EU and Nationally Based Cohesion Policies in the Italian Regions

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1. Introduction

Today it seems less feasible than ever to advance towards closer integration of the European Union(EU) without favouring greater economic and social cohesion among its countries. Nonetheless, there are still very deep economic and social disparities, both between the countries and the regions that compose the Union, undermining its unity and cohesion. Hence the need to evaluate the appropriateness and effectiveness of development policies implemented through 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 SFs). The SFs are, especially since the introduction of *Agenda 2000*, the European Community's primary tool for sustaining development in areas facing economic problems.

This paper aims to assess whether the financial resources distributed by the EU actually contributed to fostering regional development in Italy. Although marked differences in levels of regional development characterize 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 perpetuated over time (Allen and Stevenson, 1974; Iuzzolino, 2009). Our empirical framework, unlike most previous work, also considers, along with the SFs, various types of nationally financed funds. For this purpose, a dataset was constructed for the 20 Italian administrative regions for the 1994–2013 period. It contains data about SFs, as well as national funds relating to regional and industrial policy, all extracted from a database of the Italian Ministry of Economy and Finance. There is no other analysis, at least in the Italian literature, that conducts a cogent comparison of the impact of national and EU funds. With these data, we also undertake evaluation of the funds' effects on the basis of a model of their allocation rules, arguably permitting a better treatment of the selection bias in policy evaluation. 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.

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 EU outlined in Jean-Claude Juncker's White Paper on the Future of Europe hypothesizes a reduction or even a cessation of EU intervention in regional development policies. The analysis of this paper can help to quantify the potential consequences of this policy scenario.

The paper is structured as follows. After the introduction, Section 2 contains a brief review of the main institutional features of SFs. 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. European Regional Policy: The Institutional Set-up

Knowledge of the nature, amount and allocation mechanism of SFs, that is, how they are distributed across regions, is crucial to understanding the conditions of their effectiveness. In order to gain further knowledge about these points, it is necessary to go back to the major reform of European regional policy that took place in 1988. This reform 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 on a multiannual programming period. More specifically (Regulations 4253-4256/1988), four principles were established that still underpin the implementation of the SFs: 1) concentration, 2) programming (in time), 3) partnership and 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 have mainly concerned the redefinition of priorities and target areas.

The **concentration** principle implies that SFs are directed to a few priority objectives, possibly localized within target areas. The **programming** principle centres on the institution of multiannual programming periods (or programmes) with a duration of six to seven years. The **partnership** principle introduced a multilevel approach to the funds' management, involving 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 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.

In Italy, EU funds finance up to 50% of the total cost. However, the most distinctive feature of EU regional policy in Italy is that many Mezzogiorno regions have been covered by the Convergence Objective (economic and structural adaptation of less-developed regions). More precisely, this objective has concerned Abruzzo (until 1996), Molise and Sardegna (until 2006), Campania, Puglia, Basilicata, Calabria and Sicilia. On average, these regions have received more than twice as much structural funding (per capita) than the rest of the country.

More generally, each of the four principles affects, alone or jointly with others, the nature and allocation of SFs among countries and regions, giving rise to some considerations that will be useful in guiding and clarifying our empirical exercise.

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 affected by politically driven redistributive motives (Boldrin and Canova, 2001).

The institution of multiannual programming periods must inevitably determine a degree of rigidity in response to external shocks at annual or lower frequency. Moreover, period programming (combined with multilevel governance) creates the conditions for an institutional mechanism in which regions, after having committed to their spending decisions (made according to multiannual planning) require reimbursement from the EU. SFs are then mobilized, and, only with a time lag, paid out to the regions. With the multilevel governance of EU funds, introduced with the partnership principle, the quality of national or regional institutions may have an influence in the funds' management; evidence favourable to this presumption is found by Ederveen et al. (2006) and Rodriguez-Pose and Garcilazo (2013) but not by Beugelsdijk and Eijffinger (2005).

Finally, Fayolle and Lecuyer (2000) and Dall'erba (2005) argue that co-financing penalizes 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.

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) take into account only ten (1989–1999) 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.

Concerning the econometric method applied, many papers estimate a regression à la Barro, augmented by the SFs, in order to test various hypotheses about growth and convergence among regions (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 (Aiello and Pupo, 2009). There are also some estimates based on other methods (Boldrin and Canova, 2001; Coppola and Destefanis, 2007, 2015; Becker et al., 2010, 2012) and macroeconomic simulation models (Hermin and Quest).

