the regional growth's distribution. In this sense, it enables us to examine the role of an additional conditioning factor of policy outcome: different intensities of economic performance.

'Quantile regression' (QR) is a more flexible tool than mean regression (Koenker and Bassett, 1978). It lets us to measure the effect of covariates not only at the centre of the distribution, but also in the upper and lower tails (Chernozhukov and Hansen, 2004). QR uses the quantiles of the dependent variable's distribution to generalize Laplace's median regression. The identification of the pertinent quantiles is quite straightforward and strictly dependant on the characterisation of the phenomenon analysed. With QR it is hence possible to estimate the functional relations between variables for all portions of a probability distribution. Here it is employed to determine to what extent the impact of the policy (X) depends on a region's characterisation in terms of growth level (Y).

This extension seems to represent not only the verification of the robustness of the main analysis results but also, and more importantly, a step forward in terms of the analysis' *Contextualisation* since it will capture if and to what extent areas with different regional rate growth levels (three distribution's quantiles 0.10, 0.5 and 0.75) benefit from Regional Policy.

Some considerations should, however, be mentioned as concerns the applicability of QR to panel data analysis. When QR is combined with panel data model using FE to control for the unobserved heterogeneity constant over time, its identification and estimation become very complex (Kato, Galvao and Monte Rojas, 2012). In particular, when the number of observations on each individual is limited on account of the limited number of available time periods, it is difficult to make allowances for the effect of an individual FE to change across quantiles in the same way as we can allow for the effects of the X covariates. This difficulty stems from the fact that the standard methods used to cancel out FE are no longer applicable: the quantile of the difference in general is not equal to the difference in quantiles but instead become 'intractable objects' (Ponomareva, 2011).

Most of the literature that studies QR models for panel data with FE tries to deal with this difficulty by assuming that the number of periods t reaches infinity with sample size n and then considers individual heterogeneity a "pure locations shift effect" on conditional quantiles (Canay, 2010; Koenker, 2005) or by allowing it to vary across quantiles (Galvao, 2008). Instead, in relation to a relatively short panel, an attempt to estimate QR has been made by applying correlated random coefficients model (Abrevaya and

Dahl, 2008), or by focusing on the identification of the coefficients for a single conditional quantile restriction rather than on the whole set of quantiles (Rosen, 2009) or even by estimating the moment of the conditional distribution of either continuous or discrete covariates (Ponomareva, 2011).
Nevertheless, most empirical QR applications prefer a cross-section framework for analysis (Buchinsky, 1994; Powell, 2011; Powell and Wagner, 2011). The robustness check proposed here proceeded in the same way.
In particular, pooled OLS models that regress the regional growth rate at time *t* on the policy and on the other usual covariates at time *t-1* were implemented: the average annual growth rate over the period 2007-2009 (computed as in Section 5.2) was regressed onto the Regional Policy Commitments and onto the other covariates related to the 2000-2006 period and the average annual growth rate over the period 2000-2003 was regressed onto the Regional Policy Commitments and other covariates related to the period 1994-1999. As stated earlier, QR analysis focuses on the 0.10, 0.50 and 0.75 quantiles of the Y distribution.
The results obtained are shown in Table I.3. The coefficients of the key variables support the results of the main analysis. However, they also suggest that the link between EU Regional Policy spending and Economic Growth is stronger in relatively richer areas. The analysis confirms the positive impact of the EU Regional Policy on growth irrespective of other territorial conditions that can reduce or reinforce this regularly positive contribution to regional performance. However, the strength of this relationship is maximised in the best performing EU regions. This finding suggests that although the policy's role is generally positive, it is not working completely in line with its main aim, namely to remedy the gaps between the disadvantaged and the relatively more dynamic areas of the Union.

2.4.4 Controlling for spatial dependence

As mentioned in Paragraph 1.2, spatial dependence can be a relevant cause of biased results. Bearing this in mind, spatial econometrics has, in recent years, identified three different types of interaction effects that could affect local economic phenomena and consequently their analysis: endogenous interaction effects among the dependent variable (Y), exogenous interaction effects among independent variables (X), and interaction effects among error terms. Hitherto, (paragraph 2.3), by inserting spatially-lagged independent variables (spatially-lagged variables matrix), into the model (1), the analysis inserted controls for the second of these relations. However, we have not, so far, controlled for the spatial dependence of the dependent variable and error terms. Nowadays, all such dependencies can also be studied in panel data econometrics. By accounting for the unobservable spatial and time-period specific effects (Hsiao, 1986; Baltagi, 2001), panel data and spatial econometric literature offers a common setting thus enabling us to account for the cross-sectional and state dependence of the Y and the Xs, while at the same time controlling for unknown heterogeneity. In an even more significant way, it also manages to account for them simultaneously through "Spatial Dynamics Panel Data Models" (SDPDM). Such models can easily identify the dynamic responses over time and space of the a space-time diffusion

impact through cross-partial derivatives related to changes in the explanatory variables and in the dependent variables (Elhrost, 2005). Once the need to account for spatial dynamics has been identified, the most serious issue seems to be the identification, among the Spatial Panel Data Models, of that model that can best capture and represent the spatial dependence of the data. Some analyses of European regional convergence processes have found evidence of model misspecification if the spatial interdependencies of regional growth are ignored (Arbia et al., 2008). The most common approaches that address the issue of spatial dependence (Anselin, 2001) adopted in the existing literature refer to 'spatial error autocorrelation' (Piras and Arbia, 2007) and 'spatial lag' models. The latter, often considered a spatial autoregressive model (Beck et al., 2006, Blonigen et al., 2007), would seem to be more appropriate for quantifying how a region's growth rate is affected by the growth rate in surrounding regions (Abreu et al., 2005; Anselin, 2001). The addition of a spatially-lagged dependent variable ("spatial lag" models), however, causes simultaneity and endogeneity problems that GMM (Badinger et al., 2004) and maximum likelihood (Elhorst, 2005) methods can address.[27] As in classical panel data literature, a fixed-effects model is largely preferred (Elhrost, 2005) because the unobserved component is allowed to depend on the other regressors included in the model.

Within this FE spatial panel data framework, this section extends the main analysis of the paper by allowing the model (1) to account, in addition to the spatial dependence of the Xs, for Y and for error-term dependencies. For this purpose, the model (1) will assume three additional specifications (SAR, DURBIN and SEM) and the results provided by the estimation (via maximum likelihood) of each of them will be analysed in a comparative sense in order to a) decide the best way to model the spatial dependence of the phenomena analysed and b) test if the results of the main analysis are robust, given the overall spatial dependence of the phenomena under analysis.

In this manner the Spatial Autoregressive (SAR and DURBIN) specifications of model (1) will account for the spatial dynamics of the dependent variable that estimates the spatially lagged Y (Spatial lag models) coefficient. The Spatial Error Model (SEM) will, instead, account for the dependence determining the spatially inter-correlation between the error terms (LeSage & Pace, 2009). Among the Spatial Autoregressive models, DURBIN could be understood as a special case of SAR as besides including the spatially lagged Y it also includes other exogenous spatially-lagged regressors. The choice of the regressors is free: both Xs and additional variables could be inserted in their spatial lag version. On the basis of the results reported in the literature, the DURBIN version of the model is considered the most appropriate and informative for regional analysis insofar as it is a "Spatial lag" specification that, moreover, make it possible to control for Xs spatial dependence (LeSage & Pace, 2009).

27 In this sense, a variety of estimators have been recently proposed by the literature: Yu et al. (2008) and Lee and Yu (2010) provide the asymptotic properties of a quasi-maximum likelihood for an SDPD model with exogenous explanatory variables. More recently, Korniotis (2010) proposed a solution based on the Least Square Dummy Variable and instrumental methods (Anderson and Hsiao, 1982) extended to allow for the spatial effect.

As already seen for the previous robustness checks, both the data's and the model's structure needs to be adjusted to take due account of the setting in which the robustness check is to be performed, which, in this case, is the framework provided by the spatial panel data model.

In this sense, the panel was reset to comprise two periods: for the first period the independent variables refer to the first period of the main analysis (policy programming period 1994-99) whereas the dependent variable is the GDP Growth rate in the second period of the main analysis (2000-06). For the second period, the data used for the regressors refer to the period 2000-06 whereas the outcome variable is that used in the third period of the main analysis (2007-13). By performing the analysis on such a panel, we deploy explanatory variables with a one-period-lag with respect to the dependent variable, even if the SPDM framework lags prevents us from taking lags directly into account in estimating a model.

Results from the SAR, DURBIN and SEM models, presented in Table I.4 of the Annex I, refer to the version of model (1) estimated by considering Regional Policy separate from the other policies and together with the variables of the "Territory" Subsystem matrix, the "Spatially lagged variables" and the Control ones (see Section 3).

The analysis was carried out by implementing the STATA routine "XSMLE" (Hughes, Mortari and Belotti, forthcoming) and using a "Rook Contiguity" matrix as a spatial weight.

As Table I.4 shows, the spatially lagged Y coefficient is never significant. Spatial influences on regional growth rates seem to be fully accounted for by the spatial correlation among the explanatory values (already included in the main specification of the model) while the endogenous spatial dependence in terms of Y seems to be irrelevant. This robustness check highlights that in modelling the causality relation between Regional Policy and regional growth within the "integrated territorial system", the main analysis has already accounted for the overall spatial dependence characterising regional growth. Even by accounting for the additional and potentially strong source of spatial dependence related to Y, the results obtained by the main model do not change.

The findings on the main coefficient of interest (Regional Policy) are all confirmed. Moreover, the signs of the other explanatory variables are also generally confirmed, albeit with a different level of significance.

The results from the three different models (SAR, DURBIN and SEM) are coherent with each other. For each variable the coefficients used always have the same signs. By making comparisons between them, the different ways of modelling spatial dependence are shown to lead to similar conclusions. The SEM model, which accounts for the spatial dependence affecting the regression's residuals, leads to very similar results with respect to those (SAR and DURBIN) provided by directly accounting for the spatial dependence of Y. This confirms how this source of spatial dependence, and which this last model does not account for explicitly, is not very relevant for these regressions.

2.5 Conclusions

According to our *Contextualisation* aim, EU Regional Policy is considered one of the elements that characterize any territory understood as an 'integrated territorial system'. This system is based on two 'Subsystems' - 'Territory' and 'policy' - and on a series of 'elements' (Policies, Social Filter Index, R&D Activities, Infrastructural endowment) and 'relations' between the Subsystems - between the different Policies and between the Territory and Policies.

The results, collected by making use of panel data methods, look more comprehensive and with more facets than the partial results provided in literature.

Regional Policy's outcomes, if investigated in a contextualized perspective of evaluation, turn out to be strongly "linked" to the characterisation of the "integrated territorial system" within which it operates. In general, systems with better socio-economic conditions (local labour market, economic structures, human capital), infrastructures, innovation's spillovers and favourable neighbouring' conditions grow more than less fortunate systems.

Irrespective of these conditions, EU Regional Policy's role on territorial cohesion is always positive.

However, this positive role is greater for regions enjoying more advantageous conditions. Thus contrary to the policy's intended effects, those regions in greatest need of support do not receive its principal benefits. Moreover, this positive role is conditioned by the synergistic action of all policies active in the territory. Both these conditions demonstrate that a "place-based" character can help to maximize the policies' cohesive results .

Moreover, when synergies with the EU Regional Policy are in place, other EU policies operating at local level can also exert a positive impact on territorial cohesion. However, when considered in isolation Rural Development Policy influences regional growth only when targeted at the most innovative and infrastructurally advantaged regions (i.e. when basic developmental conditions are already in place). Conversely, CAP support only has an influence in the most structurally disadvantaged areas in terms of both innovation and infrastructure while it may actually exert a negative influence in the most innovative and infrastructurally advantaged regions. CAP – due to its spatially blind nature and allocation mechanisms – might be the best means to channel resources to the most disadvantaged regions (that are less capable of attracting EU Regional Policy funding) of the Union. However, the CAP's impact is negative if the policy works in isolation with respect to Cohesion policy, and if it targets regions that are per se dynamic and productive, by possibly increasing their reliance on public funding and reducing their incentives to implement structural change and sectoral evolution. This evidence confirms the importance of coordination between various EU polices but also suggests that place-based measures might need to be complemented by more traditional top-down elements in order to ensure a fully cohesive distribution of the policy benefits.

In general, the comprehensive analysis carried out confirms the necessity for all policies to be designed, implemented and evaluated according to the geographical context in which they operate, irrespective of their nature.

Regional Policy, which could be thought as the closest to a “place-based” policy, is found to be the only policy capable of promoting cohesion in absolute sense. However, also a strictly sector policy such as CAP, could be potentially good for cohesion if designed in relation to the characterisation of the “Territory” Subsystem.

3 SPATIAL DISCONTINUITY FOR THE IMPACT ASSESSMENT OF EU REGIONAL POLICY. THE CASE OF ITALIAN "OBJECTIVE 1" REGIONS

3.1 Introduction

This Chapter aims to improve existing literature by reinforcing the causal *Identification* of the EU Regional Policy's impact. In particular it aims to minimise any endogeneity bias in the estimation of the effects of the policy by exploiting randomized experiments properties.

As discussed in paragraph 1.2, existing studies that tried to deal with endogeneity bias within the classical regression framework failed to agree on a clear set of conclusions. In contrast, only a few studies have so far been produced within a quasi-experimental setting. The adaptation of experimental methods to non-randomized scenarios such as those used for policy evaluation is only feasible in particular conditions: there should be two groups of observations of which one is a counterfactual scenario for the other, representing how observations subject to policy treatment would have been without such treatment. While these conditions are easy to be find in laboratory experiment,[28] and for which these methods were originally developed, they are not common in the social sciences and far less as concerns the evaluation of EU territorial policies .

In the case of EU regional policy, policy 'treatment' is assigned according to clear criteria (e.g., regional GDP per capita below 75% of the EU average) rather than being randomly assigned (conditioned treatment). In addition, treatment is heterogeneous as between units (heterogeneity of treatment) and, since the policy works through the voluntary participation of local actors, 'intended' treatment effects may not coincide with the effect on the actual treated individuals/regions (imperfect compliance). Even if policy implementation makes resources available for a specific set of regions (treatment group), financial support (effective treatment) is only forthcoming if local actors apply for funding by submitting project proposals.

Within this specific policy framework, treated and 'control' regions differ in terms not only of treatment but also of other elements that are neither randomly distributed nor identifiable (e.g., unobservable or non-measurable elements). As a result, the untreated group is no longer a good counterfactual scenario for the treated group. In such conditions, the estimation of a treatment effect by simply comparing treated and un-treated observations would suffer from endogeneity bias.

However, despite this non-randomized framework, methods exist for analysing the treatment effect (Regression Discontinuity Design - RDD; Propensity Score Matching - PSM; Differences-In-Difference – DID; Synthetic Control) that can re-create a scenario that is 'as good as random' whereby treatment

28 In the case of "laboratory experiment", observations with treatment are randomly sorted within the group and, as a consequence, they only differ from the observations without treatment (control group) with respect to the treatment itself allowing the effect of some "treatment" randomly assigned to be estimated consistently and freely of any endogeneity bias (Angrist and Pischke, 2009).

could be considered randomly assigned. In this case, the control group could represent the counterfactual with respect to which policy effects can be identified (Blundell and Costa Dias, 2009).[29]
This is the sense in which the thesis aims to make a contribution towards *Identification* literature by applying a Regression Discontinuity Design (RDD) in order to analyse to what extent EU Regional Policy has sustained employment in the "Objective 1" Italian regions.
In this chapter the policy effect will be estimated exogenously by exploiting the discontinuity represented by the administrative boundaries that imply a passage from "Objective 1" to "non-Objective 1" Italian regions. The discontinuity isolates an 'as good as random' scenario in which it will be possible to estimate a consistent and unbiased policy impact. This innovative identification strategy will find EU Regional Policy had a positive impact on employment levels in the Italian "Objective 1" regions.
The rest of the chapter is structured as follows: paragraph 3.2 shows how RDD has been employed in policy evaluation literature to identify an "as good as random" scenario. Paragraph 3.3 presents the characteristics of the identification strategy. Paragraph 3.4 shows some preliminary statistics. Paragraph 3.5 develops the RDD to assess EU Regional Policy's impact. Paragraph 3.6 performs robustness checks and paragraph 3.7 checks the "external validity" of the analysis. Paragraph 3.8 sets out the conclusions.

