Cohesion Policies and Growth in the Italian Regions.
Is There a Sectoral Bias?

Gianluigi COPPOLA[1], Sergio DESTEFANIS[1],

Giorgia MARINUZZI[2], Walter TORTORELLA[2]

[1]CELPE Centro di Economia del Lavoro e di Politica Economica, DISES Dipartimento di Scienze Economiche e Statistiche. Università degli Studi di Salerno, Via Ponte Don Melillo, 84084 Fisciano. E-mails: glcoppola@unisa.it, destefanis@unisa.it

[2] IFEL, Istituto per la Finanza e l'Economia Locale, Dipartimento Studi Economia Territoriale, piazza S. Lorenzo in Lucina 26, 00186, Roma. E-mails: giorgia.marinuzzi@fondazioneifel.it, walter.tortorella@fondazioneifel.it

Abstract: We assess the impact of various types of cohesion policies on the economies of the 20 Italian administrative regions from 1994 to 2013. We consider separately four sectors (agriculture, energy and manufacturing, construction, services) through a multi-input multi-output transformation function, and evaluate the funds' average partial effects through a control function approach incorporating the funds' allocation rules. Our evidence implies that the funds had a significant impact on regional GDP per capita. We also find that (nationally-financed) subsidies to firms have a (weak) impact on GDP per capita. Sectoral evidence implies that European Structural Funds tend to favour services, while reducing the share of agriculture in the economy. Dealing with the selection bias through the control function approach strongly reduces the significance of national subsidies to firms, but not the impact of SFs (JEL: C43, D24).

Keywords: European Structural Funds, control function approach, sectoral development, multi-output multi-input transformation functions.

1. Introduction

It is well known that the Italian economy is characterised by a strong and persistent duality between the Centre North and the South and the isles, named Mezzogiorno (Allen and Stevenson, 1974; Putnam, 1993; Paci and Saba, 1998; Iuzzolino, 2009). In order to reduce these regional disparities, European Structural Funds have been used in the Mezzogiorno where they represent a paramount share of the total financial resources recently invested (Prota and Viesti, 2013; Marinuzzi and Tortorella, 2017).

The aim of this paper is to estimate the impact of 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) on the per capita GDP of Italian regions, taking into account the other financial resources employed in those regions and their sectoral economic structure. To this end, a large dataset has been set up for the 20 Italian administrative regions concerning the period 1994-2013. It contains the main economic indicators (value added and employment) of four economic sectors (agriculture, energy and manufacturing, construction and services), as well as of some smaller aggregates, the amount of each structural fund, and of various national funds, relating to regional and industrial policy. The data on structural and national funds were all extracted from the database "Spesa Pubblica Regionalizzata", of the General Accounting Office (Ragioneria Generale dello Stato) at the Italian Ministry of Economy and Finance.

We believe that our paper, which analyses 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. The SFs are, especially since the introduction of *Agenda 2000*, the European Community's primary tool for sustaining development in areas facing economic problems. Their 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 Euro).[1] Yet nowadays one of the possible future scenarios of the EU outlined in Jean-Claude Juncker's White Paper on the Future of Europe hypothesises a reduction or even a cessation of EU

[1] http://ec.europa.eu/regional_policy/sources/docgener/informat/basic/basic_2014_en.pdf

intervention in regional development policies. The analysis of this paper can help to quantify the potential consequences of this policy scenario.

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). In this paper we adopt a control function approach, based on a model of the SFs' allocation rules, in order to deal with the selection bias. This approach takes full advantage of the panel nature of our dataset and easily allows for multiple continuous policy treatments. It also provides novel evidence on the nature of funds' allocation mechanisms, which is still a relatively under-researched topic.

This paper also aims to identify effective practices and sectors of intervention. Indeed, the main element of novelty in the present work vis-à-vis the existing literature resides in the fact that the empirical analysis is carried out by considering separately various sectoral aggregates (the four sectors agriculture, energy and manufacturing, construction, services, plus some smaller aggregates: market services, non-market services, manufacturing, energy plus market services). Besides, our empirical framework, unlike most of the earlier work, also considers along with the European Structural Funds different types of nationally-financed funds.