Boldrin and Canova (2001), relying mainly on the assessment of changes in the empirical distributions of labour productivity, find that SFs do not generate large effects on the convergence process. Their main conclusion is that regional policies can generally be rationalized 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. By contrast, in Beugelsdijk and Eijffinger (2005), the empirical evidence does not indicate that countries that are more corrupt use their funds in a more inefficient way. 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 the regions that are more developed (not only institutionally, but also technology-wise), emphasising the importance of accompanying policies that improve the competence of the receiving environments. More recently, Rodriguez-Pose and Garcilazo (2013) have found that quality of government is relevant for the effectiveness of the cohesion policy: the better the quality of the local government, the more effective is the cohesion policy, especially above a given expenditure level. According to Fratesi and Perucca (2014), 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.

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), relying on dynamic panel estimates of an augmented neoclassical growth model, find that SFs have only contributed weakly to regional convergence in Italy. A similar result is found in Coppola and Destefanis (2007, 2015), who adopt a non-parametric approach to measure regional productivity and assess the impact of SFs on it.

Examination of the literature reveals that SFs are virtually never analyzed alongside other (national) policies/funds directed at regional growth. Data availability issues often make it very difficult to conduct this kind of joint analysis. Moreover, although the role of institutional factors for the effectiveness of funds has been widely analyzed, comparisons between the relevance of institutional and 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 over the allocation of funds across regions. Indeed, scientific reflection has focused on the allocation mechanisms of SFs far less than on the impact of the funds themselves.

Kemmerling and Bodenstein (2006) find a direct relationship between the strength of left-wing or Eurosceptic political parties in a region and the amount of funds received by that region. According to the authors, these parties are more effective in interacting directly with the European Commission through intense lobbying.

Bouvet and Dall'Erba (2010) provide Tobit estimates based on 120 NUTS (Nomenclature of Territorial Units for Statistics) I and II regions from twelve countries for the 1989–1999 period. They find that political factors have an impact on the allocation of funds. Beside political orientation, a further aspect highlighted by Bouvet and Dall'erba is the 'political alignment' between the orientation of the central government and the regional governments. Alignment facilitates dialogue in the decision-making process directed to the appropriation and use of funds.

Finally, Del Bo and Sirtori (2016) analyze the SFs allocated to the 20 Italian regions between 1996 and 2010 through time-series techniques. Their results confirm the presence of substitution effects between European and national funds and, to a lesser extent, of biases in fund allocation toward regions endowed with more bargaining power or high-growth sectors such as health, education, R&D, and transport and telecommunications infrastructure

In our empirical analysis, we will explore this issue further by providing a fixed-effect dynamic 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 should improve the treatment of selection bias, because the allocation rules of the various funds are interrelated. The adoption of a control function approach in order to deal with the

selection bias is another distinctive feature of our empirical analysis. Unlike the counterfactual analysis of Becker et al. (2010, 2012), this approach fully allows for the panel nature of our dataset and deals with multiple continuous policy treatments.

4. The Empirical Framework: Specifications and data

We are interested in the relationship between SFs (as well as national policies) and GDP per capita. 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:

$$(4.1) \qquad D.y_{it} = a_1 y_{it-1} + a_{2j} SF_{jit} + a_3 Nat_{jit} + a_4 gfi_{it} + a_5 D.pop_{it} + \\ + a_6 PERIOD\_2*SOUTH + a_7 PERIOD\_3*SOUTH + a_{8j} \mathbf{W}_{it-1} + a_i + a_t$$

where $i = 1,\ldots 20$ refers to regions, $t = 1,\ldots n$ to years, and $j = 1,\ldots m$ refers to the type of fund being considered; variables a_i and a_t are, respectively, region and year fixed effects. The dependent variable $D.y_{it}$ is the (natural logarithmic) variation of GDP per capita; the lagged dependent variable y_{it-1} allows for the dynamic structure inherent in the data (in empirical work we also experimented with more complex specifications); SF_{jit} refers to 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 $D.pop_{it}$, the (log) variation of population. All flows (not only y_{it}, but also SF_{jit}, Nat_{jit} and gfi_{it}) are taken in per capita terms at constant prices. 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 and Sardegna); PERIOD_2 is a dummy variable equal to 1 in the second funds' programming period (2000–2006); and PERIOD_3 is 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 characterized by a strong North-South divide, and that SFs are awarded more heavily to the Mezzogiorno regions). We deal in detail with the $\mathbf{W}_{it-1}$ vector below.