3.2 RDD in policy evaluation: methods and empirical analyses

As mentioned above, treatment effect methods apply an experimental approach to non-randomized contexts such as policy evaluation by identifying an 'as good as random' scenario in which randomized-experiment properties still hold. The RDD approach, in particular, focuses on a subsample of observations that come close to a 'threshold', whereby being treated or not could be considered random. This threshold is a pre-determined value of the forcing variable to which the treatment assignment is conditioned (Imbens and Lemieux, 2008). The threshold determines the assignment of the observations to one of the two groups depending on whether the value of the forcing variable is above or below a critical value. When the subsample of the observations in 'as good as random' conditions holds, it comprises observations 'near' the threshold. In this subsample, observations could be thought as randomly belonging to one (treated) or the other (control) group. Treatment assignment depends in a discontinuous way (sharply) only on the forcing variable, captured by the threshold. All other observable and unobservable characteristics change smoothly across observations on both sides of the threshold (Battistin and Rettore, 2008). Consequently, within this subsample, observations without treatment represent the counterfactual for observations with treatment insofar they are similar in all respects (the

29 Different techniques could be implemented to exploit the "randomized experiments" properties to achieve the "treatment effect" of the policy in a framework free of any endogeneity. Regression Discontinuity Design-RDD, Propensity Score Matching-PSM, Difference in Differences-DID: all propose a different way to recreate the "as good as random" scenario. Which among them is the most appropriate with respect to the characteristics of the scenario will be investigated and the research question could be settled by following a step-by-step "diagnostic" approach (Rodrik, 2005).

same smooth distribution of all characteristics) except for treatment (the discontinuous jump at the threshold).

RDD has been employed in economics (as well as in many other fields of application) to exogenously estimate the effect of different types of treatment (Imbens and Lemieux, 2008) in relation to different kinds of discontinuity and different forcing variables. In Italian case studies RDD has been used to investigate the impact of the efficiency of local tribunals in terms of average corporate size concluding that it played a positive role (Menon and Giacomelli, 2012) – and to study the effect of a programme supporting innovation incentives - finding that it was ineffective in stimulating innovative investment (de Blasio, Fantino and Pellegrini, 2011) - to look at the effect of R&D incentives for enterprises in the Emilia Romagna region - showing that they were only positive for smaller enterprises (Bronzini and Iachini, 2011) - and finally to investigate political behaviour (Gagliarducci and Nannicini, 2009; Grembi, Nannicini and Troiano, 2012). However, if we examine just EU Regional Policy, we find few papers applying RDD and generally they identify discontinuity by using GDP criteria, which makes a sharp discrimination in terms of policy assignment (see Paragraph 1.2.2). They identify the 'as good as random' scenario in regions with GDP values that are closest to the assignment threshold value, while 75% of European average GDP in terms of purchasing power parity is used to identify the most disadvantaged regions. By considering the regions on the threshold as randomly assigned to the treated or untreated group, these analyses can define a counterfactual policy. Consequently, they can estimate the exogenous policy effect. They show that 'Objective 1' regions have been able to grow more than the others (Becker, Egger, von Ehrlich and Fenge, 2010; Pellegrini et al., 2013). They also highlight how the endowment of trust and cooperation in the poorest regions has been adversely affected by EU Regional Policy (Accetturo, de Blasio and Ricci, forthcoming). They also add that the policy's effect is influenced by the degree of regional absorptive capacity, measured by the quality of regional institutions and the stock of human capital (Becker et al., 2011), and that in the Italian case, the policy effect is smaller the higher the relative size of the service sector (Percoco, 2012). Finally, EU Regional Policy's impact appears greater in parametric estimations than in non-parametric valuations (Pellegrini et al., 2013).

The structural characteristics of beneficiary regions (as shown in the previous chapter) is the key factor in the assignment of funds for EU Regional Policy and also for its impact . This poses a major challenge in terms of impact assessment and a consensus has yet to emerge on the question among existing studies in the classical regression framework. These studies have failed to address the endogeneity problem in full and this might explain the different results. They have applied techniques involving instrumental variables (Dall'Erba and Le Gallo, 2008; Ramajo, Màrquez, Hewings and Salinas, 2008), panel data (Rodríguez-Pose and Fratesi, 2004; Soukiazis and Antunes, 2006) and their integrated use (Beugelsdijk and Effinger, 2005; Bouayad-agha, Vedrine and Turpin, 2010; Bouvet, 2005; Ederveen, De Groot and Nahuis, 2006; Esposti and Bussoletti, 2008; Mohl and Hagen, 2008) in order to overcome omitted-

variable and reverse-causality biases. In this chapter, treatment effect methods and RDD in particular will be used to address this challenge.

3.3 RDD to evaluate the EU Regional Policy in the Italian 'Objective 1' regions

Since the rationale of EU Regional Policy is to counteract the potentially detrimental effect of the European integration process (Armstrong and Taylor, 2010), the largest part of its resources is targeted at the most disadvantaged areas, which - until 2006 were named 'Objective 1' regions - in order to make them competitive and capable of converging upon the same average GDP per capita in PPP of the Union's richest 'core' areas (see Paragraph 1.1). Only regions with a level of GDP per capita below 75% of the EU average GDP were assigned 'Objective 1' status (treated regions). Control regions are hence excluded from the treatment group not randomly but according to policy assignment criteria. Hence, they exhibit, at least for the elements considered as assignment criteria (GDP), different characteristics with respect to treated regions. In this case, however, they are not counterfactual to the treated regions: neither treatment (policy status), conditioning factor (GDP), nor other observable variables (e.g., socio-economic conditions, control factors) could be deemed randomly distributed among the "Objective 1" and the "Non-Objective 1" regions. Treatment and control groups cannot be compared in order to isolate treatment effect since they are not randomly defined and differ with respect to other aspects.
By exploiting the discontinuity related to policy assignment, RDD could re-create the 'as good as random' scenario by identifying a subsample of observations as close as possible to the assignment 'threshold'. Their status as treated or untreated (belonging to "Objective 1" regions or not) could be considered a "randomised" result.

The "threshold" here is the administrative boundary separating treated from untreated regions. The subsample in which the experiment is 'as good as random' therefore comprises the observations on the threshold, which, in this case, are the municipalities (sub-regional areas – '*local-government units"*) contiguous to the boundary. In this subsample, observations (municipalities) could be thought as belonging randomly to one (treated) or the other (control) side of the boundary. "Treatment assignment" is a discontinuous and sharp discriminant characteristic that depends solely on one conditioning factor (distance from the boundary) whereas all other observable (and, hence, all unobservable) characteristics change smoothly across observations. Consequently, within the subsample, observations without treatment represent the counterfactual to those with treatment, being similar in all respects (smooth distribution of all characteristics) except treatment (discontinuous jump). Any discontinuity in the outcome variables (employment variation) can be hence ascribed to treatment ("Objective 1" status) because the latter, within the subsample, is the only element distributed across space in a discontinuous way while all the other factors only exhibit smooth variations.
Among the several available methods for determining treatment effects, this 'spatial' version of RDD seems to be the best strategy to identify an 'as good as random' scenario. According to the persistent

nature of Italian dualism, the South of Italy has always been targeted by development policies. Exploiting an exogenous difference between treated and untreated over time (e.g., by running a DID model) would, therefore, have been difficult. By contrast, a spatial differentiation seems to be more helpful.
Thus, the main references for the analysis are those analyses that exploit spatial discontinuities, namely the cut-offs in treatment distribution. In particular, a former application exploited administrative boundaries of US States as a spatial discontinuity to evaluate the effect of being a "Pro Business State" (policy status derived by adopting a set of measures in favour of enterprises) on the States' productive structure (Holmes, 1998). Some relevant contributions were recently provided in this framework with respect to "place-based" policies implemented in Perù (Dell, 2010), United Kingdom (Einio and Overman, 2012), Spain (Jofre, 2012) and in the United States (Freedman, 2012).
The empirical analysis focuses on the impact of EU Regional Policy (policy programming period 1988-1999) on employment in Italian municipalities in "Objective 1" regions.

According to empirical RDD literature, such a design must focus on areas whose boundaries are associated with a change in policy status (Black, 1999; Holmes, 1998; Menon and Giacomelli, 2012), i.e. on Italian regions that share boundaries that imply a passage from an "Objective 1" region to a "non-Objective 1". The Italian administrative regional subdivision is such that a maximum of five (NUTS2) regions can be included in the design (see Maps II.1 and II.2 in Annex II): Marche, Lazio, Abruzzo, Molise and Campania. Thus, the whole analysis sample comprises 1615 observations (the municipalities belonging to the five regions). The threshold to which the discontinuity is related is therefore represented by a set of four 'policy Change Boundaries' among the five Italian regions (Marche and Lazio are 'non-Objective 1' regions, and they are contiguous to the 'Objective 1' Abruzzo, Molise and Campania). The 99 contiguous municipalities (with black borders in Map II.1) on the two sides of each of the 'policy-change boundary' segments (b1, Marche-Abruzzo; b2, Abruzzo-Lazio; b3, Lazio-Molise and b4, Lazio-Campania) instead represent the "as good as random" subsample in which "randomized experiments" properties hold.

3.3.1 Focus and data

Two main reasons make the Italian case particularly suitable for assessing the impact of EU Regional Policy on employment levels in 'Objective 1' regions. First, there is a persistent 'dualism', which has long characterised the economies of northern and southern Italian regions, that reflects the disparities characterizing Europe's richest and poorest regions, and on whose basis regions receive or are refused "Objective 1" status. Some northern Italian regions are among the richest in the Union whereas all southern Italian regions are among the poorest.

Second, Italian administrative units seem to be particularly appropriate with respect to RDD strategy's needs: Italian regions are territorially divided into as many as 8000 sub-regional units (municipalities),

each with a very limited surface area. Taking them as the "units of observation" in the design hence allows us to exploit, even in the 'as good as random' subsample, a relatively large number of observations, which are indeed very close (contiguous) to the "threshold" (regional boundary).
Our empirical analysis has focused on two earlier policy-programming periods (1988-1994; 1994-1999) rather than more recent ones (2000-2006 and 2007-2013) for two reasons. First, during this policy programming periods, the policy of interest was the only one operating in the areas being studied. Since Italian unification, Southern Italy regions have always been targets for some form of developmental support, and this would have represented a problem in terms of isolating the effect of EU Regional Policy from the influence of other policies operating in the same areas. However, during the 1990s the policy scheme used for them underwent redesign - in line with the progress of the development policies – with the adoption of a bottom-up perspective (New Regional Policy). In 1992, the 'extraordinary measures' funded by the national government (whose overall impact is considered inexistent by a number of empirical studies) were abandoned and only from 1999 did a new policy scheme start to emerge (Cannari, Magnani and Pellegrini, 2009).

Second, a relatively large time lag from the time of 'treatment' is necessary in order to assess policy impact. Counterfactual analyses must allow for a sufficient time lag between the treatment and the outcome to ensure that the estimated coefficients are capturing the real effect of the treatment and not just pre-treatment difference between the control and treated groups (Andini and de Blasio, 2012; Pellegrini et al., 2013); and which is often the discriminating element of the treatment assignment (e.g., difference in initial GDP between "Objective 1" and Non-"Objective 1" regions). By considering the policy-programming period 1988-1999, the impact could be estimated with respect to a 10-year variation in the outcome variable (variation 1991-2001) and also tested with respect to a correspondent variation over a longer time-window from 1991 to 2011. Even though the latter cannot represent the main variable of interest, due to the large number of confounding factors that such a long period would involve, it is necessary to test for the results obtained by looking at the shorter outcome variation (see paragraph 3.6.3).
Finally, the outcome variable is the variation in total employment: because a) employment and GDP growth are the main intended outcomes of Regional Policy, and b), no data are available in Italy on GDP at a municipality level. In particular, the 1991-2001 variation was computed with respect to the number of workers in factories located in municipalities, as work-place employment - rather than the employment of residents - is more in line with job creation, which was used here as a proxy for the local development of treated areas.
Within this framework our analysis will consider a value=1 dummy an independent variable for municipalities belonging to "Objective 1" regions during the policy programming periods 1988-1993 and

1994-1999[30] and the variation in employment between 1991 and 2001 a dependent variable. Additional regressors related to the socio-economic structure of the municipalities and other resource sources available are considered control variables in order to improve the efficiency of the estimates.
ISTAT is the main source of data; and especially data on outcome variables from the 1991, 2001 and 2011 "Industry and Services Census" datasets, whereas control variables data are taken from the 1991 and 2001 "Population and Housing Census" datasets.[31]

3.4 Verifying the conditions for an RDD model: preliminary statistics

The aim of this paragraph is to show that the subsample of observations as indicated above meets the conditions of an 'as good as random' scenario, thus allowing us to perform an exogenous estimation of the Regional Policy's causal effects: within the subsample everything except the treatment must be randomly distributed over the observations. Policy must be the only aspect to change discontinuously, whereas all other variables change smoothly. In order to meet this condition, the subsample observations used for the estimation must be similar in all observable respects, apart from that of treatment (Holmes, 1998). In this case observable characteristics and policy treatment are not correlated.
This expected condition can be checked by comparing the differences in mean between the contiguous "Objective 1" and "non-Objective 1" 99 municipalities with the differences in mean computed for the whole sample of municipalities (1615) of all observable variables: the observable variables' differences in mean in the subsample must be smaller than the correspondent differences for the whole sample of municipalities in the regions considered. In contrast, difference in treatment should be the same for the two samples. If this is verified, the subsample can be deemed "as good as random" and, therefore, neither observable nor unobservable variables matter with respect to the treatment effect estimation (Holmes, 1998; Menon and Giacomelli, 2012).

Table 3.1. Differences in mean for the observable variables in "Whole" and "Subsample".

	Whole Sample			Sub Sample		
	"Objective 1"	Non "Objective 1"	Diff	"Objective 1"	Non "Objective 1"	Diff
Population density	475.47	165.13	-310.33***	76.79	147.04	70.24**
Dependency ratio	57.13	54.37	-2.75***	59.62	59.41	-0.21
Old population rate	18.45	19.63	1.17**	21.19	21.48	0.29
Uneducated pop.	5.33	2.70	-2.63***	3.25	3.46	0.20
Highly Educated pop.	2.05	2.04	-0.01	1.84	1.92	0.08
Regional Transfers	2411,9	3684,2	1272,2	1172,8	1640,0	467,2
Employment	1662.61	3331.91	1669.29	1361.08	1774.51	413.43
Firms	384.22	646.46	262.24*	287.85	436.51	148.66

30 "Objective 1" regions did not change over these periods.

31 Data on regional transfer to municipalities, used to implement one robustness check (paragraph 6) come instead from the Ministry of Interior.

Table 3.1 shows that these conditions are satisfied[32] and that as a consequence untreated municipalities can be a good counterfactual for treated municipalities. For all the observable variables that we can account for, the difference between their means in the 'Objective 1' and in the 'non-Objective 1' regions is smaller when computed for the municipalities of the subsample. In almost all cases the difference is found to be insignificant. Thus, with respect to observable factors, the subsample municipalities are more similar to one another than they are to the municipalities overall. Within the subsample observables characteristics are equally distributed across treated and untreated municipalities.