The remainder of the paper is organised as follows. Section 2 presents the institutional set-up of the Funds, describing the EU Objectives, the different types of Funds and their evolution across the years 1994-2013, with special emphasis on Italy. Section 3 provides a survey of the empirical literature existing on the argument, also dealing with some treatments of the fund allocation mechanisms. Section 4 illustrates the empirical procedures and the data, while the results of the empirical analysis are shown and commented in Section 5. Section 6 concludes and sets out some implications for future research.

2. European Structural Funds: 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 localised within target areas. The **programming** principle centres on the institution of multiannual programming periods (or programmes) with a duration of six to seven years. Defining projects over a period of several years was initially found to affect the temporal distribution of funds within the period, concentrating the use of the funds in the last years of each programming period. To counter this phenomenon, for the period 2007-2013, the rule known as "n + 2" (Article 93 of EC Regulation 1083/2006), has been introduced, according to which expenditure certifications to the Commission must be submitted by December 31st of the second year following the commitment of the programme. From 2014-2020, this rule has become "n + 3" (Article 136 of EC Regulation 1303/2013).

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 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. 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). The additionality principle also sets up the obligation on the part of the national and/or regional governments to co-finance the expenditure in a certain 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 EU funds finance up to 75% of the total cost. In all other cases, EU funds finance up to 50% of the total cost. 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 mobilised, 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 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.

3. A Short Overview of the Empirical Literature

There is a vast literature on the impact and 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. (2002). Ederveen et al. (2002) and Beugelsdijk and Eijffinger (2005) consider respectively thirteen and fifteen 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 Structural Funds, 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; Aiello and Pupo, 2007). There are also some estimates of other type (Boldrin and Canova, 2001; Coppola and Destefanis, 2007, 2015) 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 the Structural Funds do not generate any large effects on the convergence process, and 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.

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.

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 SFs 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. They use data on actually spent, rather than accredited funds. Their empirical analysis is based on panel estimates of an augmented neoclassical growth model. They find that the SFs, 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 funds 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 SFs and other variables. They find that the SFs 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 the period 1989-2006, virtually no effect of actually spent funds on capital accumulation and employment.

It is difficult to discern a pattern across this wide variety of results. However, the examination of the literature reveals that SFs are 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 the role of sectoral factors has been very rarely analysed. Yet there is no reason why sectoral structure should not be one of the key determinants of SFs' impact on economic activity. There is also room for a new study yielding estimates of the impact of regional policies that allow for the mechanisms presiding to the allocation of funds across regions. It appears in fact that the existing analyses ignore the selection bias deriving from the fact that funds 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. The allocation of funds may not based solely on economic mechanisms but also derive from redistributive motives of political nature (Boldrin and Canova, 2001). Identifying the causes of the differences in the distribution of funds is conducive to a better understanding of conditions under which they operate, and to the development of policy proposals to improve their performance. However, scientific reflection has focused on this issue far less than on the impact of the funds themselves.

Boldrin and Canova (2001) indirectly stress the importance of the allocation criteria of the SFs. They explain the lack of a significant impact of the funds on the convergence process between

European regions by the fact that the allocation of SFs among regions mainly performs a redistributive function stemming from political considerations. Alegre (2012) gives an estimate of the percentage of the SFs devolved to those redistributive purposes. He estimates that only 60% of the structural funds 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 funds 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. According to their analysis the evolution of the European Union is a political process and as such it inevitably the result of compromises also including the negotiation on the nature, amount and distribution of Europeans funds among countries and regions. A second aspect they 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 third aspect is defined by Bouvet and Dall'erba, as 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 SFs allocated to the twenty Italian regions between 1996 and 2010, assessing through time-series techniques the existence of both substitution effects and distorted allocation. The latter occurs when funds are distributed across regions or sectors differently from what would be done by a welfare maximizing 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 SFs at the level of operational programmes in the Czech municipalities' data. There is however some evidence of substitution between SFs and nationally-funded public investments.

