Cohesion Policies and Factor Accumulation in the Italian Regions (1994-2013)

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Abstract: In this paper, we primarily focus on the European structural funds' effects on the GDP per capita of the 20 Italian administrative regions for 1994-2013. We rely on a consistent and rich dataset, the *Spesa statale regionalizzata* database of the Ministry of Economy and Finance. Hence our analysis does not only allow for EU funds, but also for a wide array of national funds (related to regional and industrial policies). We deal with the selection bias inherent to policy evaluation through a control function approach based on a model of the funds' allocation rules. In this ambit, the nexus between European and national funds is carefully appraised, and the existence of some substitution mechanisms across these fund types is highlighted. We also allow for the role of regional environment in driving the impact of EU and national funds on GDP per capita. We find evidence in favour of a positive impact of EU funds. We also find a less significant impact of (nationally-financed) subsidies to firms. Quality of government has relatively little relevance for EU Funds, but decisively enhances the impact of subsidies to firms. It appears that the governance of EU funds has insulated them from a potentially detrimental environment. These findings have clear policy significance and stem from our innovative comparison of EU and national funds.

1. Introduction

Today more than ever, it does not seem feasible to advance towards a closer integration of the European Union, without favouring a greater economic and social cohesion between its countries. Yet, there are still very deep economic and social disparities both between countries and between regions that compose the Union, undermining its unity and cohesion. The importance of economic and social cohesion is enhanced by the EU enlargement to Southern and Eastern Europe, and the establishment of economic and monetary union, which leaves very little room for manoeuvre at national level not only for monetary but also for fiscal policy. Hence the need to evaluate the appropriateness and effectiveness of development policies implemented through the European Structural Funds (the correct label is nowadays European Structural and Investment Funds; in the rest of the paper we will refer to them as the SF's). The SF's are, especially since the introduction of *Agenda 2000*, the European Community's primary tool to sustain development in areas facing

economic problems. Although marked differences in levels of regional development characterise many European countries, Italy is a particularly interesting (and worrying) case study for cohesion policies, because of the existence of an area of the country, the South, whose delays in development are relevant and are perpetuated over time (Allen and Stevenson, 1974; Putnam, 1993; Paci and Saba, 1998; Iuzzolino, 2009).

SF's represent an important share of the total financial resources invested in Southern Italy (the Mezzogiorno), especially after the end of the national policy for extraordinary intervention in that area (Prota and Viesti, 2012). The persistence of regional disparities, in the presence of significant financial resources dedicated to cohesion policy, raises issues about the effectiveness of these interventions, and, in particular, on the impact of SF's. This paper aims to assess whether the financial resources distributed by the EU actually contributed to foster regional development in Italy. Our empirical framework, unlike most of the earlier work, also considers, along with the SF's, various types of nationally-financed funds. There is no other analysis, at least in the Italian literature, carrying out a cogent comparison of the impact of national and EU funds. Furthermore, we undertake evaluation of the funds' effects on the basis of a model of their allocation rules, arguably allowing a better treatment of the selection bias in policy evaluation.

We believe that this exercise, by providing a new angle on the effects of cohesion policy in Italy, one of the most important countries in the EU with significant regional disparities, can make a valuable contribution to the debate on its effectiveness. In fact, cohesion policy, of which SF's are the main tool, is one of the most important EU policies. Its weight in terms of financial resources has grown over the years. For the latest programming period (2014-2020), an amount of € 351.8 billion has been allocated for this policy, almost one third (32.5%) of the total budget of the European Union (€ 1082 billion: http://ec.europa.eu/regional_policy/sources/docgener/informat/basic/basic_2014_en.pdf). This assessment of cohesion policy can contribute to the current European debate on its future. With respect to this, it is useful to remember that one of the possible future scenarios of the European Union outlined in Junker's White Paper on the Future of Europe hypothesises a reduction or even a cessation of EU intervention in regional development policies. The analysis of this paper can help quantifying the potential consequences of this policy scenario.

To carry out our empirical analysis, a dataset was constructed for the 20 Italian administrative regions concerning period 1994-2013. It contains data about the main economic indicators (GDP, investment,

employment and population, etc.), some institutional and political indicators, and the amount of SF's, of national funds relating to regional and industrial policy, and other administrative expenditures at regional level. The data on SF's, national funds and regional administrative expenditures were all extracted from a database of the Italian Ministry of Economy and Finance.

The possibility of relying on such an articulated database allows us to deal with the selection bias inherent to policy evaluation through a control function approach based on a model of the funds' allocation rules. In this ambit, the nexus between SF's and nationally-financed funds is carefully appraised, and the existence of complementarity and substitution mechanisms across these fund types is highlighted. Furthermore, the view has been often taken in the literature that regional growth in Italy is constrained by the scarce availability of some categories of local public goods, such as physical and social infrastructure. We assess the influence of these factors on the impact of EU and national Funds, employing various indicators taken from the literature, as well as from our own past work.

We find evidence in favour of a significant impact on SF's on regional GDP per capita. We also find that (nationally-financed) subsidies to firms increase GDP per capita. Quality of government and other indicators of social infrastructure have relatively little relevance for EU Funds, but decisively enhance the impact of nationally-financed subsidies to firms. Thus it appears that the governance of SF's has insulated them from a potentially detrimental environment. These findings have clear policy significance and stem from our innovative comparison of EU and national funds.

This paper is structured as follows. After the introduction, section 2 contains a brief review of the manin institutional features of SF's. Section 3 is a review of the economic literature on the impact of funds on key performance indicators, and on fund allocation mechanisms. Section 4 describes the dataset and the econometric methodology used for estimation and Section 5 presents the results of the estimates. Section 6 concludes.

2. The European Regional Policy: The Institutional Set-up

The effectiveness of SF's depends both on the unit impact that they have on regional economic performance and on the amount of the funds allocated in each region. In a deeper sense, knowledge of the allocation mechanism of SF's, that is how they are distributed across regions, is crucial to understanding the conditions under which they operate. The starting point is that funds are not

equally or randomly distributed across regions. Moreover, the allocation of funds may be based not solely on economic considerations but also derive from redistributive motives of political nature (Boldrin and Canova, 2001). In order to gain further knowledge about these points it is necessary to recapitulate briefly the history of SF's.

EU's cohesion policy was born in 1957 with the establishment of the European Economic Community. Article 3 of the Treaty of Rome provided for the creation of a European Social Fund in order to improve employment opportunities for workers and to contribute to the improvement of their standard of living. Article 158 (ex art. 130 A) of the Treaty stated that, in order to strengthen economic and social cohesion, the Community should aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions or islands, including rural areas. Article 159 (ex art. 130 B) provided for that action to be supported through the Structural Funds, the European Investment Bank and the other existing financial instruments. The Treaty of Rome also defined the aims of the Common Agricultural Policy, then implemented in 1962 through the European Agricultural Guidance and Guarantee Fund. This policy, one of the most important of the European Economic Community, aimed to increase agricultural productivity and ensure a fair standard of living for the agricultural community (Regulation 25/1962 and art. 33 (ex art. 39) of the Treaty of Rome).

In 1973 there was the first enlargement of the European Economic Community with the entry of Denmark, Ireland and the United Kingdom. This event and the assumption that an *effective policy on regional structures is an essential prerequisite to the realisation of Economic and Monetary Union* (Regulation n. 724/1975) led in 1975 to the introduction of the European Regional Development Fund. Indeed, The UK explicitly asked for this as a counterweight to its adopting the Common Agricultural Policy. Article 1 of Regulation n.724/1975 establishing the European Regional Development Fund states that this fund is intended to correct the main regional imbalances resulting in particular from agricultural preponderance, industrial change and structural under-employment.

The 1980s witness a big step forward in the set-up of European regional policies. Three Mediterranean Countries also become part of the European Economic Community: Greece in 1981, Spain and Portugal in 1986. In the same year the Single European Act, a milestone in the process of unification, was signed. Its major objective was the development of the internal market through the abolition of obstacles to the free circulation of goods, people, services and capital. All this led in 1988

to the major reform of European regional policy. With it the regulatory guidelines of Cohesion policy, as well as its budgetary aspects, were established: it defined the priorities, identified the most disadvantaged regions, increased the participation of local institutions and imposed common rules on policy management, control and evaluation, creating a system of multilevel governance centred around a multiannual programming period. More specifically (Regulations 4253-4256/1988), four principles were established that still underpin the implementation of the SF's. They are: 1) concentration, 2) programming (in time), 3) partnership, 4) additionality. All the successive reforms that have taken place over the years, at the outset of the new programming periods of the funds, have led to less radical changes. Besides quantifying the funds' budget, they mainly concerned the redefinition of priorities and target areas, and the introduction of new funds.