3.5 RDD core analysis

This paragraph develops the RDD analysis by estimating model (1) for the subsample of 99 municipalities on the boundary line. The model includes a set of dummies with which the treated and the control observations of the sample can be compared in relation to the segment of the "policy-change boundary" with which they are contiguous (Black, 1999; Freedman, 2012; Jofre, 2012; Holmes, 1998; Menon and Giacomelli, 2012).

The model generally assumes the form:

$$\Delta Y_{it} = \beta_0 + \beta_1 Policy_{it-1} + \beta_2 Y_{it-1} + \beta_3 X_{it-1} + \beta_4 WX_{it-1} + b_1 + b_2 + b_3 + b_4 + \varepsilon_{it} \qquad (1)$$

Where *i* stands for observation (municipality) and *t* for time. In particular, t=2001 and t-1=1988-1999 for the policy variable and 1991 for all other variables.

The outcome variable (ΔY) is the employment variation computed as the ratio between the difference in level and the initial level.

The policy variable is a dummy that takes value=1 for municipalities belonging to 'Objective 1' regions. Certainly, it only captures the policy status of the observations and not the effective expenditure in the municipalities. Using status eligibility instead of the actual intensity of the treatment of EU Regional Policy, (which operates through the voluntary participation of local actors applying for policy support by submitting projects to be financed), may mean running the risk of considering eligible observations "treated" when, in fact, no treatment was forthcoming. Unfortunately, local expenditure data, which would have allowed us to check that each municipality considered "treated" had received and spent funds, do not exist for the policy programming periods before 2000. In any case, coefficients estimated by considering the "Objective 1" dummy capture the "Intention to treat effect" (ITT) that is the lower bound for the "Average treatment effect" (ATE) that a continuous policy variable would have captured (Battistin and Rettore, 2008).

32 Observable variables investigated are related to a variety of socio-economic conditions according to the availability of data at municipality level. Differences shown by Table 1 relates to the variables considered at the t-1 time of the analysis, that is 1991 but the same trends come from considering them at the time t, 2001.

In addition, available data on Structural Funds expenditure for the period 2000-2006 show that each municipality in the subsample belonging to the "Objective 1" regions in fact benefited from funds (Table II.1), which makes it likely that the this also applied in previous programming periods (1988-1999).

With respect to the other regressors, Y stands for the initial level of employment and firms establishments and captures the so-called "initial conditions"; X is a matrix containing the control variables related to the municipalities' socio-economic conditions. In particular, the X matrix enables the model to account for the degree of agglomeration (proxied by Population Density) and the demographic structure of the population (proxied by the Dependency Ratio) as also for the level of human capital by including the share of Uneducated Population;
WX is the spatially-lagged matrix constructed by pre-multiplying the spatial weight matrix W, computed according to queen contiguity criteria,[33] by the Uneducated Population and the Population density variables. It allows us to control for spatial autocorrelation and to account for the spillovers existing between neighbouring municipalities.

Finally, the "policy-change boundary" dummies:
b1 is a dummy variable=1 for the municipalities on the segment of the "policy-change boundary" between Marche and Abruzzo and =0 for all the others municipalities;
b2 is a dummy variable=1 for the municipalities on the segment of the "policy-change boundary" between Lazio and Abruzzo and =0 for all the others municipalities;
b3 is a dummy variable=1 for the municipalities on the segment of the "policy-change boundary" between Lazio and Molise and =0 for all the others municipalities;
b4 is a dummy variable=1 for the municipalities on the segment of the "policy-change boundary" between Lazio and Campania and =0 for all the others municipalities.
The inclusion of these dummies allows the model to control for any omitted variable issues, related to observable and unobservable factors (Black, 1999; Holmes, 1998; Menon and Giacomelli, 2012).

The model constitutes a way of creating matching observations: for each subgroup of treated observations (municipalities 'on' one of the four segments, belonging to the treated group) a subgroup is formed of counterfactual observations (municipalities 'on' one of the four segment, belonging to the untreated group). The main strength of this kind of matching is its capacity to eliminate the influence on policy impact of any contextual conditions. The matching provided by the whole set of dummies does not coincide with that provided by regional dummies. In the case of regional dummies, municipalities are grouped by region while with the "policy-change boundary" dummies they are grouped by the boundary

33 The queen contiguity criteria has been preferred to the 4-neirest criteria because of the limited number of observations of the Whole and especially of the Subsample. In any case, the analysis carried out also by following this excluded criteria has delivered pretty much the same results.

segment to which they belong. Only in this latter case, does the matching capture the similarities in the characterisation in terms of observables and non-observables. It defines a counterfactual that completely eliminates any omitted variable bias. Consequently, any discontinuity found in the outcome variables could only be ascribed to the discontinuity that discriminates between the treated and untreated groups in the subsample, namely the boundary (conditioning factor of the policy treatment).

Table 3.2 summarises the results of the estimated models. The employment variation was originally related to the 'Objective 1' Status dummy and the 'Initial conditions'[34] and therefore to a wider set of variables.

The model estimates positive and significant policy coefficients on the basis of its first specification. The results do not change when the model includes control variables related to the socio-economic characteristics of municipalities[35] to increase the efficiency of the RDD estimation. The positive impact, moreover, has also been confirmed by controlling for spatial autocorrelation by including a spatially-lagged version of the control variables into the model.[36]

Table 3.2 Effect of EU Regional Policy on employment (RDD).

	Y: employment variation		
"Objective 1" status	15.1895**	14.3379**	15.1709**
	(6.9830)	(7.3174)	(7.4353)
Employment	0.0006	0.0004	-0.0016
	(0.0013)	(0.0031)	(0.0025)
Firms	-0.0013	-0.0017	0.0131
	(0.0077)	(0.0203)	(0.0168)
Population density		-0.0051	-0.0405
		(0.0334)	(0.0280)
Dependency ratio		-0.6117	-0.2007
		(0.4031)	(0.3857)
Uneducated Population		1.3459	1.3270
		(1.7686)	(1.8818)
Constant	-14.7111	23.5980	-14.0008
	(10.7885)	(31.9162)	(33.6299)
Spatial lag variables	No	No	Yes
R squared	0.120	0.146	0.265
Obs	99	99	99

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Set of boundary dummies included in the model. Robust and clustered S.E. in parentheses.

34 Specification of the model without "initial conditions" are not reported here in the interest of space but they lead to similar coefficients.

35 The variables account more specifically for the demographic structure (dependency ratio), the human capital endowment (share of non-educated population) and the degree of agglomeration (population density) of the municipalities.

36 Specifically, human capital and population density are included also as spatially lagged.

These findings, obtained by eliminating all the endogeneity likely to affect the analysis, demonstrate that the Regional Policy's impact is indeed positive for the economies of less disadvantaged Italian regions. The lack of a consensus on this impact could ascribed to the necessity that the policy must be analysed by taking into account its territorial nature and dependence on a complex set of other characteristics of the territory in which it works.

By succeeding in disentangling the policy from all such elements, assuming the latter to be equally distributed over the space, the analysis found that the policy had a positive causality effect. This result is not only exogenous and unbiased (thanks to the "randomized experiment" properties exploited) but also contrary to the result that the analysis would have yielded if performed in a basic OLS setting (see Table 3.3). An OLS analysis, by failing to deal with omitted variables and reverse causality issues that would probably affect the relation between policy and economic performance, is unable to estimate significant coefficients. Moreover, the estimated coefficients appear to have an opposite sign with respect to the exogenous sign provided by the RDD.

Table 3.3 Effect of EU Regional Policy on employment (OLS).

	Y: employment variation		
"Objective 1" status	-1.5399	1.8806	1.3071
	(1.6039)	(1.8416)	(1.9013)
Employment	-0.0017***	-0.0004	-0.0003
	(0.0003)	(0.0003)	(0.0003)
Firms	0.0119***	0.0028	0.0023
	(0.0025)	(0.0021)	(0.0021)
Population density		0.0012	-0.0038***
		(0.0008)	(0.0009)
Dependency ratio		-0.5918***	-0.6131***
		(0.0831)	(0.0930)
Uneducated Population		-1.3009***	-1.1451***
		(0.3001)	(0.3128)
Constant	0.6868	37.5634***	38.3481***
	(1.2824)	(4.5799)	(5.1420)
Spatial lag variables	No	No	Yes
R squared	0.010	0.066	0.080
Obs	1613	1613	1613

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Robust and clustered S.E. in parentheses.

3.6 Extension and Robustness check

RDD has disentangled the policy effect from all other observable and unobservable factors by exploiting the properties of the 'as good as random' sample. For the observations everything is assumed to be randomly distributed and smoothly changing except treatment. However, some important concerns need to be considered, and for this reason some robustness checks are proposed.

3.6.1 From 'spatial' to 'general' RDD specifications

The main analysis (paragraph 3.5) is reproduced here following the standard specification customary in RDD empirical analyses.[37] In this sense, instead of focusing on contiguous municipalities and matching them with the set of "policy-change boundary" dummies (as is customary in "Spatial RDD" applications[38]), model (2) accounts for the discontinuity by including the distance of municipalities from the boundary, namely the "forcing variable" of the treatment.

$$\Delta Y_{it} = \beta_0 + \beta_1 Policy_{it-1} + \beta_2 Y_{it-1} + \beta_3 X_{it-1} + \beta_4 WX_{it-1} + Policy_{it-1} \sum_{p=1}^{2} \gamma\, dist_i + \varepsilon_{it} \qquad (2)$$

Where the same notation of model (1) applies, and where *Dist* is the Euclidean distance from the centroid of each municipality and the closest point of the 'policy-change boundary'.

The relative results obtained (Table 3.4) are totally in line with the results of the main analysis: the basic OLS specification is unable to estimate significant coefficients (Polynomial degree= 0. The same results of Table 3.3). By accounting for the distance from the discontinuity, the RDD models (Polynomial degree= 1 and 2 of Table 3.4) instead found that EU Regional Policy plays a positive and significant role on employment. The coefficients are also of similar magnitude to those estimated by the main analysis.

Table 3.4 Effect of EU Regional Policy on employment (Classic RDD specification).

Polynomial degree	0			1			2		
"Objective 1" status	-1.4999 (1.6529)	2.0080 (1.8821)	1.4157 (1.9423)	10.3105*** (2.8915)	9.8785*** (2.8672)	9.2439*** (2.8979)	12.1672*** (4.2367)	12.0415*** (4.1892)	11.8001*** (4.1791)
Employment	-0.0017*** (0.0003)	-0.0004 (0.0003)	-0.0003 (0.0003)	-0.0016*** (0.0003)	-0.0004 (0.0003)	-0.0003 (0.0003)	-0.0014*** (0.0003)	-0.0004 (0.0003)	-0.0003 (0.0003)
Firms	0.0121*** (0.0026)	0.0030 (0.0022)	0.0025 (0.0022)	0.0113*** (0.0025)	0.0029 (0.0022)	0.0025 (0.0022)	0.0103*** (0.0024)	0.0028 (0.0021)	0.0023 (0.0021)
Population density		0.0012 (0.0008)	-0.0038*** (0.0009)		0.0013 (0.0008)	-0.0036*** (0.0009)		0.0012 (0.0008)	-0.0036*** (0.0009)
Dependency ratio		-0.5882*** (0.0837)	-0.6076*** (0.0938)		-0.5796*** (0.0845)	-0.5991*** (0.0948)		-0.5487*** (0.0861)	-0.5768*** (0.0955)
Uneducated Population		-1.3310*** (0.3012)	-1.1805*** (0.3140)		-0.8892*** (0.3247)	-0.7436** (0.3358)		-0.8672*** (0.3288)	-0.7012** (0.3367)
Constant	0.6044 (1.3488)	37.3595*** (4.6195)	38.0391*** (5.1912)	-6.3255*** (1.8624)	30.7554*** (4.9977)	31.4475*** (5.6013)	-13.5475 (2.5199)	24.0460*** (5.6317)	25.4063*** (6.2298)
Spatial lag variables	No	No	Yes	No	No	Yes	No	No	Yes
R squared Obs	0.010 1566	0.066 1564	0.080 1564	0.026 1566	0.074 1564	0.088 1564	0.037 1566	0.078 1564	0.091 1564

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Robust and clustered S.E. in parentheses.

37 Pellegrini et al. (2013); De Blasio et al. (2011); Bronzini and Iachini (2011).

38 Holmes (1998); Black (1999); Menon and Giacomelli (2012); Jofre (2012) etc.

3.6.2 Spillovers across boundary

Although the Regional Policy is by its nature 'spatially targeted', its effects, whether positive or negative, are unlikely to be totally self-contained within the territory at which the policy measures were originally targeted (Bondonio and Greenbaum, 2003; Einio and Overman, 2012; Freedman, 2012; Glaeser and Gottlieb, 2009). The effect of the policy implemented in treated municipalities could in fact spread across the 'policy-change boundary'. And in this case, the coefficients of interest would be upwardly biased if the policy effect did not take account of, for example, the better performance of the treated at the expense of the untreated and spatially sorted municipalities. They would be downwardly biased if the policy were, in some way, also benefiting untreated municipalities (e.g., economic performance of the untreated bolstered by the one of the treated).

The first effect, known as 'spatial sorting', is particularly relevant when the size of the units of analysis is very small, as happens here (municipality). Consequently, the effect has been studied in detail in the literature (Einio and Overman, 2012; Fehrenbacher and Pedell, 2012) and also as concerns Italy (Andini and de Blasio, 2013; Bronzini and de Blasio, 2006; de Castris and Pellegrini, 2005). The willingness of an enterprise to benefit from the specific financial incentives or grants offered by a spatially targeted policy scheme could exercise an influence on its localisation decisions, which, in turn, could lead to a 'distortive localisation effect'. In methodological terms, if enterprises that would otherwise have chosen to locate in untreated municipalities were to decide to locate in adjacent treated municipalities in order to obtain policy support, the treatment effect estimated would be the result of the sum of the policy effect and this sorting effect (attracting new firms in the treated area at the expenses of untreated areas rather than creating new employment opportunities).

This paragraph checks for spatial sorting by performing a 'Displacement Test' (Einio and Overman, 2012). According to this test, the RDD model has to be re-estimated by looking at different subsamples of municipalities. Each of them is made up of different rings/bands of control observations, each matched with their corresponding ring/band. Initially the test focuses on the municipalities closest to the boundary. Afterwards, the models include the control municipalities belonging to bands increasingly removed from the boundary, but always matched by their corresponding band. The assumption is that by changing the localisation decision in order to benefit from the policy is easier the closer the treated municipalities: spatial sorting is expected hence to be larger among municipalities closer to the boundary. Consequently, the treatment effect coefficients should be higher the smaller the distance from the boundary of municipalities included as observations in the models. Thus, if by extending the focus to control more distant municipalities produces a decrease in the coefficient, the impact estimated "at the discontinuity" would probably be upwardly biased, including not only the direct policy effect but also the spatial sorting from untreated municipalities.

The test is performed by comparing treated observations within 15 km from the boundary with five different samples of control municipalities, the first comprised by control municipalities within 15 km (1st band), the second by the control municipalities within 50 km (2nd band), the third control

municipalities within 75 km (3rd band), the fourth control municipalities within 100 km (4th band) and the last comprising all untreated municipalities.

The models account for discontinuity by having recourse to the forcing variable distance (see paragraph 3.6.1) rather than to "policy-change boundary" dummies, as the former solution appears to be more appropriate when the focus is not on contiguous municipalities alone. Each version of the model, related to each of the control samples, includes therefore a set of dummies that altogether match the municipalities in the same band.

The results of the different models estimated are reported in Table 3.5 and show that according to the RDD specifications (columns 2 and 3) the coefficients of interest are positive and significant irrespective of the sample of control municipalities used. Moreover, even if we only consider the full sample of control municipalities, for which spatial sorting with respect to the treated observations is necessarily less likely,[39] the EU policy's impact is still positive and significant. Moreover, by comparing all the coefficients obtained, an additional finding suggests that the positive policy effect is not the result of spatial sorting: the coefficients' magnitude does not increase in direct proportion to the municipalities' proximity to the boundary, as the largest coefficient being, at least in column 2, that obtained by looking at the control municipalities overall.