Clearly, macroeconomic simulations have a richer structure than the other econometric analyses. Yet they also rely on many more (often untested) hypotheses about model specification (variables included, some key parameters, dynamic structure, functional form, etc.). In our paper, we do not want to take sides on a simulation vs. estimation debate. Rather, we aim to identify effective practices and sectors of intervention. In order to do so, we rely on two practices that, to the best of our knowledge, radically innovate vis-à-vis the existing literature. Firstly, we use sectoral data, in order to better understand the way in which the Funds impact on different industries. Second, we undertake evaluation of the Funds' effects on the basis of a model of the allocation rules of the Funds. Arguably this should allow a better treatment of the selection bias (linked to the fact that Funds are distributed not randomly but on the basis of observable criteria). It should be noted that the treatment effect framework is beginning to catch on in the literature on the effectiveness of

European regional policy (Becker et al., 2010 and 2012; Pellegrini et al., 2013). These papers, which generally find a positive impact of cohesion policies on economic growth, are however based on a cross-sectional regression discontinuity design and do not explicitly deal with the policy assignment mechanisms. Unlike the counterfactual analysis of Becker et al. (2010, 2012), Pellegrini et al. (2013), our approach control function approach fully allows for the panel nature of our dataset and easily deals with multiple continuous policy treatments.

4. The Empirical Framework

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:

$$(4.1) \qquad y_{it} = a_1 y_{it-1} + a_{2j} SF_{jit} + a_{3j} Nat_{jit} + a_4 gfi_{it} + a_5 D.pop_{it} + \\ + a_6 \text{PERIOD\_2*SOUTH} + a_7 \text{PERIOD\_3*SOUTH} + a_8 \mathbf{W}_{it-1} + a_i + a_t$$

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 characterised 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.[2] 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

[2] 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.

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 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 SFs. We believe that comparing the structure of funding rules across fund categories is in itself a novel and useful exercise.

Estimating equation (4.1) already innovates vis-à-vis the existing literature about the impact of

SFs. There is however another point, which has received little attention in the literature: the sectoral impact of the SFs (Coppola and Destefanis, 2007, 2015, being, to the best of our knowledge the only analyses on this). It could be thought that in order to deal with this issue it is enough to replicate equation (4.1) sector by sector. However, there are not data about the amount of European (or nationally-financed) funds spent in each sector. Besides, regressing sectoral output on these funds would assume away both the impact of the funds on the rest of the economy and the impact of the rest of the economy on the sector under scrutiny.[3] Following these considerations, and drawing upon the literature on multi-output multi-input transformation functions (see Coelli and Perelman, 1999; Kumbhakar 2012, 2013; for further details on this kind of specification), we model the relationship between sectoral GDP per capita and funds as:

$$(4.2)\quad x_{s\,it} = -\alpha_1(x_{non\text{-}s\,it} - x_{s\,it}) + \alpha_2 x_{sit\text{-}1} - \alpha_3(x_{non\text{-}s\,it\text{-}1} - x_{s\,it\text{-}1}) + \alpha_{4j}SF_{jit} + \alpha_5 Nat_{it} + \alpha_6 gfi_{it} - \alpha_7\, D.pop_{it} + a_8\, PERIOD\_2{*}SOUTH + a_9\, PERIOD\_3{*}SOUTH + a_{10j}\, \mathbf{W}_{it\text{-}1} + \alpha_i + \alpha_t$$