The **concentration** principle implies that SF's – initially the European Social Fund, the European Regional Development Fund, the European Agricultural Guidance and Guarantee Fund - are directed to a few priority objectives, possibly localised within target areas. In 1989 there were five priority objectives: Objective 1: Economic and structural adaptation of less-developed regions; Objective 2: Economic recovery of regions affected by industrial crisis (as defined by three eligibility criteria); Objective 3: Combating long-term unemployment; Objective 4: Facilitating the adaptation of workers to industrial changes and changes in production systems; Objective 5: Accelerating the adjustment of industrial structures. Objectives 1, 2 and 5 concerned spatially restricted Objective areas. The other objectives covered the entire EU.

In 1994, the Cohesion Fund was introduced. This policy tool regards particular projects of countries (not regions) with GDP per capita levels below 90% of the EU mean. As Italy does not satisfy this criterion, it is not a beneficiary of the Cohesion Fund, which we do not consider in our analysis. In the same year, the Financial Instrument for Fisheries Guidance Fund was also activated to support restructuring in the fisheries sector. Concerning priorities and areas, an Objective 6, development and structural of regions with an extremely low population density, was introduced for period 1994-1999.

The reform implemented for 2000-2006 attempted to improve the effectiveness of the Funds through a clearer allocation of responsibilities among the Commission and member states and a greater concentration of aid: three Objectives were substituted to the former six: Objective 1, always related to the economic and structural adaptation of less-developed regions; Objective 2, supporting the social and economic restructuring of areas (be they industrial, rural, urban or centred on fishery) with

structural problems; Objective 3, aimed at creating new jobs through reforms of education, training and employment services.

With programming period 2007-2013 the European Agricultural Guidance and Guarantee Fund and Financial Instrument for Fisheries Guidance Fund became the European Agricultural Fund for Rural Development and European Maritime and Fisheries Fund. Objectives 1, 2 and 3 were reorganised around the Convergence Objective, aiming to accelerate the convergence of less-developed regions and member states; the Regional Competitiveness and Employment Objective, aiming to strengthen employment and competitiveness in other areas; and the less quantitatively important European Territorial Cooperation Objective. With programming period 2014-2020, the European Social Fund, European Regional Development Fund, Cohesion Fund, European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund become the European Structural and Investment Funds.

The **programming** principle centres around the institution of multiannual programming periods (or programmes) with a duration of six to seven years. In order to counter delays in the use of funds, which could concentrate their expenditure in the last years of each programming period, a rule known as "n + 2" (Article 93 of EC Regulation 1083/2006) was formally introduced for 2007-2013, according to which expenditure certifications to the Commission must be submitted by December 31st of the second year following the financial commitment of a project. It must be said that similar (although less stringent) rules were already in force since the 1994-1999 period. From 2014-2020, this rule became “n + 3” (Article 136 of EC Regulation 1303/2013): expenditure certifications must be submitted by December 31st of the third year following the financial commitment.

The **partnership** introduced a multilevel approach to the funds’ management, involving the national, regional and local actors, in the programming activity. The relationship between the European Commission and national and regional administrations has been intensified through the presentation of development plans.

The last principle, that of **additionality**, states that EU resources should be additional and not a substitute to other national and/or regional funding sources existing in the objective regions. This principle was subsequently amended by Regulation 2081/1993 assigning to Member States an amount of funds that takes into account the degree of utilisation of each Member State during the previous period (Del Bo and Sirtori, 2016). This principle also sets up the obligation on the part of the

national and/or regional governments to co-finance expenditures up to a given percentage. EU funds support only a share of total project costs, the rest being financed by national or regional resources. This procedure aims to ensure that EU regional policy does not simply become a substitute for Member States' regional policies, and to provide a check on project feasibility. The co-financing proportions vary with the objective: out of Cohesion countries (Spain, Portugal, Greece and Ireland), Objective 1 (or Convergence) EU funds finance up to 75% of the total cost. In all other cases, EU funds finance up to 50% of the total cost. Additionality of funds is not ensured ex ante but must be checked ex post. In fact, from the 1994-1999 program, the European Commission developed a statistical methodology to assess the degree of additionality of EU funds (Del Bo and Sirtori, 2016).

As regards the implementation of EU regional policy in Italy, its most distinctive feature is that many Mezzogiorno regions consistently belonged to the Objective 1 (and then Convergence Objective) area. More precisely this area included Abruzzo (until 1996), Molise and Sardegna (until 2006), Campania, Puglia, Basilicata, Calabria, Sicilia and Sardegna. These regions have received on average more than twice as much SF's (per capita) than the rest of the country.

More generally, each of the four principles impacts, alone or jointly with others, on the nature and allocation of SF's among countries and regions. Concentration implies that the socio-economic characteristics specific to each region affect the process of allocation of funds. In conjunction with the partnership principle, concentration is also likely to imply that funds' allocation is likely to be affected from politically-driven redistributive motives. The institution of multiannual programming periods must inevitably determine a degree of rigidity in response to external shocks at annual or lower frequency. With a multilevel governance of EU funds, introduced with the partnership principle, the quality of national or regional institutions may have an influence in this process (evidence favourable to this presumption is found by Ederveen et al., 2006; Rodriguez-Pose and Garcilazo, 2013; but not by Beugelsdijk and Eijffinger, 2005). Fayolle and Lecuyer (2000) and Dall'erba (2005) argue that co-financing penalises the poorer regions. According to them, it is rare that co-financing in low-income regions can double the amount allocated by the EU, while, in richer regions, co-financing more than triples the initial amount set by the EU Commission. Finally, multilevel governance (combined with period programming) creates the conditions for an institutional mechanism in which regions, after having committed to their spending decisions (made according to multiannual planning) require

reimbursement to the EU. SF's are then mobilised, and, only with a time lag, paid out to the regions. These considerations shall be useful in guiding and clarifying our empirical exercise.

3. An Overview of the Empirical Literature

There is a vast literature on the effectiveness of European regional policy. Overall, this policy seems to have a positive impact on growth, but the direction and the significance of the results largely depend on 1) the period and the level of territorial disaggregation; 2) the estimation method, and 3) the variables included in the model (dependent variables, covariates and their frequency – usually annual or multiannual).

Period and level of territorial disaggregation widely differ across the papers. For instance, Rodriguez Pose and Fratesi (2004) or Esposti and Bussoletti (2008) take into account only ten (1989-1999) or eleven (1989 -2000) years, against the 35 years (1960 -1995) of Ederveen et al. (2006). Beugelsdijk and Eijffinger (2005) and Ederveen et al. (2006) consider respectively fifteen and thirteen countries, while the analysis of Rodriguez Pose and Fratesi (2004) is based on 162 EU15 regions and that of Esposti and Bussoletti (2008) on 206 EU15 regions.

Concerning the econometric method applied, many papers estimate a regression à la Barro, augmented by the SF's, in order to test various hypotheses about growth and convergence among regions (Garcìa–Solanes and Maria-Dolores, 2002a, 2002b; Cappelen et al. 2003; Rodriguez Pose and Fratesi, 2004; Beugelsdijk and Eijffinger, 2005; Puigcerver-Peñalver, 2007). Other papers turn to more fully-fledged dynamic models (Esposti and Bussoletti, 2008; Aiello and Pupo, 2009). There are also some estimates of other type (Boldrin and Canova, 2001; Coppola and Destefanis, 2007, 2015; Becker et al., 2010, 2012) and macroeconomic simulation models (Hermin and Quest, see the surveys by Tondl, 2004; Marzinotto, 2012; and Prota and Viesti, 2013).

Boldrin and Canova (2001), mainly relying on the assessment of changes in the empirical distributions of labour productivity, find that SF's do not generate large effects on the convergence process. Their main conclusion is that regional policies can generally be rationalised in terms of redistributive practices, motivated by the nature of the political equilibria on which the EU is built. This influential work has originated many empirical studies aiming to find effective practices and areas of intervention, and to qualify their determinants.

For Ederveen et al. (2005) the "quality" of institutions matters, because the set of rules and institutions in a country determines the allocation of the funds to productive activities or to "rent-seeking" activities. On the contrary in Beugelsdijk and Eijffinger (2005) the empirical evidence does not indicate that more corrupt countries use their funds in a more inefficient way, and also for this reason the hypothesis that SF's reduced interregional disparities within the current 15 European countries cannot be rejected. Cappelen et al. (2003) find that EU regional support has a positive impact on the growth performance of European regions. However, their results also show that this impact is much stronger in samples limited to more developed (not only institutionally, but also technology-wise) regions, emphasising the importance of accompanying policies that improve the competence of the receiving environments. Esposti and Bussoletti (2008) find different results across regions without a clearly explainable pattern. Their generally positive (albeit small) impact of SF's on the growth of Objective 1 regions turns negative is some cases (i.e. German, Greek and Spanish Objective 1 regions). The largest effect is found for French Objective 1 regions. More recently, Rodriguez-Pose and Garcilazo (2013) have found that quality of government is highly relevant for the effectiveness of cohesion policy: the better the quality of the local government, the more effective is cohesion policy.

Becker et al. (2010) exploit a regression-discontinuity design around the discrete jump in the probability of Objective 1 funds receipt at the 75% threshold. They find positive effects of Objective 1 funds on GDP per capita growth, but no employment effects. Becker et al. (2012) use a dose response model to impact of EU funds, finding that they accelerate GDP growth in the recipient regions. However a reallocation of the funds across target regions would generate even faster convergence than the current funding system.