Table 3.5 Effect of EU Regional Policy on employment for different control samples (Classic RDD specification).

Treated municipalities: within 15 kms from the Boundary			
	Polynomial degree		
	0	1	2
Control munipalities band:			
Whole	-16.6885***	34.1704**	49.5443**
(obs:672)	(4.5205)	(15.6543)	(21.6131)
100 kms	-11.1561**	32.2505**	36.4980*
(obs:589)	(5.3116)	(15.2901)	(21.5718)
75 kms	-16.6885***	23.7783**	36.9954*
(obs:528)	(4.5174)	(12.3807)	(19.3603)
50 kms	6.1701	24.1516**	43.2292**
(obs:450)	(4.0714)	(9.6302)	(19.4106)
15 kms	6.1701	25.4722***	37.3784**
(obs:235)	(4.0752)	(9.7182)	(18.8808)

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Robust and clustered S.E. in parentheses. All the specifications include a set of dummies matching the municipalities by band of belonging.

According to this test, which is capable of disentangling the net policy effect from the displacement of economic activity, and which the policy might cause for enterprises moving from untreated to treated areas, it seems that the effect of EU Regional Policy is positive by itself and not driven by any sorting effect. This means that the policy does not cause the displacement of economic activities from the

39 Their distances to the boundary are of up to 200 kms.

untreated to treated areas. This result is very important. Firstly, with respect to the nature of the policy: pursuing territorial cohesion does not mean damaging the richest regions by shifting their economic activities to the poorest areas. Secondly, with respect to the scenario of interest: EU Regional Policy supports an autonomous development for the Italian "Mezzogiorno", without producing negative externalities for other regions.

3.6.3 Long-run effect

The time window for the implementation of counterfactual analyses needs to be sufficiently long in order to check whether or not the treatment of interest has produced changes in the observable characteristics of the treated and control observations. Furthermore, it is important to ensure that the final differences are "included" the treatment and that they do not simply reflect corresponding pre-treatment conditions. As paragraph 3.3.1 stressed, this is one of the reasons why the analysis looks at earlier policy programming periods: in this case, we can test for policy impact over a period of more than 10 years. In particular, the main analysis estimated the impact of the policy on variations in employment between 1991 and 2001[40] and this paragraph shows how the results obtained are valid also over a longer time period 1991-2011. Table 3.6 illustrates that even in relation to the employment variation 1991-2011 the "Objective 1" dummy coefficient remains positive, significant and similar in extent to that estimated with respect to the 1991-2001 employment variation. It not only means that the impact estimated with a shorter lag between treatment and outcome (Paragraph 3.5, table 3.2) is reliable but that it is also valid for the long term. EU Regional Policy as carried out at its onset (until 1999) was capable of setting a real local development process in motion in the most disadvantaged Italian areas.

Table 3.6 Long run effect of EU Regional Policy on employment (RDD).

	Y: employment variation 91-11
"Objective 1" status	14.033**
	(6.9878)
Employment	-0.0021
	(0.0025)
Firms	0.0140
	(0.0158)
Constant	-51.7775***
	(7.7872)
R squared	0.143
obs	99

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Set of boundary dummies included in the model. Robust and clustered S.E. in parentheses.

40 The reason why the analysis prefers to use the shortest variation as principal reference is because the number and the importance of potential confounding factors (see paragraph 3.6.4) would be higher the longer the lag between the treatment assignment and the economic performance measure. Testing for the long run impact however is required in counterfactual analysis.

3.6.4 Confounding factors

It is commonly accepted in this literature that the role of "factors" distributed across space in the same ways as the EU Regional Policy and correlated to this policy could confound the identification of the policy's direct impact .

The assumption on which RDD relies is that in the 'as good as random' sample, treatment is the only discontinuity, whereas everything else is randomly distributed and changes smoothly. The different spatial patterns of the treatment with respect to other aspects makes it possible to separate their effects.

By contrast, if some processes show the same spatial behaviour with respect to discontinuity as treatment, their role would remain 'hidden' and included in the estimated policy impact. In order to avoid this problem, discontinuity should only be correlated to treatment. If the "policy-change boundary", when broken down into segments, coincides with the regional boundaries this could imply that discontinuity characterizes not only treatment but also other region-specific features that vary with regional boundary changes. And this could apply to anything possibly correlated to EU Regional Policy and related in the same manner to discontinuity. It may, for instance, apply to regional laws (observable factor) assisting enterprises: they are valid within the regional territory but not regionally contiguous, producing a sharp change (on/off) corresponding to the regional boundary thus partly coinciding with the "policy-change boundary" (treatment discontinuity).

Most of the non-EU funded policies directly implemented by the Italian regions - which in general benefit from a stronger spending autonomy in areas such as healthcare or social services – do not directly overlap with EU Cohesion Policy targets. In addition, national-level development policies directly linked to EU Regional Policy activities (e.g., national policies targeted to the most underutilized areas, the present "Fondo per lo Sviluppo e la Coesione") were not in operation during the period here investigated (see Paragraph 3.3.1).

Some checks were, however, proposed to make sure that impact estimation is not influenced by confounding factors related to such regional effects.

For most checks, however, the general idea was to re-estimate the analysis within a placebo 'as good as random' sample created with respect to 'mock' discontinuities and with the expectation of not finding any significant policy impact in terms of employment variation.

In this framework, Table 3.7 shows the results obtained by looking at the true boundary, but in a period (1971-1981 and 1981-1991) when no discontinuity was present as the policy had not been implemented.

Table 3.7 Placebo Test: effect of EU Regional Policy on employment in a Pre Treatment period (RDD).

	Y: employment variation 81-91	Y: employment variation 71-81
"Objective 1" status	25.9492	-3.5012
	(20.6554)	(14.9115)
Employment	0.0263	0.0075
	(0.0165)	(0.0120)
Firms	-0.1354*	-0.0460
	(0.0706)	(0.0594)
Constant	61.6136	17.4320
	(52.0853)	(14.4474)
R squared	0.124	0.017
obs	99	99

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Set of boundary dummies included in the model. Robust and clustered S.E. in parentheses.

Table 3.8, shows the results obtained by using the 'true' boundary as the element of discontinuity, however shifted to the control group. By doing this the model compares all untreated municipalities. It considers the municipalities contiguous to the 'true' boundary as treated and the municipalities contiguous to the latter as controls.

Table 3.8 Placebo test: effect of EU Regional Policy on employment within control municipalities (RDD shifting boundary test).

	Y: employment variation	
Mock "Objective 1" status	-7.6773	6.8059
	(5.4405)	(5.1003)
Employment	-0.0009	-0.0002
	(0.0014)	(0.0015)
Firms	0.0113	0.0006
	(0.0088)	(0.0103)
Population density		0.0166
		(0.0198)
Dependency ratio		-0.5901
		(0.3594)
Uneducated Population		0.3103
		(1.5174)
Constant	-9.4737	18.6989
	(7.1184)	(24.4286)
R squared	0.058	0.128
Obs	110	110

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Set of boundary dummies included in the model. Robust and clustered S.E. in parentheses.

On the contrary, the municipalities used for the estimation of the model presented in Table 3.9 are all treated. These are municipalities contiguous to the administrative boundary between Molise and Campania, and do not represent a discontinuity as both regions are "Objective 1". In this case, Molise's municipalities received a 'mock' control status.

Table 3.9 Placebo test: effect of EU Regional Policy on employment (RDD mock discontinuity test).

	Y: employment variation	
Mock "Objective 1" status	-4.2441	-4.8668
	(10.0908)	(9.5159)
Employment	0.0071	0.0090
	(0.0058)	(0.0216)
Firms	-0.0444	-0.0530
	(0.0480)	(0.0886)
Population density		-0.0188
		(0.1493)
Dependency ratio		-.1270
		(0.9270)
Uneducated Population		-0.8489
		(0.8886)
Constant	-3.6424	11.3494
	(8.5305)	(59.9173)
R squared	0.033	0.039
Obs	68	68

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Set of boundary dummies included in the model. Region of Molise is considered as control. Robust and clustered S.E. in parentheses.

These checks handle the issues of regional confounding factors by illustrating how regional borders and "policy-change boundary" could discriminate observations between two different couples of treatment-control groups. As far as the aim of the analysis is to identify the effect of EU Regional Policy, only the "policy-change boundary" provides a control group capable of being a counterfactual for the treated group. It leads to an exogenous estimation of the treatment effect, disentangled from all other correlated aspects.

Additional evidence (Tables 3.10, 3.11) confirms that the "policy-change boundary" is only related to Regional Policy.

As expected, the relation between treatment and other observables is not significant. Whereas treatment changes sharply, the other observables exhibit a smooth distribution (Table 3.10).

Table 3.10 Effect of EU Regional Policy on observables (RDD Falsification test).

	Population density	Dependency rate	Elderly population ratio	Uneducated Population	Highly Educated Population
"Objective 1" status	-55.4045	-1.0886	-1.0832	-0.1372	-0.0407
	(33.5828)	(1.6924)	(1.0996)	(0.3791)	(0.2224)
R squared	0.354	0.273	0.237	0.179	0.059
Obs	99	99	99	99	99

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Set of boundary dummies included in the model. Robust and clustered S.E. in parentheses.

Moreover, if the EU Regional Policy dummy is substituted by a continuous variable accounting for the total amount of transfers given from the regions to the municipalities (source of data: Ministry of Interior

– see Paragraph 3.3.1), the model delivers insignificant policy coefficients. The meaning of the relation between this variable and the employment variation does not lend itself to easy interpretation: the "transfers" variable is a large 'container' on which funding from very different kind of policies converge. The purpose of looking at this relation, however, is to check to see if at the discontinuity point other sources of local financial support behave in the same way as the EU Regional Policy (see results in Table 3.11).

Table 3.11 Effect of "Transfers" (in place of Regional Policy) on employment (RDD).

	Y: employment variation	
Regional Tranfers	0.0000	0.0000
	(0.0000)	(0.0000)
Employment	0.0020	0.0017
	(0.0054)	(0.0054)
Firms	-0.0063	-0.0017
	(0.0095)	(0.0188)
Population density		-0.0187
		(0.0319)
Dependency ratio		-0.7237*
		(0.3996)
Uneducated Population		1.0591
		(1.7452)
Constant	-4.8569	42.2816
	(11.5788)	(29.8296)
R squared	0.075	0.108
Obs	99	99

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Set of boundary dummies included in the model. Robust and clustered S.E. in parentheses.

3.6.5 External shocks

The EU Regional Policy explicitly aims to support the development of specific sectors of strategic importance for local economic development processes (e.g., manufacturing, tourism and infrastructural sectors). Looking at how the impact of the policy in terms of employment varies across sectors could hence help to disentangle that part of employment growth attributable to the policy from that produced by potential external shocks, which that could have been driving the employment trend during the period of the analysis independently of policy actions.

Consequently, we should expect that the coefficients of the "Objective 1" dummy to be larger with respect to employment in sectors receiving the most support, such as manufacturing, construction and tourism. Conversely, they should be insignificant in sectors not directly supported by EU Regional Policy (such as agriculture, targeted by other policies, and financial services, less related to local development).

The results reported in Table 3.12 are obtained by re-estimating the analysis in a panel setting where the i, j dimensions stand respectively for: i) 5 relevant macro-sectors of the local economic structure and j) municipalities.

Table 3.12 Effect of EU Regional Policy on sectoral employment (Classical RDD specification, Panel).

	Polynomial degree		
	0	1	2
"Objective 1" Status* agricultural sector	14.0758	36.1015	24.7990
	(32.6997)	(31.2253)	(26.9216)
"Objective 1" Status* manufacturing sector	24.2512***	44.8405***	32.9690***
	(7.7619)	(9.2313)	(12.7079)
"Objective 1" Status* infrastructural sector	-0.8539	19.5238*	7.5788
	(7.4494)	(10.3387)	(13.6153)
"Objective 1" Status* tourism sector	13.1202***	33.4089***	21.3750*
	(4.4882)	(7.6402)	(12.3069)
"Objective 1" Status* financial sector	-22.3071	-0.1794	-12.4877 (14.5124)
	(7.4423)	(10.3370)	
Constant	50.4067***	35.1246***	22.2569**
	(6.5065)	(8.7714)	(10.8916)
R squared	0.004	0.005	0.007
N	6696	6696	6696

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Clustered S.E. in parentheses. All the specifications include the sectoral dummies.

The empirical evidence is totally in line with what it is expected according to policy structure and its aims.[41] The effect of the policy on employment variation is positive only for those sectors that have been more directly and explicitly supported by the policy and its structures. Instead, no significant impact is found for the "control" sectors (agricultural and financial services). Apart from confirming the robustness of the results to macro shocks, this finding suggests that policy-sustained employment growth is mainly concentrated in those sectors with close links to a sustainable local economic development process. This is completely in line with the rationale of the EU Regional Policy. This policy wants to make disadvantaged regions capable of finding their own way towards growth in the context of an on-going process of EU integration. Leveraging regional comparative advantages in sectors particularly suitable for the promotion of such broad development is line with this objective.

3.7 External validity

RDD models estimate the policy's exogenous effect at the point of discontinuity but there is no way of quantitatively testing to determine if the results are representative of the whole set of treated observations (i.e. external validity, which in our case refers to the rest of EU Objective 1 regions). Once verified that the subsample "at the threshold" is representative for the whole sample,[42] this limit turns out to be commonly accepted by the literature (Battistin and Rettore, 2008; Blundell and Costa-Dias,

41 The model is estimated here by applying Random Effect instead of Fixed Effect, since the policy dummy does not vary within sectors ("sector-invariant").

42 It could be said here that the 99 municipalities composing the Subsample are properly representing the 1615 of the Whole one since the weight that each region has in the Whole sample both in terms of number of municipalities and in terms of population is kept as well in the Subsample.

2010). However, in order to check that RDD results are indeed robust in terms of external validity, the literature suggests to reproduce the analysis in a context as more similar as possible to that being studied. In the case of Italian Objective 1 regions, Spain seems to be the most suitable test.

During the period under analysis, EU Regional Policy in Spain and in Italy was implemented with a similar approach, both in terms of resources committed and territorial coverage. As concerns Spain, the analysis will focus on the regions that share a "policy-change boundary", namely: Castilla la Mancha, Castilla-Leon, Cantabria, Comunidad Valenciana and Cataluna ("Objective 1") and Pais Basco, La Rioja, Aragon and Navarra (non-"Objective 1"). The number of municipalities belonging to these regions totals 5893 (the whole sample). The analysis is hence reproduced within this setting to see if the positive and significant impact of EU Regional Policy found for the Italian "Objective 1" regions is confirmed in this analogous context. If it did, the main results, found "at the discontinuity", could be fairly interpreted as being valid overall. Because of the physical conformation of the Spanish municipalities, within a territory that is not all contiguous but rather distributed over many separated areas spread over a larger area, it was preferred to account for the discontinuity by including the forcing variable, "distance", in the model (Model 2, classical RDD specification) rather than "policy-change boundary" dummies (Model 1).

In order to make the two cases comparable, Model 2 was also re-estimated for the Italian observations based on data available for Spanish municipalities (for which there is no information on initial conditions in terms of number of enterprises) and the results are reported in Table 3.13.

Table 3.13 Effect of EU Regional Policy on employment (RDD External validity test).