where gfi_{it}, $D.pop_{it}$, SF_{it} and Nat_{it} have the same meaning as in (4.1). On the other hand, $x_{s\,it}$ is the GDP of sector *s* divided by total population, and $x_{non\text{-}s\,it}$ is the GDP of all sectors of the economy, *but sector* s, always divided by total population. In the Cobb-Douglas transformation function (4.2), $x_{s\,it}$ and $x_{non\text{-}s\,it}$ are joint outputs produced by inputs gfi_{it}, $D.pop_{it}$, SF_{it} and Nat_{it}. We could however go one step further, and ask ourselves whether gfi_{it}, $D.pop_{it}$, SF_{it} and Nat_i may have different impacts across different sectors. For gfi_{it}, it could make more sense to take advantage of the available data and split this variable into $gfi_{s\,it}$ and $gfi_{non\text{-}s\,it}$. On the other hand, for SF_{it} and Nat_{it}, about which sectoral estimates are unavailable, we can rely on interaction terms that *conflate both the sectoral endowment and effect of these policy variables*. We end up with the following equation (also to estimated through fixed-effect panel techniques):

$$(4.3)\quad x_{s\,it} = -\alpha_1(x_{non\text{-}s\,it} - x_{s\,it}) + \alpha_2 x_{si\,t\text{-}1} - \alpha_3(x_{non\text{-}s\,it\text{-}1} - x_{s\,it\text{-}1}) + \alpha_{4j}SF_{jit} + \alpha_{5j}SF_{jit}\,(x_{non\text{-}s\,it} - x_{s\,it}) +$$

[3] For this reason, just including in a sectoral equation the output of the rest of the economy along with the other regressors would not be a satisfactory way of modelling this nexus. In this case, we would implicitly assume that the rest of the economy is not affected by the funds.

$+ \alpha_{6j}Nat_{it} + \alpha_{7j}Nat_{it} (x_{non\text{-}s\ it} - x_{s\ it}) + \alpha_8 gfi_{s\ it} + \alpha_9 gfi_{non\text{-}s\ it} - \alpha_{10}D.pop_{it} + \alpha_{11}\mathbf{W}_{it\text{-}1} + \alpha_i + \alpha_t$

whose long-run solution can be rewritten as:

(4.4) $(\alpha_s x_{s\ i} - \alpha_{5j}SF_{jit} - \alpha_{7j}Nat_{it}) + (\alpha_{non\text{-}s}\ x_{non\text{-}s\ i} + \alpha_{5j}SF_{jit} + \alpha_{7j}Nat_{it}) = \alpha_{4j}SF_{jit} + \alpha_{6j}Nat_{it}$ ...

If the interaction terms are significant, SF_{it} and Nat_{it} not only affect aggregate GDP but also its sectoral composition. Hence our analysis can be used to identify sectors where policy intervention is particularly effective (or detrimental).

Regional data for real GDP, value added, gross fixed investment, employment and labour units are taken from ISTAT's regional accounting. These data are separately considered for four industries: agriculture, energy and manufacturing, construction, services. The latter cannot be split in market and non-market services because the allocation of these services to different industries considerably changed with the new SEC95 national accounting (see for instance Collesi, 2000). *Private* physical capital accumulation was obtained by subtracting to total investment expenditure the gross fixed investment from public administration, health and education. European Structural Funds and national funds were taken from the *Spesa statale regionalizzata* database of the Ministry of Economy and Finance. All these series were deflated using a regional GDP deflator and divided by the regional number of inhabitants. It must be stressed that these series relate to the amounts disbursed by the various regions, as taken from the *Spesa Statale Regionalizzata*. These data are available from 1994 up to 2013.

5. Cohesion policy and GDP per capita across the Italian Regions

The empirical framework presented in the previous section is geared to assess the effects of SFs (as well as of nationally-financed funds) on regional growth. In order to give some perspective to this impact it is customary in the literature to provide some descriptive evidence about convergence. We do so for σ-convergence in Table 1, by comparing across the programming

periods the standard errors for (the natural logs of) real GDP per capita and value added per labour unit. This exercise reveals the existence of, first, some convergence between the economies of the Italian regions and then some divergence to be ascribed to the Great Recession. Overall, some very weak convergence between the economies of the Italian regions seems to emerge, apparently driven by what happens in services. High sectoral heterogeneity appears however from Table 1, enhancing the potential interest of our results. Indeed, this descriptive evidence, however, obviously does not clarify what type of convergence process is at work and especially the role that regional policies play in it.