Rodriguez-Pose and Fratesi (2004) detect an interesting distinction between development axes. The returns to commitments on infrastructure and business support are not significant (despite the concentration of development funds on these axes). Support to agriculture has only short-term (positive) effects on growth. Only investment in education and human capital has medium-term positive and significant returns. Fratesi and Perucca (2014) pursue this effort further, and find that regions more endowed with specific types of territorial capital (not only private capital, but also public infrastructure, human and social capital) extract larger gains from cohesion policy investment in related fields.

The macrosimulation models, such as Hermin or Quest, generally find that regional policy has a positive impact, in both the short and long run, on GDP and employment. The size of the impact observed typically varies across countries. These models have a richer structure than the other econometric analyses. Yet they also rely on many more (often untested) hypotheses about specification (variables included, some key parameters, dynamic structure, functional form, etc.).

All the studies examined so far deal with countries or a wide set of European regions. Concerning the impact of the Structural Funds on Italian regions, Aiello and Pupo (2009) focus on the effects of EU spending from 1996 to 2007 as regards the 20 Italian administrative regions. Their empirical analysis is based on panel estimates of an augmented neoclassical growth model. They find that *disbursed* SF's, although having a stronger impact in the South than in the Centre-North, have only weakly contributed to regional convergence in Italy. Coppola and Destefanis (2007) adopt a different framework to study the impact of *accredited* SF's across Italian regions in 1989-2003. The components of total factor productivity change are measured through a non-parametric FDH approach and then regressed on Funds and other variables. They find that SF's have a weak but significant impact on changes in total factor productivity, as well as on capital accumulation and changes in employment. However, in a recent paper (Coppola and Destefanis, 2015) the same authors find, for period 1989-2006, virtually no effect of *disbursed* SF's on capital accumulation and employment.

It is difficult to discern a pattern across this wide variety of results. However, examination of the literature reveals that SF's are virtually never analysed alongside with other (national) policies / funds directed to regional growth and cohesion. Indeed, data availability issues often make it very difficult this kind of joint analysis. A further remark is that, although the role of institutional factors for the effectiveness of funds has been widely analysed, comparisons between the relevance of institutional vs. other (e.g., technological) factors are rather scant. There is also room for a new study estimating the impact of regional policies while allowing for the mechanisms presiding to the allocation of funds across regions. In fact that existing analyses ignore the selection bias deriving from the fact that SF's are distributed not randomly but on the basis of observable and unobservable criteria.

Generally speaking, the literature on policy evaluation suggests that the allocation mechanisms of funds, that is the explanation of how these funds are distributed among regions, is one of the most important aspects to assess the impact they have on regional economies. However, scientific reflection has focused on the allocation mechanisms of SF's far less than on the impact of the funds

themselves.

Boldrin and Canova (2001) indirectly stress the importance of the allocation criteria of the SF's. They explain the lack of a significant impact of these funds on the convergence process between European regions by the fact that the allocation of SF's among regions mainly performs a redistributive function stemming from political considerations. Alegre (2012) gives an estimate of the percentage of the SF's devolved to those redistributive purposes. He estimates that only 60% of SF's is actually used to increase public investment. The remaining 40% is directed toward other uses, such as increasing government consumption or lowering taxes.

For Kemmerling and Bodenstein (2006), the political orientation of regional governments affects the amount of the allocated funds. They find a direct relationship between the strength of left-wing or Eurosceptic political parties in a region and the amount of the funds received by that region. According to the authors, parties that have a regionalist rather than a national vocation are more effective in interacting directly with the European Commission through intense lobbying.

Bouvet and Dall'erba (2010) study the allocation of SF's taking into account the economic and productive characteristics of the European regions, as well as some political aspects of regions and nations, and variables related to the multi-level governance of funds. They also highlight is the political orientation (left/right, liberal/conservative party) of the national, as well as regional, governments: left-wing governments are likely to have a higher propensity to spend. A further aspect defined by Bouvet and Dall'erba is the "political alignment" between the orientation of the central government and the regional governments. Alignment facilitates dialogue the decision-making process directed to the appropriation and use of funds.

Bouvet and Dall'Erba provide Tobit estimates based on 120 Nuts I and II regions from twelve countries for period 1989-1999. They find that political factors have an impact on the allocation of funds, and this impact also depends on the objectives of cohesion policy. Left-wing and Eurosceptic governments are able to get more funds for regions interested by Objectives 3, 4, 5 and less for Objective 2. The weight of the first political party of a coalition government, which is a proxy of the government stability, also has a positive impact on the amount of allocated funds. More stable governments manage to get more funds for Objective 1 regions while more stable regions get less funds for Objectives 1, 3 4 and 5. Political alignment has a positive effect on the allocation of Objective 1 funds.

Del Bo and Sirtori (2016) analyse the SF's allocated to the twenty Italian regions between 1996 and 2010, assessing through time-series techniques the existence of both substitution effects between European and national funds and distorted allocation. The latter occurs when the funds are distributed across regions or sectors differently from what would have been done by a welfare maximising social planner. For regions, this distortion may depend on their bargaining capability with the national or European government. For sectors, it may be linked to increased investment in high-growth sectors such as health, education, R&D, and transport and telecommunications infrastructure. The results confirm the presence of substitution effects between European and national funds and, to a lesser extent, of regional and sectoral distortion.

Finally, Janský et al. (2016) estimate econometrically the compliance of municipalities in the Czech Republic with the principle of additionality during period 2010-2013. They find no across-the board crowding out of national public expenditures by SF's at the level of operational programmes. There is however some evidence of substitution between European funds and nationally-funded public investments.

In our empirical analysis, we shall explore further this issue, by providing a fully-fledged panel analysis of the allocation mechanisms of European (and national) funds across Italian regions. This exercise is also the basis for a novel assessment of the impact of regional policies on GDP per capita. Considering national funds alongside European regional policy should lessen problems of omitted variable bias, and improve treatment of the selection bias, as the allocation rules of the various funds are interrelated (see Bouvet and Dall'erba, 2010). The adoption of a control function approach in order to deal with the selection bias is indeed another distinctive feature of our empirical analysis. Differently from the counterfactual analysis in Becker et al. (2010, 2012), this approach fully allows for the panel nature of our dataset and deals with multiple continuous policy treatments. Finally, we will also provide a comparison of the relevance of the institutional vs. technological environment for the effectiveness of regional policies.

4. The Empirical Framework. Specifications and data

In principle, SF's should increase the productive capacity of the benefited regions, and reduce their performance gap vis-à-vis the other areas (European Commission, 2000; p. 155). Here we are

interested in the relationship between SF's (as well as national policies) and GDP per capita. This is a macroeconomic impact assessment, concerning aggregate effects on a particular territory. As is well known, the main challenge that policy evaluation has to face is to distinguish the changes in the economic situation caused by policies from those caused by other factors (see, for instance, Blundell and Costa Dias, 2000). The fundamental problems in this respect are the omitted variable bias (linked to the difficulty of measuring the effects of intervention separately from other factors) and the selection bias (linked to the fact that funds are not distributed randomly but on the basis of given criteria, possibly impairing the comparison between target and non-target areas).

We address these problems through the following panel specification for a GDP growth equation:

$$(4.1) \qquad D.y_{it} = \alpha_1 y_{it-1} + \alpha_{2j} SF_{jit} + \alpha_3 Nat_{jit} + \alpha_4 gfi_{it} + \alpha_5 \Delta pop_{it} + \\ + a_6 \text{ PERIOD\_2*SOUTH} + a_7 \text{ PERIOD\_3*SOUTH} + \alpha_{8j} \mathbf{W}_{it-1} + \alpha_i + \alpha_t$$

where *i = 1,… 20*, refers to regions, *t = 1, … n* to years, and *j = 1,… m*, refers to the type of fund being considered; variables α_i and α_t are respectively region and year fixed effects. The dependent variable $D.y_{it}$ is the (natural logarithmic) variation of GDP per capita; SF_{jit} are the European Structural Funds (whose types are indexed by j) spent in a region, while Nat_{jit} stands for an array of national funds related to regional and industrial policies (also indexed by j) accruing to a given region. Equation (4.1) is compatible both with Solow's neoclassical approach and with other growth models (see on this Puigcerver-Peñalver, 2007). It also includes gfi_{it}, the (log of the) gross fixed investment per capita, and Δpop_{it}, the (log) variation of population. All flows (not only y_{it}, but also SF_{jit}, Nat_{jit}, gfi_{it}) are taken in per capita terms. Furthermore, there are the interaction terms PERIOD_n*SOUTH: SOUTH is a dummy variable equal to 0 for the non-Mezzogiorno regions and to 1 for the Mezzogiorno regions (these regions being Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia, Sardegna), PERIOD_2 a dummy variable equal to 1 in the second Funds' programming period (2000-2006); PERIOD_3 a dummy variable equal to 1 in the third period (2007-2013). These variables can account for time-varying heterogeneity across the Italian territory (recall that Italy is characterised by a strong North-South divide; also SF's are awarded more heavily to the Mezzogiorno regions, interested by Objective 1 (or *Convergence*) of the EU). We deal in detail with the $\mathbf{W}_{it-1}$ vector below.