	Spain			Italy		
Polynomio	0	1	2	0	1	2
"Objective 1" status	-11.3690***	10.3285***	6.9122**	-1.7620	10.4404***	11.9754***
	(1.5781)	(2.3778)	(2.7891)	(1.6602)	(2.9036)	(4.2568)
Constant	23.5648***	10.3947***	1.8831	2.6353**	-4.9363	-12.6259***
	(1.0573)	(1.5694)	(2.0439)	(1.1951)	(1.8310)	(2.5335)
R squared	0.021	0.021	0.031	0.001	0.018	0.031
Obs	5892	5892	5892	1566	1566	1566

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Robust and clustered S.E. in parentheses.

It emerges that for Spain too, the impact of the policy is positive, significant and of a similar extent with respect to Italy.

In addition, if Italian and Spanish municipalities are pooled together, the same model can be run for them all , allowing all the coefficients to vary by country (i.e. each variable interacting with a "country" dummy that matches municipalities by country of origin):

$$Country * \Delta Y_{it} = \beta_0 + \beta_1 Country * Policy_{it-1} + \beta_2 Country * Y_{it-1} + Country * Policy_{it-1} \sum_{p=1}^{2} \gamma\, dist_i + \varepsilon_{it} \quad (3)$$

The results are shown in Table II.2, and confirm the findings already obtained by estimating the two RDD models separately.
According to this classical way of checking for the external validity of the RDD strategy, the Local Average Treatment Effect estimated for the municipalities on the boundary could be interpreted as also valid for the entire municipality sample. The analysis of the Spanish case will be further developed in the following chapter.

3.8 Conclusions

This analysis has contributed to the *identification* of the net impact of the European Regional Policy by making use of treatment effect methods.
By adapting experimental methods to the non-randomized scenario through the application of RDD has allowed us to perform the estimation in an "as good as random" scenario, in which endogeneity does not matter and, thus, find consistent and unbiased evidence on the Regional Policy's effectiveness.

The design, which ultimately captures the policy effect by defining and comparing "randomly defined" treatment and control groups, has been developed over some key steps. In particular, it first identified the threshold that determines the treatment discontinuity in the "policy-change boundary", as the conditioning factor for the treatment that sharply divides observations into treated (they achieve "Objective 1" Status) and untreated (they do not achieve the status). Then, in order to be able to apply the properties of "randomized experiment", and by restricting the focus to the observations increasingly closer to the "policy-change boundary" (the discontinuity), an "as good as random" subsample of observations was identified that includes the municipalities contiguous to the "policy-change boundary", both treated and untreated (observations "on" the threshold). Within this subsample, observations turned out to be randomly characterized in terms of both treatment and observable and unobservable contextual aspects. By exploiting the fact that municipalities within the subsample are more similar to one another than they are to the municipalities overall, it was proven that everything in the subsample (control and contextual conditions) is smoothly distributed across municipalities apart from treatment, which, consequently, is uncorrelated to anything else. As the only discontinuity refers to policy, "non-Objective 1" observations (untreated) turned out to have (except for treatment) the same characteristics as "Objective 1", which hence represents the policy "Counterfactual". By comparing the randomly distributed treatment and counterfactual observations RDD was finally able to ascribe any discontinuities found in the outcome variables to the only discontinuity that differentiated the two groups and identified as the Regional Policy "treatment effect".

The consistent and unbiased items of evidence prove the positive impact of EU Regional Policy on employment in "Objective 1" Italian regions during the 1990s. The results' "internal validity" was

confirmed by several robustness checks whereas their “external validity” was checked by examining the Spanish case.
RDD results are in contrast to those obtained from basic OLS models, as the latter are probably affected by omitted variable and reverse causality bias. Analyses (e.g., basic OLS estimation) that do not disentangle the conditioning factors’ role from that of policy can even yield a negative policy impact. This means that these factors in each “integrated territorial system” can hamper the policy in delivering an overall positive impact.

Furthermore, according to the RDD extensions proposed here, the effect on employment supported by EU Regional Policy is not only positive but also sustainable and autonomous. Employment growth has leveraged sectors closely linked to local economic development (i.e. manufacturing, construction and tourism), which are those targeted by the policy. In addition, the territorial cohesion promoted did not imply the displacement of the economic activities from the richest to the poorest areas. Instead, it has promoted its own process of job creation in one of the most persistent scenario of underdevelopment (i.e. Italian Mezzogiorno) in Europe.
Such an analysis, in addition to providing consistent, unbiased and significant items of evidence of Regional Policy’s positive impact, hence confirmed that Regional Policy cannot be considered “exogenous” and that treatment-effect methods could represent a valuable tool in dealing with the endogeneity that often affects territorial policies evaluation.

4. IMPACT EVALUATION WITH CONDITIONING FACTORS: HOW DOES THE NET IMPACT OF EU REGIONAL POLICY DIFFER ACROSS COUNTRIES?

4.1 Introduction

This fourth chapter of the thesis aims to built on both the *Contextualisation* and the *Identification* work developed in previous chapters. In particular, the net EU Regional Policy impact for all of Europe is estimated by exploiting the *Identification* strategy presented in chapter 3. By doing so, it offsets the different role played by the country specific conditioning factors studied in the *Contextualisation* analysis (Chapter 2). For each country, the estimated impact will hence be exogenous. In this framework, this chapter will test whether, once the impact is not affected by the conditioning role of regional factors, the net impact of EU regional policy is the same for all countries or whether, conversely, national-level characteristics can still determine differential effects.

In this sense, the RDD analysis proposed in Chapter 3 will be extended to the other EU MS that host some of the most disadvantaged regions in Europe in order to estimate the Regional Policy role for Europe as a whole. Thanks to this *Identification* strategy the role of the policy will be isolated from the conditioning factors identified by the analysis' *Contextualisation*, and playing a different role in each MS. The impact to be estimated refers to the net policy impact that the EU Regional Policy is capable of achieving in the different MS at which it has been targeted. Very similar evidence will emerge for all countries. This is in contrast to the heterogeneous results provided by existing cross-country analyses, often affected by endogeneity bias. The heterogeneity found in the literature on EU Regional Policy's cross-country impact hence depends on the role of conditioning factors. The majority of such works did not succeed in controlling for the endogeneity intrinsic to them. Thus their different roles in each country accounts for variance in the policy's impact.

Since the results remain slightly different and grouped according by MS characterisation, other aspects, apart from the elements that compose each territory, may be shaping the policy outcome across space. Country specific governance and policy implementation are likely to play the most important role in this respect (ESPON, 2005).

The remainder of the chapter will be organized as follow: paragraph 4.2 sheds light on the spatial context of the analysis by leveraging country-specific literature produced on EU Regional Policy; paragraph 4.3 will present data and recall the methodology already proposed in the previous chapter; paragraph 4.4 will discuss the results and paragraph 4.5 will present the conclusions.

4.2 EU Regional Policy and country specificities

An earlier chapter addressed the impact of EU Regional Policy in Italy in terms of *Identification*. The policy, however, and under the same rules, (i.e. by targeting the most disadvantaged regions) operates in almost all European countries.

Thus, this chapter exploits the same *Identification* strategy, extending the focus to all European countries with both "Objective 1" and 'non-Objective' regions (Germany, Italy, Spain, United Kingdom). The policy programming periods of reference remain the 1988-1999 because the same reasons apply as those used for the analysis of the Italian case.[43]

For the 1994-1999 period, a total budget of € 138.2 billion was allocated to the SF, representing less than 0.50% of the total gross national product of all EU Member States (Puigcerver-Peñalver, 2007). The largest part of the total budget was reserved for "Objective 1" regions (68%), which accounts for roughly one third of the total resources of the Union's Budget (€ 114 billion, in addition to a match-funding of national public and private resources for a further € 95 billion), covering a population of about 92 million inhabitants (one quarter of the total population of the EU as a whole)[44] and representing supply-side policies capable of adding infrastructures, human capital and productive investments (EU Commission, 1999).

The SF's main objectives are to reduce disparities in GDP and unemployment between the regions of Europe by identifying market failures and existing growth constraints. In the 1994-99 period these objectives were primarily targeted through investments in some priority areas: almost half of the resources were employed in business development (industrial investment support and SME development) and 11% in physical infrastructure such as transport infrastructure, energy and environmental projects. Other priorities varied widely from country to country: particular emphasis on human resources development was given by Ireland and UK; Austria and the Netherlands were particularly active in R&D and finally agriculture and rural development were at the core of the strategy for Germany and Austria (EU Commission, 1996).

As already shown in paragraph 1.2 there is little evidence that these measures have significantly reduced spatial disparities within the "Objective 1" regions (ESPON, 2005).

Some positive evidence relate to their capacity to generate growth within capital cities and other regions performing relatively strongly. In the meantime, they reduced the gap in GDP per capita between the "Objective 1" regions and the rest of the EU from 64% of the EU average in 1993 to 69% in 2000 (EU Commission, 1999). However, the impact expected in terms of reducing internal disparities remains unclear (See Paragraph 1.2).

Furthermore, the policy structure does not completely match the territorial-cohesion objectives: the policy supported transport and environmental infrastructures, human capital and knowledge, the information society and the knowledge economy (EU Commission, 1999); in addition, the distribution of the expenditure favoured regions without major cities (e.g. Barcelona, Athens).

43 Counterfactual analyses needs to exploit a large temporal window to estimate the policy impact; lack of updated data would prevent to look at most recent years for outcome variables.

44 Almost 51% of the EU population was living in areas which are eligible under one of the Structural Funds' four regional objectives. "Objective 1" regions alone represent 26.6% of the EU population (more than in the previous period 1989-1993, when the share was of 21.7%).

However, mono-centric regions appear to be the largest beneficiaries of such support (ESPON, 2005), with some exceptions for old industrial regions (e.g., Bremen in Germany, Merseyside in England). Lack of cooperation between the public and private sector was seen as a major reason for the policy's possible failure (EU Commission, 1999) highlighting how the management process was favoured where partnership was strongest (e.g., Castilla y Leon and Macedonia).
Another reason advanced in literature relates to a potentially wrong role assigned to administrative regions at the local level: cooperation between the region and the local level for design and implementation will be in fact examined in more detail in the following programming periods (EU Commission, 2000).
The choice of administrative regions as the primary policy actors has also been criticised because it offers neither the necessary geographical proximity (some European regions are bigger than Belgium) nor a common background (EU Commission, 2000).

In this framework, the large heterogeneity in the policy structure and impact has been found in cross-country studies looking at these earlier policy-programming periods.
First, over half of the SF budget was allocated to just three MS (Spain, Italy and Germany).
In absolute terms, Spain was the biggest recipient of SF (23% of the total budget), which delivered a sizable impact, by adding around one percentage point to annual output growth in the average "Objective 1" region and 0.4 points to employment growth. Over the period 1994-2000, the Framework has resulted in the creation of over 300,000 new jobs and eliminated 20% of the initial income gap per capita between the assisted regions and the rest of the country (De la Fuente, 2003).
In Germany, in the period 1994-1999, all the eastern landers were qualified as "Objective 1", with the exception of Berlin (only East-Berlin was an "Objective 1" area, whereas West Berlin was an Objective 2 area). Conversely, the West-German landers were not all Objective 2 and, moreover, 5b and Objective 6 did not apply to Germany at all. More than 100 Operational Programmes, Single Programming Documents, and Community Initiative Programmes were under operation here. Among these, that in Sachsen was the biggest. Mecklenburg-Pomerania, Sachsen-Anhalt and Branderburg used to have many instruments for technology promotion, but they have failed to update these instruments or interface them properly with regional development policy, achieving – as a result – very limited effects. All programmes upgrade human resources, especially in business skills and training in innovation policy for local public policy managers.
In Italy, EU Regional Policy prioritises the poorest part of the country, the "Mezzogiorno", which presents a persistent and deep disparity with respect to the north in terms of economic growth, structural development, and institutions. The gap has not been filled but the impact of the specific policy has turned out to be positive according to our previous application (Chapter 3).
In per capita terms, the four cohesion countries (Spain, Portugal, Ireland and Greece) were the biggest beneficiaries (47% of the SF budget). Among them, Portugal, Greece and Ireland were all targeted as

"Objective 1". In Portugal, the principal imbalance is between the coastal and interior sub-regions, which demand differential policies. More than 80% of the economic activities were in the central region whereas regions such as Setubal present a huge gap in terms of human resources (Soukiazis and Antunes, 2006). Policy action in Greece suffers from the quality of the management structures and from limited effectiveness and insufficient co-operation between the relevant Ministries (General Secretariat for Research, General Secretariat for Industry, Ministry of Education, Ministry of Agriculture). In Ireland, however, the availability of SF has coincided with the remarkable success of the economy. In addition, whereas for the other EU countries infrastructure had been the main priority, policy was here mostly targeted at investment in human resources (Bradley and Untiedt, 2008).

The other MS were less involved in this part of EU Regional Policy (see Table III.1) because of their smaller size in terms of population and a more even distribution of the disadvantage (EU Commission, 1999).

In the United Kingdom during the SF's first programming period (1989-1993) only Northern Ireland received "Objective 1" status. For the second period (1994-1999), two other regions were included: Merseyside, previously an "Objective 2" region and the Highlands and Islands, previously "Objective 5b". These regions either suffer from the disadvantages of peripherality and/or from the cumulative effects of continuing industrial and economic decline, with high rates of long-term unemployment. Here the Community's assistance is given to actions that promote improvements in infrastructure, local business development, investment in innovation and new technology, the protection of the environment, community economic development and investment in human resources. In terms of results, while the programmes in Merseyside and especially in Highlands and Islands suffer from dispersion and the lack of a clear focus, in Northern Ireland the measures have been generally well planned and executed, achieving a degree of success in the support of small enterprises.

In Belgium, the effectiveness of the "Objective 1" programmes of the province of Hainaut has suffered from insufficient regional administration autonomy with respect to Wallonia.

In France, "Objective 1" regions are very different in nature. The 4 overseas departments (DOMs) were facing serious problems of very high unemployment, due to high birth rates, an overall small population and economies at sub-critical mass. The major challenge for all DOMs has hence been the restructuring of very small, non-competitive production into a value-added learning economy. The two European regions were instead much better connected to the overall French economic system, and in fact they lost the "Objective 1" status at the start of the 2000-06 programming period (EU Commission, 1996).

In Austria, the "Objective 1" area Burgenland was targeted for funding but only as concerns a few technology areas capable in this framework of constructing a telecommunications network, attracting a Nokia research centre and building a technology centre that provides support for SME's.

In the Netherlands, the "Objective 1" region of Flevoland was transiting to an industrial phase, although agriculture and food were still important, accounting for 5.6% of the labour force, more than twice the

national average. Here policy was mainly aimed at support research infrastructure since the region considers itself to be in a fledgling state and in need of infrastructure (EU Commission, 1996).
On the basis of this variegated picture, the pattern of the "Objective 1" regions evolved over the following decades and today the geography of disadvantage is totally different.
This chapter of the thesis will contribute towards understand whether or not this process has been driven by a convergence process involving the most disadvantaged areas. Since the net impact of EU Regional Policy is not clear, the development of the EU's geography of disadvantage could be mainly ascribable to the extension of the European Union to countries with areas that, on average, are even more disadvantaged than the "Objective 1" regions of the former European Union.