Table 1 - σ-convergence

Standard errors of logs **Real VA per Labour Unit**	***Period***		
	1994-99	***2000-06***	***2007-13***
Total Economy	0.282	0.267	0.280
Agriculture	0.314	0.324	0.372
Energy & Manufacturing	0.524	0.506	0.540
Construction	0.331	0.274	0.342
Services	0.268	0.263	0.265

Source: own elaboration on Regional Accounting Data from Istat

Tables A.1-A.6 in the Appendix present the main evidence concerning the direct impact of Funds (and other development funds) on our variables of interest.[4]

For ease of presentation, we will first comment on the results, shown in Table A.1, for the auxiliary regression selecting the relevant variables within the $\mathbf{W}_{it-1}$ vector. We limit presentation to fund variables that are relevant in the following analysis. 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

[4] We do not provide diagnostic tests. They are generally satisfactory and available upon request.

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.[5]

We find satisfactory diagnostics for both simple and augmented versions of the auxiliary regression. 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.

Turning now to equation (4.1) and (4.3), our results imply that SFs had a significant impact on GDP per capita. Table A.2 conveys this message well. A, say, doubling of SFs increase the steady-state level of GDP per capita by about one fifth of the same proportional increase of investment, and more than twice as much of nationally-financed subsidies to firms per capita. Also note that while we find that (nationally-financed) subsidies to firms have a weak positive impact on GDP per capita growth, other national funds (especially national *cohesion* funds) were not significant. For the sake of illustration, we have carried out estimates without and with the $\mathbf{W}_{it-1}$ variables in the regression. In the latter case, interestingly, the significance of current-account subsidies to firms decreases, while that of SFs is unchanged. It thus appears that dealing with the selection bias through the control function approach does not affect the significance of European cohesion policies.

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 shocks. This is not always true for national funds, but, at least in the important case of

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

current-account subsidies to firms, a reaction function conditional on lagged variables turns out to be a good approximation of the data generating process. 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.

Turning now to the sectoral estimates,[6] it is easy to see that they are characterised by higher goodness of fit. The transformation function uses the available information in a more efficient way than aggregate estimates. The gist of the aggregate results is maintained. Like in the aggregate case, we carry out estimates both with and without the $\mathbf{W}_{it-1}$ vector, and do not obtain appreciably different results for the impact of SFs (see Tables A.3 and A.4). However, there are now interesting insights coming from the interaction terms involving the sectoral value added. Generally speaking, SFs favour services and are detrimental to (especially) agriculture and industry. The same is also true for the much weaker effects associated with nationally-financed subsidies to firms (see Table A.5). When we split SFs in EU funding and national co-financing (See table A.6), we find that the funds' impact in favour of services is particularly strong for *private* services. This is particularly true for the impact of national co-financing.

6. Concluding Remarks

In this paper we consider the impact of SFs on convergence across Italian regions across the three waves of the European cohesion policy (concerning the 1994-2013 period). 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. We focus on the impact of cohesion policies on sectoral VAs in the Italian regions, considering

[6] In order to understand correctly Tables A.3-A.6 relatively to A.2, it should be kept in mind that, for the sake of parsimony, we provide results for a version of (4.3) with a single investment variable (hence we impose $\alpha_8 = \alpha_9$).

separately the funds' effects on four sectors (agriculture, manufacturing, construction, services) of the regional economies, as well as on some smaller sectoral aggregates. Unlike in most of the earlier work, we allow for official series for disbursed European Structural Funds and for different types of nationally-financed funds.

Our evidence implies that SFs had a significant impact on GDP per capita. We also find that (nationally-financed) subsidies to firms have a weak positive impact on GDP per capita. Yet when we deal with the selection bias through the control function approach the significance of these subsidies is strongly reduced. Sectoral evidence implies that SFs tend to favour services, while reducing the share of agriculture and (to a lesser extent) industry in the economy.