SFs are taken into account in terms of disbursements to the regions by the Rotation Fund (*Fondo di Rotazione*), the Italian governmental institution responsible for raising funds from the EU. We allow for these funds in two different specifications: with and without the national resources of the Rotation Fund (the national co-financing, to which reference was made in Section 2). A substantial proportion of SFs are 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 most often maintained in the literature (see 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 and to households, and capital-account expenditures split

among subsidies and investment expenditures.[1] We also 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*. Also for national funds, there exists a large component of multi-regional aggregates, with which we deal in the same manner as with SFs. These national funds, especially capital-account expenditures (Prota and Viesti, 2012) are believed to be an important stimulus to regional growth. Therefore, omitting these variables is a potential source of misspecification. More information about the data is provided in the Appendix.

The adoption of a fixed-effect approach, as suggested in Wooldridge (2002, ch. 10), can be useful, at least to some extent, for the purposes of policy evaluation. 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). It may be reasonable to assume that funds are randomly allocated, *conditional on observable covariates*. This hypothesis of 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 allocation. In fact, we include in (4.1) the funds, an array of variables determining $D.y_{it}$ (y_{it-1}, gfi_{it} and $D.pop_{it}$, the time-varying interaction terms), *and a vector of* $\boldsymbol{W}_{it-1}$ *variables presiding over the regional allocation of the funds*. Wooldridge (2004) demonstrates that such an equation can consistently estimate the average partial effect (that is, the average treatment effect) of the policy on the response, provided that funds are continuous variables, and are a linear homoscedastic function of $\mathbf{W}_{it-1}$ and $\mathbf{X}_{it}$ (the latter being the vector of other regressors in [4.1]). In our case, we can take continuity for granted, and test for the other conditions (functional form, homoscedasticity, as well as regressor exogeneity). This 'kitchen sink' approach is particularly

[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.

convenient for us because it lends itself readily to the modelling of multiple policy variables (SF_{jit} and Nat_{jit}).

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

Our regression framework allows us to deal 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 are constrained by the scarce availability of certain local public goods.[2] Consequently, one should control for regional differences in these factors when assessing the impact of regional policies. In order to do this, we estimate the following variant of (4.1):

$$(4.1') \qquad D.y_{it} = a_1 y_{it-1} + a_{2j} SF_{jit} + a_{2',j} q_i SF_{jit} + a_3 Nat_{it} + a_{3'} q_i Nat_{it} + a_4 gfi_{it} + a_5 D.pop_{it} + \\ + a_6 PERIOD\_2*SOUTH + a_7 PERIOD\_3*SOUTH + a_{8j} \mathbf{W}_{it-1} + a_i + a_t$$

where the interaction terms between q_i, the time-invariant quality of the regional environment (we do not have readily available time-varying measures) and the funds allow for the impact of institutions on the nexus between funds, quality of the regional environment and the economy. Rodriguez-Pose and Garcilazo (2013) adopted a similar set-up, for EU-wide regional data, to assess the relevance of quality-of-government indicators. We extend the analysis to other indicators of regional environment.

In order to measure the quality of government, we employ two different indicators: the composite indicator developed by the QOG Institute (Charron et al., 2014), and the index of civic sense

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

for 1996, calculated by *Sole 24 Ore*, 8th September 1997. This index has already been 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. We compare their performance with that of two indicators of technological capability, also found to be a significant measure of regional differences in D'Acunto et al. (2004): an index of technological potential for 1991 (from Netti and Sarno, 1998) and the number of patents recognized from EPO per firm for 1991 (from Paci and Usai, 2000; D'Acunto et al., 2004). Both these variables predate our sample. We stress that all these environmental indicators have a wide range 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 for other European countries, characterized by different kinds of economic and socio-political environments.

5. The main results

In this section, we present the main results obtained from our regression framework. One important observation should be made regarding the dynamic specification of the regressions. Going beyond the simple baseline specification presented in Section 4, we experimented widely 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 with SFs 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 from 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 SFs (with and without co-financing) one year back.