4.3 Data and Methodology

For the policy programming periods of interest (1988-1999), regions classified as "Objective 1" were distributed among almost all the MS (see Figure III.1): all regions of Greece, Portugal and Ireland, the Hainaut province of Belgium, the overseas départements, Corsica and the "arrondissements" of Valenciennes, Douai and Avesnes (France); the region of Flevoland in the Netherlands; the province of Burgenland in Austria; all the East-German landers, half of the Spanish territory, the Italian "Mezzogiorno" (see chapter 3) and some counties of the United Kingdom (in Scotland and in the North-West areas).
Since the methodology exploited leverages within countries' spatial discontinuities (namely, administrative boundaries between "Objective 1" and "non-Objective 1" regions) the analysis is forced to exclude the cohesion countries of Portugal, Greece and Ireland: as all their regions are classified in terms of this status. The same reason led us to exclude France, as the only regions classified as "Objective 1" are not continental and consequently do not entail spatial discontinuities with respect to the untreated areas. Belgium and Austria are also excluded, because the policy assignment is not at NUTS 2 level but only at the provincial level: respectively Hainaut and Burgenland. Finally, the Netherlands has also been excluded due to the difficulties in assessing the impact of the EU regional policy in their regions highlighted by large and converging body of literature (Madureira et al., 2007).[45] The region was granted this status on account of its relatively low per capita gross regional product, but this primarily reflects a particularly high net number of outgoing commuters.
Thus, the analysis focuses on Germany, Italy, Spain and United Kingdom. The sample seems to be however representative for Europe since these four countries alone absorb 70% of the "Objective 1" population in Europe in 1994 (EU Commission, 1996). As already shown in Chapter 3, the RDD proposed here uses for its observations the smallest administrative units (LAU 2 level of the European NUTS

45 The Objective 1 status granted by the region of Flevoland for its relatively low per capita gross regional product primarily reflects the especially high net numbers of outgoing commuters, due to the fact that Flevoland became a residential area for people from the area of the Randstad, as the pressure of space in that area became very high. At the same time, a lot of people living in Flevoland are working in the Randstad (EU Commission, 2003)

classification) belonging to the regions (NUTS2) that share one segment of the boundary implying a policy discontinuity in terms of "Objective 1" status assignment ("policy-change boundary").
In Germany the sample is composed of roughly 8,000 "Gemeinden" belonging to the landers Schleswig-Holstein, Niedersachsen, Hessen, Freistaat Bayern (not treated as "Objective 1") and to Brandenburg, Mecklenburg-Vorpommern, Freistaat Sachsen, Sachsen-Anhalt, Freistaat Thüringen (treated as "Objective 1").
In Spain the "municipios" involved in the sample are roughly 6000 and belong to the Autonomous communities of Pays-Basco, la Rioja, Aragon and Catalonia (not treated as "Objective 1") and Cantabria, Castilla y León, Castilla-La Mancha and Comunidad Valenciana (treated as "Objective 1").
In Italy, the sample is the one referred to in chapter 3. The treated regions contiguous to the "policy-change boundary" are Abruzzi, Campania and Molise, whereas the untreated and contiguous regions are Marche and Lazio.
Finally, in United Kingdom there are two different "policy Change Boundaries" since the "Objective 1" areas are spread over all the country. The first one separates Cheshire, Lancashire and Greater Manchester (not "Objective 1") from Merseyside ("Objective 1" region) involving 715 wards as observations. The other one is between Highlands and Islands and the untreated Scottish regions of Argyll and Bute, Aberdeen, Perth and Kinross and Moray.
For each country, the RDD model estimates the effect on employment variation[46] of being an "Objective 1" region at the distribution cut-off point. The RDD model (1) is very similar to the one presented in paragraph 3.5, in that it uses the territorial units' distance from the "policy-change boundary" as a forcing variable for the treatment. The polynomial specification allows us to control for discontinuity by constructing a balanced control group with respect to the treated group (Blundell and Costa Dias, 2009). This classical RDD specification was preferred to the "spatial" version (Holmes, 1998) so as to provide improved comparability among country specific results.
In this framework, model (1) will be applied in the four different contexts built up with respect to the four discontinuities ("policy-change boundary") identified in Europe.[47]

$$\Delta Y_{it} = \beta_0 + \beta_1 Policy_{it-1} + \beta_2 Y_{it-1} + Policy_{it-1} \sum_{p=1}^{2} \gamma\, dist_i + \varepsilon_{it} \qquad (1)$$

As already showed in chapter 3, the 1991-2001 variation in employment[48] is considered a dependent variable[49] and the "Objective 1" status dummy is the principal regressor. An additional control is then represented by the inclusion of initial condition in terms of the number of employees.

46 Employment is an head count variable for each country but, due to data availability, for Spain and United Kingdom we consider employment of the resident population instead of work-place employment.

47 For United Kingdom, at the moment we are looking at the "policy-change boundary" of England, but also the one in Scotland will be investigated soon.

48 For Germany, the initial year is 1996 instead of 1991 since they are the first data available.

The model is estimated separately for each country in order to leave out country specific elements that would affect the results in a pooled analysis.

4.4 Empirical Results

The rationale of the RDD models implemented in this thesis is to offset the role of the observables and unobservable affecting the estimation of the policy impact. They operate by exploiting the different distribution of such phenomena across space. Since for each "policy-change boundary" treatment is the only aspect exhibiting a sharp change, spatial units increasingly closer to the boundary could be compared as treated and counterfactual groups. The results generated with this procedure are valid at the cut-off point of each distribution.

The rest of this paragraph presents the results obtained by estimating the RDD model in the four different contexts (Table 4.1).

The first result presented is based on a standard OLS (column 1). As so far argued in the thesis, this kind of specification may suffer from different sources of endogeneity related to the systemic nature of EU Regional Policy. In particular, each country's specific result is not cleansed of the role played by other elements of the "integrated territorial system" and therefore is not representative of the policy's exogenous impact. The OLS model, as well as the RDD in the next columns, is estimated first without any control variable and then with the inclusion of the initial condition (number of employees in 1991).

The coefficients estimated by the basic OLS specification are very different from one another. The only significant ones are those for Germany and Spain. They have a similar extent and are negative. The other coefficients, which are insignificant, exhibit different signs: negative for Italy, positive for England and Scotland.

By controlling for the initial condition, all the negative results are confirmed. Instead, among the positive coefficients, those for Scotland become negative whereas the coefficient estimated for "Objective 1" areas in England remains positive and also turns out to be significant. In an OLS setting the latter finding could suggest that employment increases more for the wards of Merseyside (treated region) than for the richest areas in the untreated regions, but only given its initial level. In particular, a convergence process emerges across the England wards so that wards with a higher initial level grow less than the others (the initial condition coefficient is negative and significant). This result has increasing relevance according to the value of the R squared of the regression: whereas for the other countries an OLS specification seems to be incapable of explaining the relation between dependent and independent variables, in the case of England, the inclusion of the initial conditions leads the R squared to increase meaningfully.

49 As well as in the previous Chapter, according to the data availability, employment is considered here as a proxy for the whole local development that is the main aim of the EU territorial policies.

However, the general picture provided by this specification may be largely biased since the effect of the initial conditions and the that of "Objective 1" status goes together raising the question of whether "Objective 1" status or worst initial conditions lead to the positive trend in employment.

The RDD specifications presented in column 2 and 3 will answer questions of this kind: the policy effect will be disentangled from the role played by initial conditions and conditioning factors by assuming that at the cut-off point ("policy-change boundary") they are smoothly distributed across observations, unlike treatment.

The value-added that characterizes this framework is that each coefficient represents the net impact that EU Regional Policy returns to the country, irrespectively of the conditioning factors that are likely to differ from country to country.

As Table 4.1 shows, the positive effect of EU Regional Policy on variation in employment already suggested for England by the OLS model is confirmed by the RDD specifications. In particular, the highest coefficient is estimated by considering the forcing variable of *distance* with a polynomial degree of 1 and by including the initial conditions. As expected in counterfactual literature, the inclusion of such variables increased the precision of the results already obtained by relating the dependent variable to the treatment variable. This finding is in line with the literature on the Merseyside case (Boland, 2010): SF has represented a major growth injection for targeted areas. In particular, the Merseyside policy adopted a completely different approach with respect to the UK's. One of the five measures of the Merseyside "Objective 1" Programme, "Pathways to Integration",[50] is seen in literature (Meegan and Mitchell, 2001) as one of the most positive experience of the policy in that period.

Also for Italy, Spain and Scotland the net impact estimated by RDD models turns out to be positive. The net effect of EU Regional Policy on employment in "Objective 1" regions is hence positive for all these European regions, although with different level of significance. For these countries, as mentioned earlier, the biased OLS results were actually negative. On the contrary, the RDD specification (with the polynomial degree that makes it possible to account for the forcing variable) estimates a positive impact of Objective 1 status. This positive result is robust to the inclusion of the initial level of employment. These findings are completely in line with those already discussed in chapter 3, according to the literature and to the results obtained by the analysis carried out here (*Identification*).

In these Member States the EU Regional Policy has been able to support economic development in the most disadvantages areas in line with the intended objective of the policy. These results can be deemed as free from the endogeneity that generally affects analyses carried out in the classical regression framework (Paragraph 1.2).

By shelving the classical regression framework and applying treatment effect methods, the results obtained on EU Regional Policy's impact are less heterogeneous. In particular, once controlled for the role of the conditioning factors, the impact is almost entirely positive. Cross-country endogenous results

50 The strategic priority addresses issues of social and economic exclusion. Education, skills, training and jobs were the main objectives (Meegan and Mitchell, 2001).

can be very heterogeneous because the policy impact they estimate has not been adjusted to take account of the role of such conditioning factors, whose overall influence on policy outcome is clearly important as well as playing a different role in different countries.

Table 4.1. Effect of EU Regional Policy on employment (Classical RDD Specification).

Polynomial degree	0		1		2	
England						
"Objective 1" status	6.4294	18.6167**	27.5510*	42.5834***	7.3873	31.3825*
	(8.2701)	(8.5329)	(15.4750)	(15.1029)	(18.3935)	(17.3555)
Employment		-0.0132***		-0.0151***		-0.0153***
		(0.0020)		(0.0021)		(0.0021)
Constant	13.9022***	55.9386***	5.8177*	49.9542***	21.9899**	66.9907***
	(2.8362)	(8.5803)	(3.4323)	(8.1712)	(8.9725)	(12.8967)
R squared	0.01	0.101	0.027	0.153	0.038	0.164
Obs	715	715	715	715	715	715
Germany						
"Objective 1" status	-7.4802***	-7.5317***	-5.7311***	-5.7945***	-6.3839***	-6.4506*
	(1.0934)	(1.0916)	(1.6635)	(1.6629)	(2.3220)	(2.3225)
Employment		-0.0001**		-0.0000**		-0.0000**
		(0.0000)		(0.0000)		(0.0000)
Constant	6.4871***	6.6164***	3.0293***	3.1526***	0.8330	0.9403
	(0.4523)	(0.4611)	(0.7763)	(0.7818)	(101158)	(1.1181)
R squared	0.006	0.007	0.008	0.008	0.009	0.009
Obs	7999	7999	7999	7999	7999	7999
Italy						
"Objective 1" status	-1.7620	-1.7103	10.4404***	10.472***	11.9754***	11.9570***
	(1.6602)	(1.6606)	(2.9036)	(2.9033)	(4.2568)	(402578)
Employment		0.0001**		0.0001**		0.0001*
		(0.0000)		(0.0000)		(0.0000)
Constant	2.6353**	2.5365**	-4.9363	-5.0176***	-12.6259***	-12.6210***
	(1.1951)	(1.2003)	(1.8310)	(1.8335)	(2.5335)	(2.5336)
R squared	0.001	0.001	0.018	0.018	0.031	0.031
Obs	1566	1566	1566	1566	1566	1566
Scotland						
"Objective 1" status	0.3143	-3.8430	-1.9537	-4.4911	6.9433	4.8033
	(2.7315)	(2.6999)	(5.0738)	(4.6594)	(5.7346)	(5.6823)
Employment		-0.0115***		-0.0169***		-0.0173***
		(0.0058)		(0.0061)		(0.0062)
Constant	4.8166***	27.0120***	10.6006***	34.2629***	1.2748	24.8284***
	(1.3907)	(8.7667)	(2.7787)	(9.2848)	(3.9955)	(8.7367)
R squared	0.0001	0.047	0.031	0.068	0.032	0.087
Obs	251	251	251	251	251	251
Spain						
"Objective 1" status	-11.369***	-13.0663***	10.3285***	10.6366***	6.9122**	6.5252**
	(1.5781)	(2.3553)	(2.3778)	(2.3218)	(2.7891)	(2.7371)
Employment		-0.3348		-0.8586***		-0.8956***
		(0.2319)		(0.2514)		(0.2475)
Constant	23.5648***	35.3597***	10.3947***	37.9527***	1.8831	30.7999***
	(1.0573)	(8.3644)	(1.5694)	(8.5047)	(2.0439)	(8.6148)
R squared	0.007	0.008	0.021	0.027	0.031	0.037
Obs	5892	5892	5892	5892	1566	5892

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Robust and clustered S.E. in parentheses.

The only coefficient that remains negative is that for Germany. Here, the RDD models confirm the negative OLS coefficients. Thus, it seems that for this country EU Regional Policy has failed to support the

most disadvantaged areas in catching up with the richest. It is worth noting, however, that for this case also the RDD results can suffer as a result of a certain methodological bias: the “policy-change boundary” here coincides with the boundary between West and East Germany. A series of differences between treated and control groups can be hence distributed across space as well as the treatment itself. This issue could undermine the assumption of the RDD according to which the discontinuity should only be related to the treatment and nothing else. An additional potential criticism weakening an RDD estimation that leverages the spatial distance of policy discontinuity is due in this case to the distribution of real expenditure within the “Objective 1” regions, strongly in favour of one of the lander (Sashen), which is furthest from the “policy-change boundary”, and observations regarding this region is hence weighted less by the present model (ESPON, 2005).

Apart from these methodological issues, the relatively recent re-unification of Germany and corresponding profound structural economic changes could have influenced and even offset the intended impact of EU Regional Policy. The “Objective 1” German areas are the east landers, which in the period of the analysis had recently been unified with West Germany and just entered the EU. Once unified with Germany and Europe economic and social resources for the eastern territories started to be attracted from the centre of Germany and of Europe.

The productive economy of the five new Landers and Berlin was characterized at the moment of unification by a grossly oversized industrial sector and an almost total absence of a service sector and small and medium-sized enterprises. Productivity in the industrial sector was about a third of the level in the former Federal Republic; plant was out-dated; and production was geographically concentrated without regard for environmental damage. Real economic growth increased after unification, but this was largely due to construction industry and associated sectors, the food processing sector and the growth of companies producing for regional as opposed to supra-regional markets. 20% of the Federal Republic's population in the new Landers accounted for only 4% of its industrial output (EU Commission, 1994).

The accessibility to the core areas represented, at least initially, the most important advantage for these territories in terms of benefit from integration. Instead of developing endogenous development processes, economic activity is attracted towards ‘core areas’ with a displacement of local resources. Out-migration flows of population and workers probably dominated the early stages of these areas’ integration, leading to developmental trajectories that favour concentration and agglomeration in core areas in contrast to the intended objectives of the EU Regional Policy (against centripetal and exclusive processes leaving out poorest areas).

All these considerations can be reflected, at least partly, by the slightly smaller magnitude of the negative RDD coefficient with respect to the OLS. The negative trend captured by the OLS results should not be entirely attributed to the “Objective 1” status of the areas but may be the result of other observable and unobservable regional characteristics fully accounted for in the RDD framework. The

higher R-squared in the RDD seems to suggest that this technique is best at capturing the true relation between the policy treatment and economic performance.
Consequently the results for the case of Germany need to be interpreted with caution and always within a broader framework.

4.5 Conclusions

This Chapter has extended the *Identification* analysis to the whole European context. EU Regional Policy is, moreover, a EU wide policy involving different levels of governance and different actors, that varies from country to country. Even if it has a unique design, ERP implementation may, therefore, acquire different features in different countries. Moreover, the role of territorial conditioning factors is also likely to differ in different countries. Since such factors are capable of shaping the policy impact, the results achieved by analyses that do not control for them may be biased.