SF's are taken into account in terms of disbursements to the regions by the Rotation Fund (*Fondo di Rotazione*) the Italian governmental body responsible for raising funds from the EU. However, with a view to increase the robustness of our estimates, we include these funds in two different specifications: without and with the national resources of the Rotation Fund (the national co-financing, to which reference was made in Section 2). A further point is that a substantial share of SF's is not allocated to any single region, but to multi-regional aggregates. In the following analysis we shall assume that these funds are spread across regions proportionally to the shares of regionally-allocated Funds. This is the hypothesis that is most often maintained in the literature (Esposti and Bussoletti, 2008; Aiello and Pupo, 2009) and that most makes sense from an a priori standpoint.

Among the national funds (related to regional and industrial policies) going to a given region, we include current-account subsidies to firms (*trasferimenti in conto corrente alle imprese*) and to households (*trasferimenti in conto corrente alle famiglie*), as well as capital account expenditures (*spese in conto capitale*) split among subsidies (*trasferimenti*) and investment expenditures.[1] Finally we measure national cohesion policies through the sum of such funds as the *Fondo innovazione tecnologica*, *Fondo contributo imprese*, *Fondo solidarietà nazionale*, and when operational, the *Fondi aree depresse*). These national funds, especially capital account expenditures (see e.g. Viesti and Prota, 2008; Prota and ViestI, 2012) and, to a lesser extent, current-account subsidies to firms (Giavazzi et al., 2012), are believed to be an important stimulus to regional growth. Their amounts changed considerably during the period under analysis, generally decreasing. Therefore, omitting these variables is a potential source of misspecification. Moreover, the literature lacks analyses comparing the joint macroeconomic impact of these national policies and SF's. Also for national funds, there exists a large component of multi-regional aggregates, with which we deal in the same manner as with SF's.

The adoption of a fixed-effect approach, as suggested in Wooldridge (2002, ch. 10), can account for systematic differences across time and regions and address, at least to some extent, both omitted variable and selection bias for the purposes of policy evaluation. Furthermore, through the y_{it-1} variable we do not only allow for the dynamic structure inherent to the data (whose omission could lead to biased estimates). This variable also allows to some extent to address the problems of omitted

[1] For reasons of data availability we could not produce a series of capital-account subsidies *to firms* separated by the rest of capital account expenditures.

variables and bias selection: fund disbursement is partly related to the past history of the regional economy.

We want however to pursue further the search for a treatment of the selection bias problem, along the lines of the *control function approach* (Heckman and Hotz, 1989; Wooldridge, 2004; Cameron and Trivedi, 2005, ch. 25). While we cannot assume that funds are randomly allocated (or assigned), it may be reasonable to assume that they are randomly assigned *conditional on observable covariates*. Unconfoundedness underlies a standard regression approach to estimating the average treatment effect of policies (in our case, an average partial effect, as we deal with continuous variables) through a "kitchen sink" regression that includes the treatment variable along with other variables determining the response variable and/or policy assignment. Consistently with this approach, we include in equation (4.1) the funds, an array of variables determining $D.y_{it}$ (y_{it-1}, gfi_{it} and pop_{it}, the time-varying interaction terms), *plus a vector of* $\boldsymbol{W}_{it-1}$ *variables presiding to the regional allocation of the funds*.

We model the regional allocation of funds (either SF_{jit} or Nat_{jit}) as the outcome of a process including a set of economic and political determinants, mainly along the lines of Bouvet and Dall'erba (2010). Vector $\mathbf{W}_{it-1}$ includes lags of either SF_{jit} or Nat_{jit} (allowing to appraise the existence of mechanisms of complementarity or substitution among different funds), GDP per capita and private investment; measures of regional rate of unemployment and of sectoral shares of employment, and value added, as well as politically-based indicators. The latter include the political orientation of each regional government, and an alignment measure, built by comparing the political orientation of each regional government and the national government. We assume that funds can react only with delay to changes in the economic or political environment. Hence this dynamic specification also applies to any effects of substitution or complementarity between the various policy variables.

Wooldridge (2004) demonstrates that, if funds are roughly continuous variables over a broad range, $\mathbf{W}_{it-1}$ and $\mathbf{X}$ (the latter being the vector of other regressors in (4.1)) are exogenous variables, E (funds| $\mathbf{W}_{it-1}$, $\mathbf{X}$) is a linear function of $f(\mathbf{W}_{it-1}, \mathbf{X})$ and Var (funds|$\mathbf{W}_{it-1}$, $\mathbf{X}$) is constant, a ''kitchen sink'' regression (so labelled because it "throws in" the equation all the relevant variables correlated with the response variable and the policy assignment) like (4.1) can consistently estimate the average partial effect (that is the average treatment effect) of the policy on the response. In our case, all funds are continuous variables, and we proceed to test the other conditions for the applicability of the

''kitchen sink'' model (functional form, homoscedasticity, and regressor exogeneity). This approach is particularly convenient for us, as it lends itself readily to the modelling of multiple policy variables (SF_{jit} and Nat_{jit}).

Note that we model through the same framework the allocation mechanisms for SF_{jit} and Nat_{jit}, although we rely on the literature about the allocation of EU funds. In order to restrict the set of relevant $\mathbf{W}_{it-1}$, we estimate an auxiliary regression where funds are a function of all potential $\mathbf{W}_{it-1}$ and select a parsimonious specification consistent with good diagnostics. We believe that comparing the structure of funding rules across fund categories is in itself a novel and useful exercise.

Our regression framework also allows dealing straightforwardly with another issue highly relevant to the SF literature. It has often been maintained in the literature that policy effectiveness and, more generally, growth in the lagging regions is constrained by the scarce availability of certain local public goods, such as physical and social infrastructure.[2] Subsequently, one should control for regional differences in these factors when assessing the impact of regional policies. Beugelsdijk and Eijffinger (2005) and Ederveen *et al*. (2005) provided important first attempts along these lines for country-level data. More recently Rodriguez-Pose and Garcilazo (2013) dealt with two quality-of-government indicators for regional data. We believe that pursuing this effort, extending the comparison to indicators of technological capability, is a high priority for the correct assessment of the impact of the funds under scrutiny. In order to see how the quality of the regional environment can affect the effectiveness of funds, we estimate the following variant of (4.1):

$$(4.1') \qquad D.y_{it} = \alpha_1 y_{it-1} + \alpha_{2j} SF_{jit} + \alpha_{2'j} q_i SF_{jit} + \alpha_3 Nat_{it} + \alpha_{3'} q_i Nat_{it} + \alpha_4 gfi_{it} + \alpha_5 pop_{it} +$$

$$+ a_6 PERIOD\_2*SOUTH + a_7 PERIOD\_3*SOUTH + \gamma_{8j} \mathbf{W}_{it-1} + \gamma_i + \gamma_t$$

where the interaction terms between q_i, the time-invariant quality of the regional environment (neither for institutional nor for technological indicators we have time-varying measures along the time span under scrutiny) and the funds should allow for the impact of institutions on the nexus between funds, quality of the regional environment, and the economy.

[2] D'Acunto et al. (2004) provide evidence in favour of this view for the Mezzogiorno regions.

The dataset built for this empirical exercise contains data on the cohesion policies implemented in the Italian regions, regional economic variables and political and institutional variables. We utilise annual regional data available from 1994 up to 2013. Regional data for real GDP, value added, gross fixed investment, employment and labour units are taken from ISTAT's regional accounting. European Structural and national funds were both taken from the database "*Spesa Pubblica Regionalizzata*", of the General Accounting Office (*Ragioneria Generale dello Stato*) at the Italian Ministry of Economy and Finance, which allows us to rely for both kinds of funds on series based on the same methodology. Funds series relate to the amounts actually disbursed by the various regions. All these series were deflated using a regional GDP deflator and divided by the regional number of inhabitants. Regional data on GDP, gross fixed capital formation, population and employment (labour units) are taken from ISTAT Regional Accounting. As said above, we also considered including various measures of the regional rate of unemployment (obtained from ISTAT Labour Force Survey) and of sectoral shares of employment and value added, as well as politically-based indicators. As far as the latter are concerned, we extracted data about regional governments from 1990 to 2013 from the "*Anagrafe degli amministratori locali e regionali*" database of the Italian Ministry of the Interior. A political orientation binary variable is assigned the value zero or one for each single regional government depending on whether the government is right- or left-wing. Furthermore, an *alignment* variable was constructed by comparing the orientation of each regional government with the national government that existed in the same year. A dichotomous variable is assigned the value of one in case the regional government has the same political orientation as the national government and the value of zero in the opposite case.