A second point about dynamic specification concerns the estimation procedure. It is well known that a fixed-effect ordinary least square (OLS) underestimates the coefficient of the lagged dependent variable (a phenomenon known as the Nickell bias). With a number of periods approaching the number 20, the extent to which our set-up can be affected by this problem is unclear. Given the large number of estimates that we carried out, we stuck to the 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. We will then turn to (4.1) and (4.1'). 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. These tests were also run for augmented versions of the auxiliary regressions, including both $\mathbf{W}_{it-1}$ and $\mathbf{X}_{it}$ vectors. $\mathbf{W}_{it-1}$ includes lags of either SF_{jit} or Nat_{jit}, GDP per capita and private investment; measures of regional rates of unemployment and sectoral shares of employment and value added; politically based indicators (political orientation of each regional government and an alignment measure of 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. Consequently, this dynamic specification also applies to any effects

of substitution or complementarity between the various policy variables.[3]

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 to which we will return when commenting on 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. Political factors are virtually never significant, but our results are not directly comparable with those in Bouvet and Dall'erba (2010) or 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 a 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 we present the main results obtained for equation (4.1). We always carry out estimates for SFs both with and without national co-financing, and show estimates that include each definition of SFs one at a time, alongside each one of the national funds at a time. The overall picture consistently points to the significant impact of SFs, with and without co-financing. Only current-account subsidies to firms are significant (and much less than the SFs, anyway) among the national funds. All estimates have satisfactory diagnostics, and tests of weak exogeneity, carried out for all policy variables (and for private investment), never reject the null hypothesis (of exogeneity). This may strike some readers as odd, but we have already remarked that EU funds are not reactive to cyclical

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

shocks. This is not always true for national funds, but, at least in the important case of current-account subsidies to firms, a reaction function conditional on lagged variables turns out to be a good approximation of the data generating process.

For the sake of robustness we have carried out estimates (available on request) that include one fund at a time in the regression, as well as all funds together. The main message remains the same, as also does if we exclude the $\mathbf{W}_{it-1}$ variables from the regression (in this case, interestingly, the significance of current-account subsidies to firms increases, while that of SFs is unchanged).

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 those we labelled national cohesion funds) embody a policy intervention defined as precisely as in the case of SFs. In this sense, it is interesting to notice that the auxiliary regressions for current-account subsidies to households and national cohesion funds showed some specification problems. This could mean that they are conglomerations gathering a rather heterogeneous array of funds. This explanation is not likely to hold true for nationally funded public investments, however.

Throughout Table A.4, SFs (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. In quantitative terms a doubling, say, 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 that has amounted in recent years to more than 40 percentage points. It should also be kept in mind, however, that SFs (inclusive of national co-financing) are barely above 1.5% of GDP in the Mezzogiorno regions at the moment.

In Table A.5, we test the role of various indicators of environmental quality on the effectiveness of funds. For the sake of conciseness, we limit ourselves to commenting on results about SFs and

current-account subsidies to firms. A fairly small impact of quality of government is found for SFs. 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 indices 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 omitted from 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 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 poorer areas.

6. Concluding Remarks

In this paper, we focused on the impact of European Structural Funds on GDP per capita in the Italian regions through the three EU programming cycles from 1994 to 2013. More precisely, in contrast to the approach taken in previous work, we have dealt jointly with the effects of EU and an array of nationally funded funds. In addition, 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 of 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 correlated with capital-account subsidies. Regarding the role of other economic variables, there is anti-cyclical behaviour by current-account subsidies and national cohesion funds, but not EU funds. Turning to the results about the impact of the funds, we have ascertained that EU funds have a significant effect on GDP per capita, both with and without national co-financing. In addition, (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 SFs is not significantly affected by the selection bias attributable to the fund allocation mechanisms, which does, however, matter for subsidies to firms. Furthermore, quality of government has very little influence on the effectiveness of SFs, but decisively enhances the impact of subsidies to firms.

At a time when the EU Commission is considering a stark reduction 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 highlight that the current system of multilevel governance–cum–multiannual programming of SFs makes them considerably more effective than nationally based policies in a context characterized by strong institutional and structural heterogeneities.

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APPENDIX

Data Sources and Definitions

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 utilize annual regional data available from 1994 up to 2013. Regional data for real GDP, value added, gross fixed investment, and employment and labour units are taken from ISTAT's regional accounting (ISTAT being the Italian Statistical Office). European structural and national funds were both taken from the database *Spesa statale 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), and sectoral shares of employment and value added are taken from ISTAT Regional Accounting. Measures of the regional rate of unemployment are obtained from the ISTAT Labour Force Survey.