This extension had an informative value in terms of *Contextualisation*: it makes it possible to understand the drivers of the impact heterogeneity highlighted in the existing analyses focusing on different countries.
Does it depend on cross-country specificities? National governance is likely to play a significant part on the policy's final implementation.
Or does it depend on the difficulty of the regression analyses in eliminating the role of conditioning factors from net policy impact? Since they play a different role country by country, they can lead to different results.
By estimating net policy impact for each country, this chapter shed light on the reasons for the gap in the literature. The estimated impact has removed the role of conditioning factors. Any cross-country differences can be attributed to MS specificities.
To answer this question, this chapter applied the RDD model used in the Italian case to all the European countries presenting a "policy-change boundary" between "Objective 1" and "non-Objective 1" regions. By comparing the results net of the role of factors of the "integrated territorial system", the differences found among them could be ascribed to country specific aspects.
What this chapter concluded is that the net policy impact is positive for all the EU MS except Germany. For this country, however there are implications related to the unification process potentially critical for the RDD. The large heterogeneity characterizing the cross-country impact estimated by the endogenous OLS models is hence eliminated, or at least reduced, in the RDD exogenous results. That means that the lack of consensus of the literature can be largely due to the differences in country specific conditioning factors not removed by endogeneous analyses.
EU Regional Policy support for territorial cohesion is in fact positive for the whole Europe. Only in England has the impact been found to be positive irrespective of territorial conditioning factors. Elsewhere, such factors hamper the policy's effectiveness. However, the RDD models allowed us to show

that the net impact is also positive for the rest of Europe. The different magnitudes and meanings of country coefficients are difficult to interpret: they were estimated with respect to different distributions of the outcome variable and correspond to different treatment intensities. However, evidence from country specific literature and implementation features characterizing the policy across countries can be helpful in this sense.

Several elements can have a determining influence in this sense: the different scale and scope of funding; the distribution of funding among different priorities; the role played by national governments; the relationship between regional administrations and sub-regional actors; the distribution of funding according to different level of disadvantages; the characterisation of public-private partnerships in the management of the policy. In other words, the degree of “place-based-ness” that each country gives to the policy.

All these elements can discriminate the sign and magnitude of country specific policy outcomes even when disentangled from all other elements of the “integrated territorial system”.

CONCLUSIONS

The European Union has earmarked considerable resources to reducing disparities between core and peripheral regions. However, great disparities still remain and are often accentuated by the economic integration process. Moreover, major underdevelopment scenarios persistently characterize some of the mostly disadvantaged areas. These trends and processes can be explained by "the interactions between institutions and geography [that] are critical for development, and many of the clues for development policy lie in these interactions" (Barca, McCann and Rodríguez-Pose, 2012, p. 140).
The evolution of the EU Cohesion policy framework has attempted to respond to these challenges while, at the same time, taking into account the insights of the lively academic and policy debate on the true drivers of regional economic performance. The "New Regional Policy" paradigm (OECD, 2009) claims that all policies need to be designed in relation to the social cultural and institutional elements of the context in which they work and are implemented by favouring the relations between the external elites and the local actors. In particular, all policies can contribute towards cohesion irrespectively of their nature. Development policies should be "place-based", i.e. characterised in relation to the context in which they work, leveraging its advantages and promoting its endogenous potential. Thus, both explicitly territorial policies (e.g., Regional Policy) and some sector policies originally considered "space neutral" (e.g., CAP) are nowadays recognised to exhibit considerable spatial impact (Crescenzi, de Filippis and Pierangeli, 2014).

In line with these changes in both theory and policy paradigms, EU Cohesion policy has been largely studied by the empirical literature. Nonetheless, there is still no consensus on its capacity to offset the disparities between richer and poorer areas of the Union thus making them all and consequently the Union as a whole capable of competing at world level.

In this sense, the thesis has contributed towards filling the gaps referring to two of the most important questions that feed the actual debate on the policy: what is the role played by factors conditioning the policy's successes and failures; what has the policy's net impact been?

In line with the "Integrated framework approach" on which the current policy paradigm is based, the thesis is founded on the following hypotheses: the EU Cohesion policy is part of the "integrated territorial system" that each territory represents. Consequently, the policy has to be: a) considered in relation to the other elements comprising the system, which may play the role of conditioning factors; b) evaluated by netting out the conditioning role of these elements from the policy's impact.
With respect to the first point (Contextualisation), the analysis had to depict the "integrated territorial system" of which the EU Cohesion policy is part (Crescenzi and Rodríguez-Pose, 2011). In particular, it is

here considered as based on two subsystems ("Territory" and "policy") to which all elements highlighted as relevant in the various branches of regional economics are related.
With respect to the second point (Identification), the analysis had identified an "as good as random" scenario in which to exploit randomized experiment properties and estimated the policy's net impact by comparing treated municipalities with their counterfactuals.

Within this framework, the thesis developed three empirical efforts aiming at filling the gaps that the literature presented in this sense.
Neither in terms of Contextualisation nor in terms of Identification has there been a full consensus on the role played by EU Regional Policy. In the first case, almost all studies considered EU Regional Policy only in relation to the element/s relevant for their own theoretical scheme, thus depicting only part of the interdependencies characterizing the policy. In the second case, most of the studies carried out in a classical regression framework are hampered in dealing with the endogeneity that these interdependencies imply from a methodological point of view.

In this sense the thesis' contribution is valuable. It attempted to provide a Contextualisation for the policy within the system, as also by attempting an Identification of the policy's net impact within a system and identifying the net impact for different systems (Identification and Contextualisation).
In terms of the Contextualisation of the policy within the "integrated territorial system", the objective was to identify how the relation between the policy and the regional growth in Europe is shaped by the other elements composing the System. The analysis answered the question: what is the role of the other elements of the System as conditioning factors?
In terms of the Identification of the net policy impact, the objective was to understand how the policy impacted on its intended outcome irrespectively of the characterisation of the "integrated territorial system" in which it works. The study answered the question: once the conditioning factors are removed, what has the policy's net impact been?
In terms of the Identification of net policy impact in different "integrated territorial system" (Identification and Contextualisation), the objective was to check if the heterogeneity in cross-country impact estimated in literature depends on the different role that conditioning factors play across space or on country specific effects. The study answered the question: once the conditioning factors are removed, does the policy's impact turn out to be unique for all EU MS?

The first study (*Contextualisation*) showed that the link between EU Regional Policy expenditure and regional growth is generally positive, although the strength of this relationship is highly influenced by local socio-economic conditions and by synergies (or their lack) with other EU policies.
This evidence calls for more coordination between different policies and better tailoring to local structural condition in order to maximize territorial impact and strengthen territorial cohesion.

These findings emerged by accounting, on one hand, for "Territory" characterisation in terms of socio-economic conditions, innovative capacity and infrastructural endowment as "growth determinants" and as policy "conditioning factors" while, on the other hand, by accounting for the other European "spatially targeted" policies (i.e. Rural Development) and the European "spatially blind" policy that is mainly considered capable of implying "spatial effects" (i.e. CAP).
This in-depth investigation of the "integrated territorial system" allows us to indicate how its characterisation conditions the Regional Policy's impact.
The positive role of EU Regional Policy is maximized when interaction occurs between CAP and Rural Development Policy. Furthermore, thanks to this interaction, these policies may also contribute towards cohesion even if this is not their main intended outcome. Thus, if policies that are acting within the "integrated territorial system" are considered in relation to one another synergetic actions could be found and exploited in terms of the overall policies' achievement.
Then, EU Regional Policy, which could be deemed a more "place-based" policy, turns out to be the only policy capable of promoting cohesion. By contrast, CAP, which up to now has been a strictly sector policy even delivering a negative spatial impact, appears to be potentially capable of contributing towards cohesion, but only if designed in relation to the characterisation of the "Territory" Subsystem. Thus, if policies are designed, implemented and evaluated according to the geographical context in which they work they can contribute towards territorial cohesion irrespectively of their original nature.

The second study (*Identification*) showed that EU Regional Policy's impact, once disentangled from the role of the relevant conditioning factors of the "integrated territorial system", is positive.
The net impact of the "Objective 1" Structural Funds on the employment of the Italian regions has been estimated by Regression Discontinuity Design. The estimation identified the "as good as random" scenario in which the properties of "randomized experiment" are exploited in municipalities increasingly closer to the "policy-change boundary" between Italian "non-Objective 1" and "Objective 1" regions.
The positive net impact on employment supported by EU Regional Policy is also sustainable and autonomous. Employment growth has leveraged the sectors most linked to local economic development (i.e. manufacturing, construction and tourism), and which were actually the policy's targets. In addition, the territorial cohesion promoted did not entail a displacement of economic activities from the richest to the poorest areas. Instead, it promoted a process of job creation in one of the most persistent scenario of underdevelopment (i.e. Italian Mezzogiorno) in Europe.
Furthermore, the results of RDD's "internal validity" were confirmed by several robustness checks whereas their "external validity" was checked by examining the Spanish case.
In addition to providing consistent, unbiased and significant pieces of evidence of a positive policy impact, this analysis also confirmed how Structural Funds cannot be considered "exogenous" and how in this sense treatment effect methods could represent a valuable tool when dealing with the endogeneity that often affects territorial policy evaluation.

In fact, the RDD results contradict the results obtained by basic OLS models, which are probably affected by omitted variable and reverse causality bias. This means that the controversial results obtained by classical regression analyses are due to the role played by conditioning factors. The role of such factors in each "integrated territorial system" can hamper policy by delivering an overall positive impact. According to analyses (e.g., basic OLS estimation) that fail to disentangle the role of such factors from the policy's role, the latter's estimated impact may be even negative.

The third study (*Identification* and *Contextualisation*) showed how when EU Regional Policy's impact has removed the role of conditioning factors, it turns out to be positive for the whole of Europe. This means that the lack of consensus in the literature can be largely due to the differences in the country specific conditioning factors not removed by endogeneous analyses.
The analysis took advantage of the RDD specification applied by the previous works to estimate the net policy impact for other European MS. The RDD exogenous results eliminated, or at least reduced, the large heterogeneity characterizing the cross-country impact estimated by the endogenous OLS models. The country specific impact, very different when estimated by OLS, turns out to be positive for almost all the EU countries when estimated by RDD.
The different magnitude and meaning of country coefficients are difficult to interpret since they have been estimated with respect to different distributions of the outcome variable and correspond to different intensities of treatment. However, in general they are related to country-specific differences, such as: the different scale and scope of funding; the distribution of funding among different priorities; the role played by national governments; relationships between regional administrations and sub-regional actors; the distribution of funding according to different levels of disadvantage; the characterisation of public-private partnerships in the management of the policy. In other words, the net impact can depend on the degree of "place-based-ness" that each country gives to the policy.

In general, the thesis contributed towards filling gaps identified in the literature by providing more comprehensive and multi-faceted evidence than that hitherto proposed by different partial analyses.
The resulting policy implications are particularly significant with respect to the current debate on the EU Cohesion policy. First, they support the predominant role played by the policy within the 2014-2020 budget (EU Commission, 2013). In addition, they highlight the need to reform the policy by giving it a stronger "place-based" perspective (Barca, 2009). This context-specific approach (Rodrik, 2007) can maximize the benefits for territorial cohesion also in the current perspective of limited resources. A cohesion policy reformed in a "place-based" direction, hence, is not only a good but also the best tool for achieving territorial cohesion. In this sense, the key issues to be pursued by a reformed cohesion policy are: greater concentration upon priorities; making a number of key changes to the governance system; the increment in the leverage effect of investments; simplifying management rules; greater

concentration on the poorest Member States and regions; and high-level political compromises (Barca, 2009; European Commission, 2010; 2013).

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ANNEX I. Additional tables Chapter 2

Table I.1 Challenging policy variable

Dependent variable: GDP per capita Average Growth Rate			
	1	2	3
Spatially Targeted Policies	0.0004***	0.000	0.000001*
	(0.000)	(0.000)	(0.000)
Constant	-0.732***	-0.026***	-0.026***
	(0.1563)	(0.003)	(0.003)
N id	139	198	198
R squared	0.149	0.170	0.170
Prob>F	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table I. 2.a Challenging outcome variable (overall European support)

Dependent variable: GDP per capita Average Growth Rate								
	1	2	3	4	5	6	7	8
Log of initial GDP p.c.	-0.143815***	-0.145176***	-0.145303***	-0.148371***	-0.149354***	-0.123339***	-0.148997***	-0.152344***
	(0.0233)	(0.0252)	(0.0255)	(0.0270)	(0.0284)	(0.0282)	(0.0275)	(0.0287)
Policy	0.000009*	0.000009*	0.000009*	0.000009*	0.000004	0.000004	0.000008*	0.000007*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Social Filter Index		0.000696	0.00092	0.001439	-0.003859	0.00099	-0.005155	-0.002852
		(0.0037)	(0.0038)	(0.0040)	(0.0037)	(0.0038)	(0.0037)	(0.0039)
R&D Activities			0.002644	0.002965	0.001966	0.002822	0.010910**	0.002651
			(0.0051)	(0.0051)	(0.0047)	(0.0039)	(0.0053)	(0.0041)
Infrastructural endowment				0.280759	-0.018784	-0.015175	0.023079	0.361271
				(0.3082)	(0.3341)	(0.3450)	(0.3024)	(0.2917)
Spatially Lagged Social Filter					0.004603	0.004844	0.004589	0.00301
					(0.0041)	(0.0038)	(0.0041)	(0.0045)
Spatially lagged R&D Activities					0.022518***	0.027390***	0.023636***	0.020592***
					(0.0037)	(0.0042)	(0.0035)	(0.0036)
Spatially lagged Infrastructure					0.149982	0.3466	0.012867	0.322528
					(0.5357)	(0.4118)	(0.5081)	(0.5105)
Social Filter Index*Policy						-0.000006***		
						(0.0000)		
R&D Activities*Policy							-0.000006***	
							(0.0001)	
Infrastructure*Policy								-0.000359**
								(0.0002)
Constant	1.364453***	1.377979***	1.376116***	1.397399***	1.386175***	1.105593***	1.377051***	1.406883***
	(0.2320)	(0.2514)	(0.2521)	(1.2637)	(0.2751)	(0.2739)	(0.2662)	(0.2773)
National Growth Rate	0.035664***	0.035836***	0.035855***	0.035594***	0.040986***	0.039424***	0.039827***	0.040572***
	(0.0051)	(0.0050)	(0.0050)	(0.0050)	(0.0046)	(0.0039)	(0.0045)	(0.0045)
Krugman Index	0.011517	0.011222	0.010224	0.009837	-0.002037	0.002773	0.002232	0.005369
	(0.0079)	(0.0080)	(0.0084)	(0.0083)	(0.0092)	(0.0087)	(0.0092)	(0.0095)
Population Density	0.000002**	0.000002**	0.000002**	0.000002**	0.000002**	0.000002**	0.000002**	0.000002**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Obs	242	242	242	242	242	242	242	242
R squared	0.869	0.869	0.869	0.870	0.899	0.913	0.903	0.906
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust and clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table I.2.b Challenging outcome variable (Regional Policy, Rural Development Policy and CAP).