We employ two different indicators In order to measure the quality of government at the regional level. First, a composite indicator developed by 'The QOG Institute' (Charron et. al., 2014). This is a perception-based indicator built from a 34,000-respondents survey from 172 regions within 18 EU member states. The EU regional survey was undertaken between 15 December, 2009, and 1 February, 2010. This indicator takes regional governments as a unit of analysis, and addresses the provisions of the local public goods more directly linked with the quality of local government. Then, we use the index of civic sense (*Indice di lealtà verso le istituzioni*) for 1996, calculated by *Sole 24 Ore*, 8-9-1997. This index was already found to be a relevant measure of institutional quality in D'Acunto et al. (2004) and has the useful property of being computed for the early years of our sample.

We expect the above indicators to yield roughly comparable results. It is interesting to contrast their performance with that of two indicators of technological capability, found as well to be a significant measure of regional differences in D'Acunto et al. (2004). We use for this purpose 1) the index of technological potential, for 1991 (from Netti and Sarno, 1998). This index is based on the information gathered in the ISTAT survey on technological innovation carried out for 1990-1992. It is defined as a ratio between total expenses for R&D, purchases of patents and licenses, designing, product testing, marketing (excluding the advertising of new products) and investments in new machinery, equipment and plant and resident 1991 population (from the 1991 ISTAT population census); 2) the number of patents recognised from EPO per firm (we take the mean of the ratio between patent data for 1980 and 1990, from Paci and Usai, 2000; and number of firms for 1981 and 1991 from Istat census data). Both these indexes predate our sample.

As a final remark, we stress that all these environmental indicators have a wide rage of variation, as documented in Charron et. al. (2014), D'Acunto et al. (2004), Netti and Sarno (1998), and Paci and Usai (2000). The evidence linked to their use can thus be of interest also for other European countries, characterised by different kinds of economic and socio-political environments.

5. The main results

We expound in this section the main results obtained from our regression framework. An important remark relates to the dynamic specification of the regressions. Going beyond the simple baseline specification presented in Section 4, we widely experimented with various leads and lags of SF_{jit}, Nat_{jit} and gfi_{it}, and found out that the best fit in (4.1 and (4.1') was consistently achieved with current values of private investment and national funds, and SF's forwarded one year with respect to other variables. In our view, this dynamic specification well describes the institutional mechanism in which regions, after having engaged in their spending decisions, demand reimbursement to the Rotation Fund. Funds from the EU are then paid out to the regions with a lag of approximately one year. This effectively means that the Rotation Fund expenditures written down for year t have already been made in year t-1. With a view to simplifying presentation of the auxiliary regressions as well as of (4.1) and (4.1'), in showing and commenting our results we will follow the convention of dating SF's (with and without co-financing) one year back.

A second point about dynamic specification concerns the estimation procedure. It is well known that fixed-effect OLS underestimate the coefficient of the lagged dependent variable (a phenomenon known as the Nickell bias). With a number of periods approaching the number of 20, it is not clear to which extent our set-up can be affected by this problem. Given the large number of estimates that we carried out, we stuck to computationally convenient fixed-effect OLS as the workhorse for our empirical analysis. Working in reverse, we applied to our specifications of interest the bias approximation formula suggested in Bun and Kiviet (2003) in order to correct for the Nickell bias. As a result, the coefficient of the lagged dependent variable somewhat increased (in the order of ten percentage points), but conclusions about the steady-state value and significance of all key regressors remained unchanged. These estimates are available on request.

For ease of presentation we will now comment on the results for the auxiliary regression selecting the relevant variables within the $\mathbf{W}_{it-1}$ vector. Then we will turn to (4.1) and (4.1'). In all cases we will refer to the summary tables presented in the Appendix. Given the conditions we need to fulfil for our ''kitchen sink'' regression model, in the auxiliary regressions we select specifications that are consistent with sufficiently good diagnostics (especially inasmuch as the heteroskedasticity and Reset tests are concerned), and present them in a way apt to highlight the main characteristics of the allocation mechanisms. Notice that the heteroskedasticity and Reset tests were also run for augmented versions of the auxiliary regressions, including both $\mathbf{W}_{it-1}$ and $\mathbf{X}_{it}$ vectors. The comments of the results will be articulated first around the existence of substitution or complementarity between the funds, then about the relevance of the economic variables, and finally on the role of the variables of a political nature. We recall that, in the auxiliary regressions, funds can react only with delay to changes in the economic or political environment, including other funds. Hence any effects of substitution or complementarity between the policy variables are filtered through this dynamic specification.[3]

When considering SF's (both without and with national co-financing), we find a strong negative correlation (substitution effect) with public investments and current-account subsidies to households as well as a positive correlation (complementarity effect) with capital-account subsidies. National cohesion funds also react negatively to current-account subsidies to households, while showing a positive correlation with SF's and public investments. For national funds for current-account subsidies

[3] We also tested for the presence of contemporaneous policy effects, which turned out to be insignificant.

to firms there is a substitution effect with capital-account subsidies. From the estimates for current-account subsidies to households, a slight substitution effect also emerges between current-account subsidies to firms and households (a strong substitution effect with SF's also shows up here). Public investments react negatively (although not very significantly) to SF's and current-account subsidies.

Turning now to the role of economic variables, for SF's we can detect a positive influence of the weight of the public sector and the construction sector. The weight of construction and industry matters positively for national cohesion funds. There are no anti-cyclical effects for SF's (except, weakly, with private investment). On the other hand, a strong anti-cyclical effect exists for national cohesion funds and current-account subsidies (both to firms and households). This is partially countered by a significant positive role of private investment (for current-account subsidies to firms) and a negative influence of female rate of unemployment (for national cohesion funds). A pro-cyclical role of private investment and female rate of unemployment also shows up for capital-account subsidies.

Finally, the alignment indicator has a negative influence on national cohesion funds and, to a much less significant extent, also on SF's. This may mean that (to some extent) regional governments strive to obtain larger EU and national cohesion funds when relations with the central government are not good. On the other hand, a very weak positive influence of alignment shows up for (nationally funded) public investments.

Overall, we find satisfactory diagnostics for both simple and augmented versions of the auxiliary regression (this is not true for the Reset tests of some national funds, a matter on which we will come back when commenting the evidence from (4.1) and (4.1')). These estimates also have a rather high fit, as warranted by the adjusted R-squares and F-tests. Our results are not directly comparable with those in Bouvet and Dall'erba (2010) and in Del Bo and Sirtori (2016), because we rely on fixed-effect panel estimates, which are more likely to account for unobserved heterogeneity in a satisfactory way. At any rate, we also find substitution effect between EU and national funds, especially with public investments and current-account subsidies to households, as well as a complementarity with capital-account subsidies. Perhaps it is even more interesting to point out that, in accordance with their multiannual programming horizon, EU funds are not reactive to cyclical shocks. This is also true for nationally-funded public investments, which are arguably also driven by long-term considerations, while all other national funds show some kind of explicit dependence from the cycle. It may be left to

future research to understand why there is, for some of them, evidence of pro-cyclicality, notably with respect to the female rate of unemployment.

In Tables A.4-A.5 of the Appendix we present the main results obtained for equation (4.1). Results are presented (in Table A.4) first for a version of (4.1) without the $\mathbf{W}_{it-1}$ variables, and then for a version of (4.1) complete with them (in Table A.5). We always carry out estimates for SF's without and with national co-financing.

In Table A.4a, we present estimates include one fund at a time in the regression, as well as an equation (in column (9)) including all funds together. All estimates have satisfactory diagnostics, and tests of weak exogeneity, carried for all policy variables (and for private investment), never reject the null hypothesis (of exogeneity). This may strike some reader as odd, but in regional panel estimates it is likely that much of the feedback from GDP per capita on the funds works itself out at the national level and hence is absorbed by year fixed effects. The overall picture consistently points to a significant impact of SF's, while only current-account subsidies to firms are significant (less than the SF's, anyway) among the national funds. In Table A.4b we present estimates including each definition of SF's at a time, alongside with each one of the national funds at a time. The main message remains the same. SF's and current-account subsidies to firms rule the roost. Other national funds (in particular national cohesion funds) are never significant. Overall, the results obtained imply that SF's have a significant impact on GDP per capita (both without and with national co-financing).

We then turn to assess, in Table A.5, the consequence of including in the analysis (through the ''kitchen sink'' approach) the $\mathbf{W}_{it-1}$ variables that were found to influence significantly the fund allocation mechanism. This inclusion does not have an appreciable impact on the significance of SF's. We conclude that the impact of SF's we found in Table A.4 is therefore not significantly influenced by a selection bias phenomenon. The same is not true for current-account subsidies to firms, whose significance dwindles below the 5% significance level in Tables A.5.

In general terms, the lack of significance of national funds on GDP per capita may be linked to their crowding out the effect of other GDP components. A note of caution must be sounded in the sense that not all these aggregates (especially what we labelled national cohesion funds) embody a policy intervention defined as precisely as with SF's. In this sense it is interesting to notice that the modelling of current-account subsidies to households, national cohesion funds and (to a lesser extent) capital-account subsidies showed some specification problems at the auxiliary regression stage. This could

mean that they are conglomerations gathering a rather heterogeneous array of funds. This explanation is not however likely to hold true for nationally-funded public investments.