As regards politically based indicators, we extracted data about regional governments for the 1990–2013 period 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 of 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 where the regional government has the same political orientation as the national government and the value of zero in the opposite case.

In order to measure the quality of government at the regional level, we use:

1) a composite indicator developed by the QOG Institute (Charron et al., 2014). This is a perception-based indicator built from a 34,000-respondent survey from 172 regions within eighteen EU Member States. The EU regional survey was undertaken between December 15, 2009, and February 1, 2010;

2) an index of civic sense (*Indice di lealtà verso le istituzioni*) for 1996, calculated by *Sole 24 Ore*, 8th September 1997.

We also rely on two indicators of technological capability:

1) the index of technological potential for 1991 (from Netti and Sarno, 1998), 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 recognized from EPO per firm, based on the information gathered in the ISTAT survey on technological innovation carried out for 1990–1992. The number of patents per firm is determined by taking the mean of the ratio between patent data for 1980 and 1990 (from Paci and Usai, 2000) and the number of firms for 1981 and 1991 from ISTAT census data.

Legend of Tables A.1-A.5
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.4, 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.4, 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.4, 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.4, 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.4, 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.4, 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.

In all the specifications of Table 4.A, when testing for weak exogeneity, we excluded the $\mathbf{W}_{it-1}$ vector from the estimated equation.

Added instrumental variables to test for weak exogeneity of ue (rf) are: ue_1 (rf_1), ue_2 (rf_2), ch_1, ks_1, ki_1, gfi_1, pub_vsh_1, bdg_nsh_1.
Added instrumental variables to test for weak exogeneity of gfi are: ue_1 (or rf_1), gfi_1, gfi_2, ki_1, ur_f_2. These variables reflect the results from a reaction function for gfi (available on request). Remarkably, lagged GDP per capita terms were never significant in that function.

Added instrumental variables to test for weak exogeneity of cf are: ue_1 (or rf_1), cf_1, ks_1, gfi_1.

Added instrumental variables to test for weak exogeneity of ch 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.

Added instrumental variables to test for weak exogeneity of ks 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.

Added instrumental variables to test for weak exogeneity of ki are: ue_1 (or rf_1), cf_2, ch_1, ks_1, ki_1.

Added instrumental variables to test for weak exogeneity of nc 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.

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

Dep. Var.	D.cf	D.cf
ue_1	0.0310	
	0.56	
rf_1		-0.0241
		-0.35
cf_1	-0.7198	-0.7197
	-9.45	-9.50
ks_1	-0.2389	-0.2395
	-2.60	-2.61
y_1	-4.2696	-4.1508
	-2.55	-2.50
gfi_1	0.7043	0.7068
	1.99	1.98
align_1	0.0674	0.0658
	0.96	0.94
or_1	0.0022	0.0061
	0.02	0.07
N	380	380
r2_a	0.41	0.41
F	15.77	16.33
C-W	0.60	0.60
A-B	0.21	0.23
R	0.32	0.31
C-W (+)	0.60	0.60
R (+)	0.30	0.29

Current-Account Subsidies to Households

Dep. Var.	D.ch	D.ch
ue_1	-0.0794	
	-2.76	
rf_1		-0.0932
		-2.28
cf_2	-0.2148	-0.2104
	-2.75	-2.72
ch_1	-1.0485	-1.0446
	-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	1.1498	1.2086
	1.10	1.12
y_2	-4.2148	-4.2832
	-2.52	-2.48
gfi_1	0.2138	0.2394
	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	0.0208	0.0184
	0.44	0.40
or_1	-0.0495	-0.0488
	-0.92	-0.90
N	360	360
r2_a	0.56	0.56
F	25.04	24.43
C-W	0.85	0.82
A-B	0.85	0.95
R	0.06	0.06
C-W (+)	0.85	0.82
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.4 – Eq. (4.1), The Impact of Funds on GDP per Capita, dep. var.: D.y

	(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
C-()	0.18(ue)	0.23(rf)	0.74(cf)	0.81(cf)	0.82(ch)	0.65(ch)	0.25(ks)	0.21(ks)	0.26(ki)	0.52(ki)	0.72(nc)	0.81(nc)
	0.79(gfi)	0.94(gfi)										

Tab. A.5 – Eq. (4.1'), The Impact of Funds, Role of Regional Environment, dep. var.: D.y, N = 360

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