Dependent variable: GDP per capita Average Growth Rate									
	1	2	3	4	5	6	7	8	9
Log of initial GDP p.c.	-0.134759***	-0.136044***	-0.136211***	-0.139181***	-0.138891***	-0.109592***	-0.139260***	-0.129511***	-0.153600***
	(0.0184)	(0.0192)	(0.0195)	(0.0207)	(0.0211)	(0.0254)	(0.0228)	(0.0205)	(0.0276)
Regional Policy	0.000027***	0.000027***	0.000028***	0.000028***	0.000028***	0.000022**	0.000034***	0.000036***	0.00000
	(0.0000)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Rural Development Policy	0.000018	0.000018	0.000018	0.000018	0.000009	0.000003	-0.000003	-0.000008	0.000041**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
CAP	0.000012	0.000012	0.000012	0.000011	-0.000020***	-0.000012*	-0.000012	-0.00001	-0.000030***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Social Filter Index		0.000654	0.000934	0.001426	-0.003313	-0.000337	-0.004167	-0.000478	-0.003539
		(0.0036)	(0.0037)	(0.0039)	(0.0029)	(0.0036)	(0.0031)	(0.0031)	(0.0033)
R&D Activities			0.003303	0.003612	0.002692	0.004493	0.009363	0.003842	0.003404
			(0.0050)	(0.0050)	(0.0041)	(0.0035)	(0.0064)	(0.0032)	(0.0041)
Infrastructural endowment				0.264735	-0.070618	-0.01222	0.01311	0.918993***	0.005722
				(0.2927)	(0.2811)	(0.2704)	(0.2752)	(0.3068)	(0.2760)
Spatially Lagged Social Filter					0.003169	0.004039	0.004446	-0.000095	0.006026*
					(0.0030)	(0. 0036)	(0.0034)	(0.0032)	(0.0036)
Spatially lagged R&D Activities					0.024730***	0.024843***	0.025266***	0.019630***	0.026934***
					(0.0034)	(0.0037)	(0.0037)	(0.0036)	(0.0043)
Spatially lagged infrastructure					0.087014	0.332402	0.188186	0.57536	0.246156
					(0.4053)	(0.3792)	(0.3948)	(0.3922)	(0.4122)
Social Filter Index*Regional Policy						-0.000013**			
						(0.0000)			
Social Filter Index*Rural Development Policy						0.000022*			
	1					(0.0000)			
Social Filter Index*CAP						-0.000005*			
						(0.0000)			
R&D Activities*Regional Policy							-0.00001		
							(0.0000)		
R&D Activities*Rural Development Policy							0.00001		
							(0.0000)		
R&D Activities*CAP							-0.000006		
							(0.0000)		
Infrastructure*Regional Policy								-0.001222***	
								(0.0003)	
Infrastructure*Rural Development Policy								0.001749***	
								(0.0004)	
Infrastructure*CAP								-0.001444***	
								(0.0003)	
Regional Policy* Rural Development Policy									0.00000
									(0.000)
Regional Policy*CAP									0.00000001**
									(0.0000)
Rural Development Policy*CAP									0.00000
									(0.0000)
Constant	1.283990***	1.296756***	1.294491***	1.315237***	1.292399***	0.975101***	1.282550***	1.180432***	1.446998***
	(0.1831)	(0.1915)	(0.1925)	(0.2024)	(0.2026)	(0.2483)	(0.2198)	(0.1972)	(0.2688)
National Growth Rate	0.031536***	0.031699***	0.031691***	0.031444***	0.036686***	0.035673***	0.035365***	0.034932***	0.035287***
	(0.0048)	(0.0047)	(0.0047)	(0.0047)	(0.0036)	(0.0036)	(0.0037)	(0.0036)	(0.0035)
Krugman Index	0.028021***	0.027744***	0.026637***	0.026290***	0.017015*	0.018163*	0.018208*	0.033977***	0.020798**
	(0.0093)	(0.0095)	(0.0096)	(0.0095)	(0.0097)	(0.0097)	(0.0096)	(0.0092)	(0.0097)
Population Density	0.000001**	0.000001**	0.000001**	0.000002**	0.000002***	0.000002***	0.000002***	0.000001***	0.000001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Obs	242	242	242	242	242	242	242	242	242
R squared	0.884	0.884	0.884	0.885	0.919	0.927	0.921	0.939	0.924
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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

Table I.3 Quantile regression

	Quantile 0.10		Quantile 0.50		Quantile 0.75		Mean regression	
Dependent variable: average regional GDP growth rate 2007-2009								
Initial	-0.055	0.032	0.006	-0.000	0.003	-0.001	0.000	0.0001
condition	(0.0677)	(0.0273)	(0.0058)	(0.0088)	(0.0055)	(0.0092)	(0.0127)	(0.0149)
Regional	0.00002	0.000002	0.000006**	0.000005	0.000005**	0.000007	0.00001*	0.00001
Policy	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Covariates*	No	Yes	No	Yes	No	Yes	No	Yes
Dependent variable: average regional GDP growth rate 2000-2003								
Initial	-0.007	-0.014	-0.002	-0.015**	-0.009	-0.009	-0.003	-0.007
condition	(0.0139)	(0.0122)	(0.0059)	(0.0066)	(0.0064)	(0.0087)	(0.0047)	(0.0057)
Regional	0.0000051	-0.000004	0.00001***	0.00001**	0.000009**	0.00001*	.00001***	0.00001**
Policy	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Covariates *	No	Yes	No	Yes	No	Yes	No	Yes

*Covariates included in the model are the Control variables plus those one related to the "Territory" (Social Filter Index, R&D Activities and Infrastructural endowment) and to the "Policy" (Rural Development Policy and CAP) Subsystem .

** Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table I.4 Spatial Panel data model

Dependent variable: GDP per capita Average Growth Rate			
	SAR	DURBIN	SEM
Spatially lagged Y	-0.139646	-0.1973682	
	(0.1807)	(0.1630)	
Ln of initial GDP p.c.	0.0706273	0.1195099*	0.076037
	(0.1041)	(0.0677)	(0.0617)
Regional Policy	0.0001165**	0.0001183***	0.0001288***
	(0.0000)	(0.0000)	(0.0000)
Rural Development Policy	0.0000284	0.0000352	0.0000141
	(0.0000)	(0.0000)	(0.0000)
CAP	-0.0000312	-0.0000361	-0.0000378
	(0.0000)	(0.0000)	(0.0000)
Social Filter Index	-0.01765	-0.0177591	-0.0160019
	(0.0143)	(0.0112)	(0.0109)
R&D Activities	0.0378418	0.0390929**	0.0321667*
	(0.0309)	(0.0193)	(0.0189)
Infrastructural endowment	2.713875*	3.237553**	2.989705**
	(1.4307)	(1.3450)	(1.3417)
Spatially lagged Social Filter Index		-0.0610526*	
		(0.0372)	
Spatially lagged R&D Activities		-0.1299134	
		(0.1006)	
Spatially lagged Infrastructure		4.652283	
		(6.1640)	
National Growth Rate	0.1716416***	0.1646388***	0.1663109***
	(0.0231)	(0.0128)	(0.0122)
Krugman Index	0.1649753***	0.1686406***	0.1768534***
	(0.0501)	(0.0317)	(0.0319)
Population Density	0.0000243***	0.0000231***	0.000027***
	(0.0000)	(0.0000)	(0.0000)
Obs	242	242	242
R squared	0.157	0.108	0.144

** Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table I.5a Principal component Analysis. Eigen analysis of the Correlation Matrix.

Component	Eigenvalue	Difference	Proportion	Cumulative
Component 1	2.35352	1.37195	0.5884	0.5884
Component 2	0.981569	0.319494	0.2454	0.8338
Component 3	0. 662075	0.659236	0.1655	0.9993
Component 4	0. 002839	-	0.0007	1.0000

Table I.5b Principal component Analysis. Principal Components' Coefficients.

Variable	Comp 1	Comp 2	Comp 3	Comp 4
Agricultural share of employment	-0.3963	0.4757	0.7852	-0.0094
Long term unemployment	-0.3132	0.7339	-0.6026	0.0105
Human Capital	0.6103	0.3407	0.1101	0.7066
Skilled labour forces	0.6102	0.3449	0.0905	-0.7074

ANNEX II. Additional tables Chapter 3

Map II.1 Italy, Whole and Sub samples.

Map II.2 Whole and Sub samples

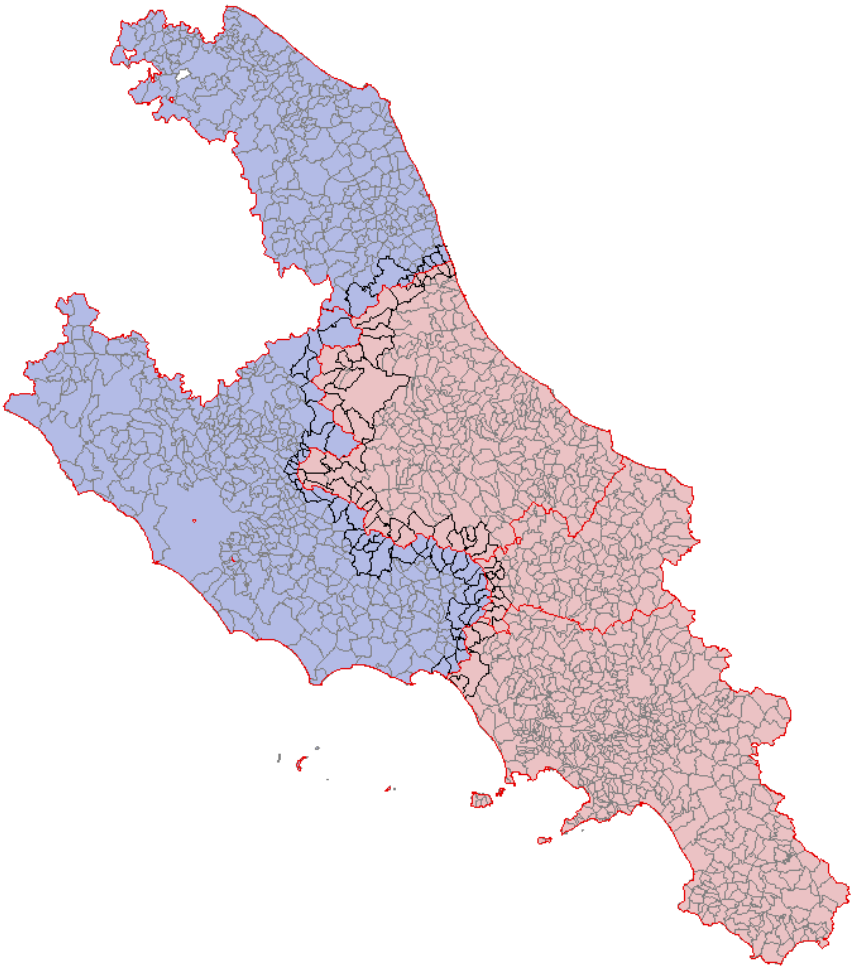


Table II.1. Expenditure data during the period 2000-2006

	Whole sample		Sub sample	
	Obs	expenditure	Obs	expenditure
Ob.1	971/992	10,826,188,178	47/47	249,651,779
Non Ob. 1	481/623	2,352,715,929	47/52	175,877,237

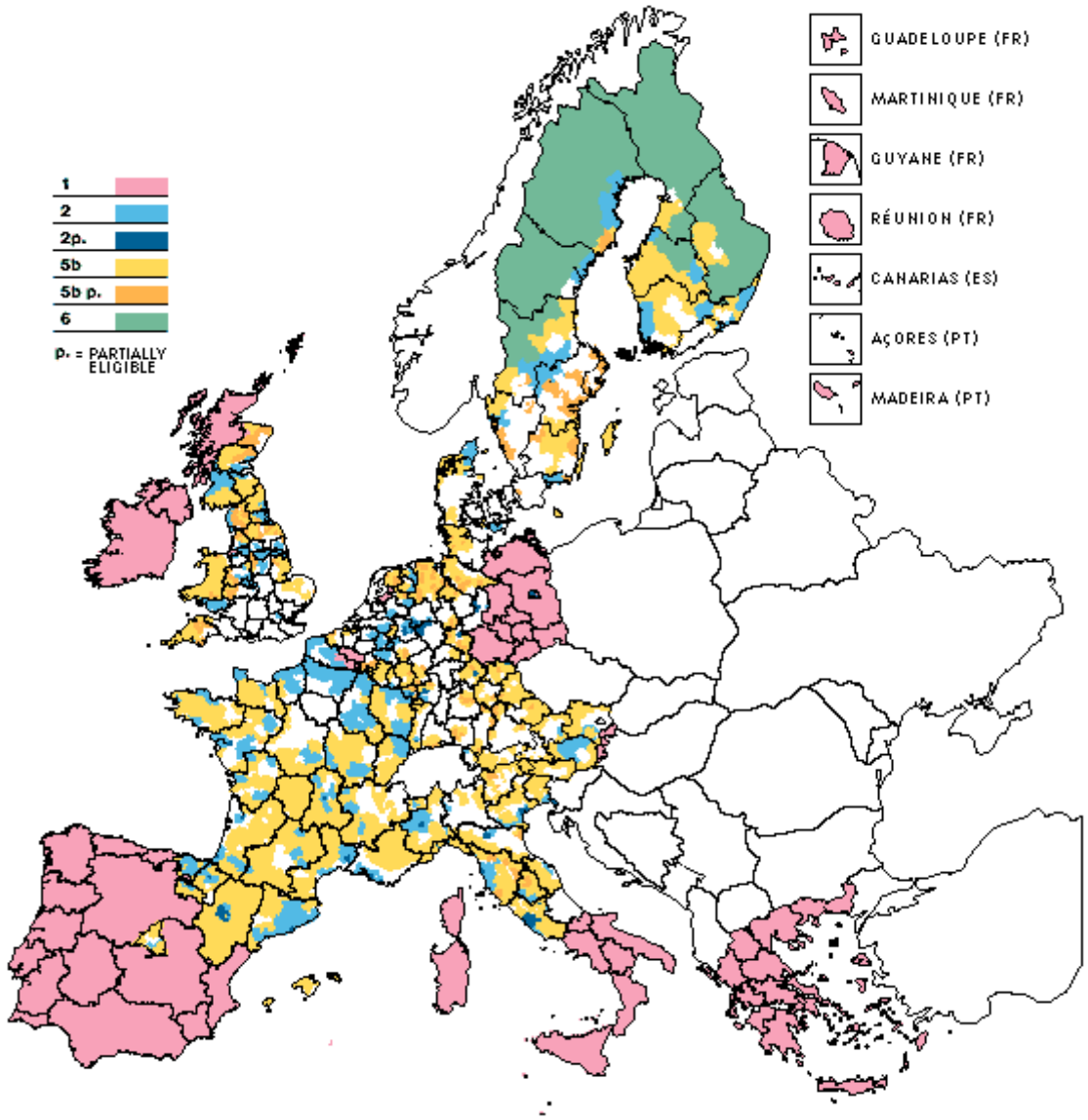
Table II.2 Effect of EU Regional Policy on employment. Italian and Spanish observations pooled (Classic RDD specification).

	Polynomial degree		
	0	1	2
"Objective 1" Status	-1.2317	17.1493***	8.3689***
	(1.3317)	(1.8678)	(1.9566)
Constant	13.4275***	3.5739	0.4265
	0.6332	(0.5463)	(0.4769)
R squared	0.004	0.031	0.043
Obs	7457	7457	7457

***statistically significant at 1% level; ** statistically significant at 5% level; *statistically significant at 10% level. Robust and clustered S.E. in parentheses. Both the treatment and the forcing variables are interacted with a country dummy.

ANNEX III. Additional tables Chapter 4

Figure III.1. Regional Policy in Europe (1994-99)



Source: DG Regio

Table III.1. “Objective 1” coverage of population

Member states	Million inhabitants	% national population
Belgium	1,279	12.,8
Germany	16,447	20.7
Greece	10,209	100.0
Spain	23,269	58.,2
France	2,546	4.4
Ireland	3,500	100.0
Italy	21,133	36.6
Netherlands	0,217	1.45
Portugal	9,868	100,0
United Kingdom	3,4	6.0
Austria	0,2	3.5
Total	92,151	25.0

Source: DG Regio, year 1994 (Austria 1995)

Table III.2. Descriptive statistics. Mean values.

Mean values		"Objective 1"	Non "Objective 1"
England	Obs	121	595
	Y	20.3	13.9
	Distance	3701.8	-54715.5
Germany	Obs	3648	4351
	Y	-1.0	6.5
	Distance	81746.6	-111340.4
Italy	Obs	992	623
	Y	0.9	2.7
	Distance	66559.9	-48369.8
Scotland	Obs	80	171
	Y	5.1	4.8
	Distance	47966.2	-58665.2
Spain	Obs	3804	2089
	Y	12.2	23.6
	Distance	15145.5	-10817.7