Throughout Table A.5, SF's (either ue or rf) have an impact on the level of GDP per capita up to one sixth of that of private investment, which is consistently significant. Current-account subsidies to firms are less significant, and have an impact of about one third than that of SF's. In quantitative terms a, say, doubling of ue (rf) increases per capita steady-state GDP per capita by 2.1% (2.7%) on average. This may not seem impressive vis-à-vis a gap in GDP per capita between Northern and Southern Italy amounting in recent years to more than 40 percentage points. It should also however be kept in mind that currently SF's (inclusive of national co-financing) are barely above 1.5% of GDP in the Mezzogiorno regions.

In Table A.6 we put to test the role of various indicators of environmental quality on the effectiveness of funds. For the sake of conciseness, we limit ourselves to commenting results about SF's and current-account subsidies to firms and we only refer to results inclusive of the $\mathbf{W}_{it-1}$ vector. Fairly little impact of quality of government is found for SF's. The interaction terms between them and the quality of government indicators are virtually never significant. On the other hand, the impact of subsidies to firms is decisively enhanced by quality of government indicators. It thus appears that the allocation mechanism of EU funds has insulated them from institutional influences (such as the managerial and political capability of local authorities) that were potentially at work, as shown by their relevance for national funds. The role of these influences for subsidies to firms is also highlighted in Giavazzi et al. (2012). This interpretation is vindicated by the finding of a significant interaction with indicators of institutional quality, but not with the indexes of technological capability. The latter never affect the policy impact of either EU or national funds. All this evidence remains the same if the $\mathbf{W}_{it-1}$ vector is not included in the estimates.

A final important remark concerns the relative role of ue and rf. Although both SF indicators basically tell the same story, rf turns out consistently to have a higher and more significant coefficient. In the light of the considerations made about national co-financing in Section 2, this may mean that more careful consideration should be given to the co-financing rule, especially in the poorer areas.

6. Concluding Remarks

In this paper, we focused on the impact of the European Structural Funds on GDP per capita in the Italian regions through the three EU programming cycles from 1994 to 2013. More precisely, we have dealt jointly, unlike what has been done in much of the previous work, with the effects of EU and an array of nationally funded funds. Also, we have taken into account through a control function approach the selection bias potentially resulting from the fund allocation mechanism. The identification of the fund allocation mechanism is in itself an important result of the present study, since we do not have prior knowledge about comparative evidence of this type for EU and national funds.

Summing up the evidence about fund allocation, it can be said that EU funds are negatively correlated with public investments, and positively with capital-account subsidies. Regarding the role of other economic variables, there is an anti-cyclical behaviour of current-account subsidies and national cohesion funds, but not of EU funds. Turning to the empirical evidence about the impact of the funds, we have ascertained that EU funds have a significant effect on GDP per capita, both without and with national co-financing. Also (nationally-funded) current-account subsidies to firms have a positive impact on GDP per capita, while other national funds are not significant. The impact of the SF's is not significantly affected by the selection bias attributable to the fund allocation mechanisms, which on the other hand matters for subsidies to firms. Furthermore, quality of government has very little influence on the effectiveness of SF's, but decisively enhances the impact of subsidies to firms.

All in all, it appears that the allocation mechanism of SF's has isolated them from undue institutional influences, and is consistent with their significant impact on the level of GDP per capita. This is not true for either national cohesion policies (although here measurement issues may have a role) or other national funds, with the partial exception of current-account subsidies to firms. At a time when the EU Commission is envisaging a reduction (if not a cessation) of EU intervention in regional development policies, our evidence implies that this choice could have dire consequences for the reduction of regional disparities in Italy. More generally, our results seem to highlight that the current system of multilevel governance cum multiannual programming of SF's makes them considerably more effective than nationally-based policies in a context characterised by strong institutional and structural heterogeneities.

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APPENDIX

Legend of Tables A.1-A.6

Region and year fixed effects are always included in the estimates, and not shown in the interest of parsimony. For all regressors, we report coefficients and t-ratios (below the coefficients). Standard errors are heteroskedasticity-robust.

List of variables and abbreviations

GDP	y
EU structural funds (Rotation Fund: EU funding only)	eu
EU structural funds (Rotation Fund: EU funding + national funding)	rf
Current-account subsidies (to firms)	cf
Current-account subsidies (to households)	ch
Capital-account expenditures (subsidies)	ks
Capital-account expenditures (investments)	ki
National cohesion funds	nc
Gross fixed investment (private)	gfi
Population	pop
Female unemployment rate	ur_f
Public sector (value added) share	pub_vsh
Construction sector (employment) share	bdg_nsh
Manufacturing sector (employment) share	mfg_nsh
Alignment between regional governments and national government (=1 if aligned)	align
Political orientation of regional governments (=1 if centre-left)	or

Variables y, eu, rf, cf, ch, ks, ki, nc, gfi, are at constant prices, divided by regional population, and taken in natural logarithms.
A _1 or _2 termination indicates a 1- or 2-year lag.
The D. symbol stands for a first (logarithmic) difference.

N is the number of observations, r2_a is the coefficient of determination adjusted for degrees of freedom; F is the value of the joint significance test for all regressors; aic and bic are, respectively, the Akaike information criterion and the Bayesian information criterion. All these measures of fit are *not* inclusive of the effect of region and year fixed effects.

C-W is the Cook-Weisberg test for heteroskedasticity, A-B is the Arellano-Bond test for first-order serial correlation, R is the Reset test for functional form and omitted variables (we include quadratic and cubic terms of fitted values), C- is the C-test of regressor weak exogeneity; for all these test we report their p-values. C-W (+) and R(+) are respectively the Cook-Weisberg and the Reset test for an augmented version of the auxiliary regressions, including not only the $\mathbf{W}_{it-1}$ but also the $\mathbf{X}_{it}$ vectors. The latter comprise gross fixed investment, log variation of the population and also lagged GDP per capita, if not included the in auxiliary regression already.

In Table A.4a, column (1), we test for weak exogeneity of, ue. Added instrumental variables are: ue_1, ue_2, ch_1, ks_1, ki_1, gfi_1, pub_vsh_1, bdg_nsh_1 (for ue).
In Table A.4a, column (2), we test for weak exogeneity of rf. Added instrumental variables are: rf_1, rf_2, ch_1, ks_1, ki_1, gfi_1, pub_vsh_1, bdg_nsh_1 (for rf).
In Table A.4a, column (3), we test for weak exogeneity of cf. Added instrumental variables are: ue_1 (or rf_1), cf_1, ks_1, gfi_1.
In Table A.4a, column (4), we test for weak exogeneity of ch. Added instrumental variables are: ue_1 (or rf_1), cf_1, ch_1, ch_2, ks_1, nc_1, y_2, gfi_1, pub_vsh_1, bdg_nsh_1.
In Table A.4a, column (5), we test for weak exogeneity of ks. Added instrumental variables are: ue_1 (or rf_1), ue_2 (or rf_2), cf_1, ch_1, ks_1, ks_2, ki_1, y_2, gfi_1, gfi_2, ur_f_2, mfg_nsh_1.
In Table A.4ab, column (6), we test for weak exogeneity of ki. Added instrumental variables are: ue_1 (or rf_1), cf_2, ch_1, ks_1, ki_1.
In Table A.4a, column (7), we test for weak exogeneity of nc. Added instrumental variables are: ue_1 (or rf_1), cf_1, ch_1, ki_1, nc_1y_2, ur_f_2, mfg_nsh_1, bdg_nsh_1, align_1.
In Table A.4a, columns (8) and (9), we test for weak exogeneity of gfi. Added instrumental variables are: ue_1, gfi_1, gfi_2, ki_1, ur_f_2.

in Table A.5, columns (1)-(2), the $\mathbf{W}_{it-1}$ vector includes, as control variables for ue (or rf): ue_1 (or rf_1), ue_2 (or rf_2), ch_1, ks_1, ki_1, gfi_1, pub_vsh_1, bdg_nsh_1.
In Table A.5, columns (3)-(4), the $\mathbf{W}_{it-1}$ vector includes, as control variables for ue (or rf) and cf: ue_1 (or rf_1), ue_2 (or ue_2), cf_1, ch_1, ks_1, ki_1, gfi_1, pub_vsh_1, bdg_nsh_1.
In Table A.5, columns (5)-(6), the $\mathbf{W}_{it-1}$ vector includes, as control variables for ue (or rf) and ch: ue_1 (or rf_1), ue_2 (or ue_2), ch_1, ch_2, ks_1, ki_1, nc_1, y_2, gfi_1, pub_vsh_1, bdg_nsh_1.
In Table A.5, columns (7)-(8), the $\mathbf{W}_{it-1}$ vector includes, as control variables for ue (or rf) and ks: ue_1 (or rf_1), ue_2 (or ue_2), ch_1, ks_1, ki_1, gfi_1, gfi_2, ur_f_2, pub_vsh_1, mfg_nsh_1, bdg_nsh_1.
In Table A.5, columns (9)-(10), the $\mathbf{W}_{it-1}$ vector includes, as control variables for ue (or rf) and ki: ue_1 (or rf_1), ue_2 (or ue_2), cf_2, ch_1, ks_1, ki_1, gfi_1, pub_vsh_1, bdg_nsh_1.
In Table A.5, columns (11)-(12), the $\mathbf{W}_{it-1}$ vector includes, as control variables for ue (or rf) and nc: ue_1 (or rf_1), ue_2 (or ue_2), ch_1, ks_1, ki_1, nc_1, y_2, gfi_1, ur_f_2, pub_vsh_1, bdg_nsh_1, align_1.

Tab. A.1 – EU and National Cohesion Funds, Auxiliary Regressions for the Fund Allocation Mechanism

European structural Funds

Dep. Var.	D.ue	D.rf
ue_1	-0.8619	
	-14.91	
ue_2	0.1135	
	2.02	
rf_1		-0.8173
		-13.66
rf_2		0.1052
		1.81
ch_1	-0.1365	-0.1632
	-1.62	-2.30
ks_1	0.2541	0.3154
	3.20	4.31
ki_1	-0.2167	-0.2083
	-3.10	-3.43
gfi_1	-0.6505	-0.7411
	-1.49	-2.07
pub_vsh_1	6.0585	4.4423
	1.78	1.44
bdg_nsh_1	8.2955	9.5211
	1.59	2.09
align_1	-0.0148	-0.0472
	-0.29	-1.08
or_1	-0.0689	-0.0425
	-1.12	-0.79
N	360	360
r2_a	0.45	0.44
F	20.78	18.21
C-W	0.39	0.96
A-B	0.72	0.80
R	0.21	0.45
C-W (+)	0.50	0.97
R (+)	0.37	0.60

Nationally-funded Cohesion Funds

Dep. Var.	D.nc	D.nc
ue_1	0.1010	
	1.95	
rf_1		0.1364
		2.23
cf_1	0.0914	0.0922
	1.70	1.71
ch_1	-0.2067	-0.2083
	-2.80	-2.80
nc_1	-0.8072	-0.8102
	-9.09	-9.20
ki_1	0.1303	0.1372
	2.00	2.08
y_1	-9.6318	-9.9105
	-3.83	-3.89
y_2	6.5142	6.6923
	2.86	2.92
ur_f_2	-0.0354	-0.0349
	-3.17	-3.13
mfg_nsh_1	6.2772	6.2543
	2.21	2.22
bdg_nsh_1	27.9241	27.4442
	4.98	4.94
align_1	-0.1079	-0.1047
	-1.79	-1.73
or_1	-0.0816	-0.0823
	-1.11	-1.13
N	380	380
r2_a	0.43	0.43
F	11.06	11.11
C-W	0.11	0.11
A-B	0.85	0.95
R	0.06	0.06
C-W (+)	0.11	0.09
R (+)	0.05	0.05

Tab. A.2 – Nationally-funded Current-Account Subsidies, Auxiliary Regressions for the Fund Allocation Mechanism

Current-Account Subsidies to Firms			Current-Account Subsidies to Households		
Dep. Var.	D.cf	D.cf	Dep. Var.	D.ch	D.ch
ue_1	0.0310		ue_1	-0.0794	
	0.56			-2.76	
rf_1		-0.0241	rf_1		-0.0932
		-0.35			-2.28
cf_1	-0.7198	-0.7197	cf_2	-0.2148	-0.2104
	-9.45	-9.50		-2.75	-2.72
ks_1	-0.2389	-0.2395	ch_1	-1.0485	-1.0446
	-2.60	-2.61		-10.51	-10.49
			ch_2	0.1511	0.1472
				2.76	2.64
			ks_1	-0.0493	-0.0546
				-0.83	-0.92
			nc_1	0.0453	0.0459
				1.54	1.55
y_1	-4.2696	-4.1508	y_1	1.1498	1.2086
	-2.55	-2.50		1.10	1.12
			y_2	-4.2148	-4.2832
				-2.52	-2.48
gfi_1	0.7043	0.7068	gfi_1	0.2138	0.2394
	1.99	1.98		0.82	0.91
			pub_vsh_1	1.7118	1.2486
				0.53	0.38
			bdg_nsh_1	5.1301	5.2678
				1.37	1.38
align_1	0.0674	0.0658	align_1	0.0208	0.0184
	0.96	0.94		0.44	0.40
or_1	0.0022	0.0061	or_1	-0.0495	-0.0488
	0.02	0.07		-0.92	-0.90
N	380	380	N	360	360
r2_a	0.41	0.41	r2_a	0.56	0.56
F	15.77	16.33	F	25.04	24.43
C-W	0.60	0.60	C-W	0.85	0.82
A-B	0.21	0.23	A-B	0.85	0.95
R	0.32	0.31	R	0.06	0.06
C-W (+)	0.60	0.60	C-W (+)	0.85	0.82
R (+)	0.30	0.29	R (+)	0.03	0.03

Tab. A.3 – Nationally-funded Capital-Account Expenditures, Auxiliary Regressions for the Fund Allocation Mechanism

Capital-Account Subsidies

Dep. Var.	D.ks	D.ks
ue_1	0.0206	
	0.54	
rf_1		-0.0067
		-0.13
ue_2	-0.0497	
	-1.05	
rf_2		-0.0083
		-0.13
cf_1	-0.0539	-0.0575
	-0.94	-0.99
ch_1	-0.1340	-0.1284
	-1.52	-1.47
ks_1	-0.8145	-0.8200
	-8.74	-8.67
ks_2	0.0668	0.0703
	1.00	1.05
ki_1	0.0866	0.0943
	1.01	1.09
gfi_1	0.7975	0.7900
	1.62	1.58
gfi_2	0.5387	0.5386
	1.21	1.22
ur_f_2	-0.0244	-0.0242
	-2.00	-1.94
mfg_nsh_1	-3.9832	-3.9174
	-1.42	-1.40
align_1	-0.0382	-0.0340
	-0.68	-0.58
or_1	-0.0884	-0.0837
	-1.45	-1.35
N	360	360
r2_a	0.41	0.41
F	23.26	23.01
C-W	0.31	0.31
A-B	0.07	0.05
R	0.12	0.10
C-W (+)	0.31	0.31
R (+)	0.12	0.10

Public Investment Expenditures

Dep. Var.	D.ki	D.ki
ue_1	-0.1014	
	-1.76	
rf_1		-0.1157
		-1.85
cf_2	-0.0946	-0.0914
	-1.34	-1.30
ch_1	-0.1902	-0.1877
	-2.00	-1.97
ki_1	-0.7802	-0.7867
	-7.67	-7.53
align_1	0.0652	0.0616
	1.20	1.15
or_1	0.0268	0.0270
	0.41	0.42
N	360	360
r2_a	0.43	0.43
F	28.20	28.64
C-W	0.68	0.74
A-B	0.20	0.24
R	0.87	0.91
C-W (+)	0.68	0.71
R (+)	0.87	0.90

Tab. A.4a – Eq. (4.1), The Impact of Funds on GDP per Capita, dep. var.: D.y, N = 380; Estimates without the $\boldsymbol{W}_{it-1}$ vector

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
y_1	-0.2539	-0.2539	-0.2291	-0.2412	-0.2401	-0.2398	-0.2458	-0.2545	-0.2551
	-7.72	-7.66	-7.34	-7.43	-7.42	-7.41	-7.24	-7.82	-7.81
gfi	0.0315	0.0294	0.0310	0.0315	0.0315	0.0317	0.0314	0.0290	0.0267
	3.14	2.88	3.36	3.42	3.37	3.39	3.49	2.84	2.55
D.pop	-0.5436	-0.5466	-0.5237	-0.5406	-0.5421	-0.5414	-0.5350	-0.5145	-0.5179
	-2.93	-2.97	-2.96	-3.04	-3.04	-3.04	-3.02	-2.82	-2.87
ue	0.0042							0.0045	
	2.80							2.94	
rf		0.0054							0.0058
		3.34							3.60
cf			0.0022					0.0036	0.0036
			1.94					2.65	2.66
ch				-0.0006				-0.0040	-0.0042
				-0.41				-1.71	-1.79
ks					0.0002			0.0019	0.0020
					0.15			0.89	0.93
ki						-0.0002		-0.0013	-0.0010
						-0.15		-0.77	-0.60
nc							-0.0016	-0.0016	-0.0018
							-1.18	-1.10	-1.22
r2_a	0.21	0.22	0.20	0.19	0.19	0.19	0.19	0.22	0.23
F	18.74	19.73	14.93	14.42	14.61	14.31	14.23	11.88	12.73
aic	-2278	-2281	-2273	-2269	-2269	-2269	-2269	-2279	-2283
bic	-2250	-2253	-2246	-2241	-2242	-2241	-2242	-2232	-2235
C-W	0.36	0.32	0.70	0.69	0.64	0.69	0.66	0.36	0.25
A-B	0.12	0.17	0.11	0.07	0.07	0.07	0.09	0.12	0.19
R	0.46	0.28	0.46	0.12	0.16	0.13	0.13	0.98	0.88
C-()	0.18(UE)	0.23(RF)	0.85(CF)	0.73(CH)	0.91(KS)	0.50(KI)	0.49(NC)	0.79(gfi)	0.94(gfi)

Tab. A.4b – Eq. (4.1), The Impact of Funds on GDP per Capita, dep. var.: D.y, N = 380; Estimates without the $\boldsymbol{W}_{it-1}$ vector

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
y_1	-0.2430	-0.2427	-0.2545	-0.2543	-0.2559	-0.2561	-0.2541	-0.2538	-0.2583	-0.2586
	-7.69	-7.65	-7.74	-7.69	-7.89	-7.84	-7.75	-7.68	-7.61	-7.57
gfi	0.0310	0.0289	0.0314	0.0294	0.0312	0.0292	0.0315	0.0294	0.0308	0.0286
	3.10	2.83	3.12	2.87	3.10	2.84	3.13	2.87	3.11	2.83
D.pop	-0.5239	-0.5264	-0.5438	-0.5468	-0.5450	-0.5481	-0.5433	-0.5467	-0.5419	-0.5450
	-2.84	-2.88	-2.93	-2.97	-2.92	-2.96	-2.92	-2.96	-2.92	-2.97
ue	0.0042		0.0042		0.0042		0.0042		0.0045	
	2.82		2.80		2.79		2.80		2.96	
rf		0.0055		0.0054		0.0054		0.0054		0.0058
		3.40		3.33		3.35		3.32		3.54
cf	0.0023	0.0023								
	1.98	2.01								
ch			-0.0003	-0.0002						
			-0.17	-0.14						
ks					0.0011	0.0012				
					0.76	0.87				
ki							-0.0002	0.0000		
							-0.15	0.02		
nc									-0.0016	-0.0017
									-1.05	-1.17
r2_a	0.22	0.23	0.21	0.21	0.21	0.22	0.21	0.21	0.21	0.22
F	17.01	17.84	16.22	17.15	16.48	17.49	16.27	17.07	16.26	17.07
aic	-2281	-2284	-2276	-2279	-2276	-2279	-2276	-2279	-2277	-2281
bic	-2249	-2253	-2244	-2247	-2245	-2248	-2244	-2247	-2246	-2249
C-W	0.37	0.31	0.37	0.32	0.35	0.30	0.37	0.32	0.35	0.29
A-B	0.17	0.25	0.11	0.16	0.11	0.15	0.11	0.16	0.16	0.23
R	0.91	0.74	0.44	0.28	0.53	0.34	0.47	0.29	0.53	0.33

Tab. A.5 – Eq. (4.1), The Impact of Funds on GDP per Capita, dep. var.: D.y; Estimates with the $\boldsymbol{W}_{it-1}$ vector

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
y_1	-0.2461	-0.2479	-0.2392	-0.2398	-0.1995	-0.2107	-0.2452	-0.2486	-0.2372	-0.2401	-0.1902	-0.2052
	-6.14	-6.18	-5.94	-5.97	-3.44	-3.63	-5.93	-5.96	-5.52	-5.56	-3.32	-3.60
gfi	0.0424	0.0389	0.0428	0.0394	0.0372	0.0345	0.0438	0.0401	0.0380	0.0350	0.0417	0.0379
	3.28	2.99	3.31	3.02	2.89	2.65	3.31	3.00	2.92	2.67	3.26	2.95
D.pop	-0.5606	-0.5574	-0.5547	-0.5532	-0.5476	-0.5529	-0.5683	-0.5669	-0.5540	-0.5559	-0.5065	-0.5054
	-2.92	-2.95	-2.90	-2.94	-2.86	-2.93	-2.90	-2.94	-2.90	-2.95	-2.62	-2.66
ue	0.0047		0.0047		0.0050		0.0047		0.0050		0.0051	
	2.97		2.96		3.09		3.01		3.17		3.14	
rf		0.0061		0.0062		0.0061		0.0063		0.0062		0.0066
		3.72		3.72		3.70		3.80		3.80		3.91
cf			0.0017	0.0018								
			1.63	1.76								
ch					-0.0015	-0.0013						
					-0.93	-0.79						
ks							0.0014	0.0018				
							0.95	1.23				
ki									-0.0004	0.0000		
									-0.26	0.02		
nc											-0.0028	-0.0031
											-1.59	-1.83
N	360	360	360	360	340	340	360	360	340	340	360	360
r2_a	0.22	0.23	0.22	0.23	0.22	0.23	0.21	0.22	0.22	0.23	0.23	0.24
F	8.75	9.10	7.92	8.25	6.68	6.94	7.35	7.25	7.55	7.82	7.08	7.43
aic	-2158	-2163	-2157	-2163	-2048	-2051	-2153	-2157	-2050	-2054	-2159	-2164
bic	-2100	-2105	-2091	-2097	-1975	-1979	-2083	-2083	-1985	-1989	-2085	-2090
C-W	0.74	0.56	0.79	0.61	0.82	0.64	0.73	0.52	0.94	0.90	0.72	0.53
A-B	0.32	0.42	0.34	0.44	0.14	0.14	0.31	0.41	0.90	0.76	0.07	0.07
R	0.60	0.72	0.77	0.81	0.41	0.56	0.84	0.93	0.34	0.49	0.68	0.70

Tab. A.6 – Eq. (4.1'), The Impact of Funds, Role of Regional Environment, dep. var.: D.y, N = 360; Estimates with the $\boldsymbol{W}_{it-1}$ *vector*

x = indicator of institutional quality by 'The QOG Institute'.

	(1)	(2)	(3)	(4)	(5)
ue	0.0064			0.0062	
	3.04			3.04	
rf		0.0067			0.0067
		3.25			3.25
cf			0.0019	0.0017	0.0019
			1.90	1.73	1.99
ue*x	0.0027			0.0025	
	1.41			1.32	
rf*x		0.0010			0.0011
		0.56			0.59
cf*x			0.0026	0.0027	0.0025
			2.26	2.28	2.07
r2_a	0.22	0.23	0.21	0.23	0.24
aic	-2159	-2161	-2155	-2160	-2163
bic	-2096	-2099	-2093	-2086	-2089
C-W	0.65	0.55	0.95	0.96	0.99
A-B	0.33	0.42	0.39	0.32	0.39
R	0.82	0.78	0.50	0.43	0.43

x = indicator of technological potential by Netti and Sarno, 1998.

	(1)	(2)	(3)	(4)	(5)
ue	0.0042			0.0042	
	2.49			2.50	
rf		0.0055			0.0057
		3.20			3.25
cf			0.0016	0.0019	0.0020
			1.60	1.80	1.90
ue*x	-0.0001			-0.0002	
	-1.21			-1.33	
rf*x		-0.0002			-0.0002
		-1.67			-1.76
cf*x			0.0000	0.0001	0.0001
			0.12	0.69	0.73
r2_a	0.22	0.23	0.20	0.22	0.23
aic	-2158	-2164	-2148	-2155	-2162
bic	-2096	-2102	-2086	-2081	-2088
C-W	0.52	0.52	0.57	0.55	0.56
A-B	0.45	0.49	0.38	0.49	0.50
R	0.53	0.61	0.92	0.61	0.61

x = indicator of civic sense by Sole 24 Ore, 8-9-1997.

	(1)	(2)	(3)	(4)	(5)
ue	0.0009			0.0027	
	0.20			0.60	
rf		0.0044			0.0054
		0.95			1.16
cf			-0.0086	-0.0089	-0.0084
			-2.22	-2.26	-2.14
ue*x	0.0072			0.0040	
	0.86			0.48	
rf*x		0.0032			0.0014
		0.38			0.16
cf*x			0.0163	0.0167	0.0162
			2.74	2.80	2.73
r2_a	0.22	0.23	0.21	0.23	0.24
aic	-2157	-2161	-2155	-2160	-2165
bic	-2095	-2099	-2093	-2086	-2091
C-W	0.77	0.56	0.70	0.93	0.75
A-B	0.30	0.41	0.38	0.36	0.47
R	0.66	0.74	0.93	0.83	0.82

x = number of patents per firm, D'Acunto et al., 2004.

	(1)	(2)	(3)	(4)	(5)
ue	0.0049			0.0049	
	2.98			2.94	
rf		0.0066			0.0067
		3.80			3.80
cf			0.0019	0.0017	0.0018
			1.39	1.25	1.34
ue*x	-0.0036			-0.0037	
	-0.43			-0.44	
rf*x		-0.0085			-0.0082
		-1.25			-1.20
cf*x			-0.0032	-0.0003	-0.0001
			-0.47	-0.04	-0.01
r2_a	0.21	0.23	0.20	0.21	0.23
aic	-2156	-2162	-2148	-2153	-2159
bic	-2094	-2100	-2086	-2079	-2085
C-W	0.70	0.55	0.61	0.75	0.60
A-B	0.34	0.47	0.40	0.37	0.50
R	0.59	0.71	0.95	0.76	0.78