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

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 (the bracketed values below the coefficients). Standard errors are heteroskedasticity-robust.
Coefficient significance is highlighted by star number:
* means a p-value < .1; ** a p-value < .05; *** a p-value < .01.
N is the number of observations, r2_a is the coefficient of determination adjusted for degrees of freedom *not* inclusive of the effect of region and year fixed effects.

List of variables and abbreviations

GDP	y
Sectoral value added (for sector S)	x_s
EU structural funds (Rotation Fund: EU funding only)	eu
EU structural funds (Rotation Fund: national co-financing only)	cofin
EU structural funds (Rotation Fund: EU funding + national co-financing)	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	gfi
Population	pop
Manufacturing sector (value added) share	mfg_vsh
Public sector (value added) share	pub_vsh
Construction sector (employment) share	cos_nsh
Alignment between regional governments and national government (=1 if aligned)	align
Political orientation of regional governments (=1 if centre-left)	or

Furthermore, sectors s are denoted in the following way:
agr stands for agriculture, *iss* for energy and manufacturing, *cos* for construction, *ser* for services, *pri* for private services, *pub* for public services, *mfg* for manufacturing, *uti* for energy plus private services.
x_S_var denotes variable $(x_{non\text{-}s\ it} - x_{s\ it}) \times var_{jit}$ for each sector S and variable var_{jit} in turn.

Variable y is at constant prices, divided by regional population. Variables eu, cofin, rf, cf, ch, ks, ki, nc, gfi, are divided by GDP.
A _1 or _2 termination indicates a 1- or 2-year lag. The D. symbol stands for a first (logarithmic) difference.
Unless otherwise stated, all these variables are in natural logarithms.

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-(*x*) is the C-test of weak exogeneity for regressor *x*; for all these test we report their p-values. These tests were also run for augmented versions of the auxiliary regressions, including both W_{it-1} and X_{it} vectors. C-W (+) and R (+) are respectively the Cook-Weisberg and the Reset test for the augmented version of the auxiliary regressions, including not only the W_{it-1} but also the X_{it} vectors. The latter comprise lagged gross fixed investment, log variation of the population and also lagged value added per capita, if not included in the auxiliary regression already.

In Tables A.2-ff, the W_{it-1} vector includes, as control variables
- for ue (or rf): ue_1 (or rf_1), ue_2 (or rf_2), ks_1, ki_1, mfg_vsh_1.

- for ue (or rf) and cf: ue_1 (or rf_1), ue_2 (or ue_2), cf_1, ch_1, ks_1, ki_1, mfg_vsh_1, y_1.
- 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, mfg_vsh_1.
- for ue (or rf) and ks: ue_1 (or rf_1), ue_2 (or ue_2), ch_1, ks_1, ki_1, gfi_2, ur_f_2, mfg_vsh_1, pub_vsh_1, cos_nsh_1.
- 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, mfg_vsh_1.
- 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, ur_f_2, mfg_vsh_1, align_1.
- for ue (or rf) and cofin: ue_1, ue_2, ks_1, ki_1, mfg_vsh_1, cofin_1, ci_1, nc_1, pub_vsh_1, align_1, or_1.

In all specifications, when testing for weak exogeneity, we excluded the W_{it-1} vector from the estimated equation.
Added instrumental variables to test for weak exogeneity of ue (rf) are: ue_1 (or rf_1), ue_2 (or rf_2), ks_1, ki_1, mfg_vsh_1.
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, cos_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, cos_nsh_1, align_1.

Table A1 - EU and National Funds, Auxiliary Regressions for the Fund Allocation Mechanism

Regressors \ Dep. Var.'s	European Structural Funds		Nationally-funded cofinancing	Current-account subsidies (to firms)
	ue	rf	cofin	cf
ue_1	0.1485 (14.70)		-0.1041 (-1.83)	
ue_2	0.1024 (1.80)			
rf_1		0.1596 (13.93)		
nc_1			-0.0275 (-9.23)	
cf_1 .			0.0359 (3.33)	0.2820 (9.29)
ch_1		-0.1479 (-2.34)		
ks_1	0.2189 (3.29)	0.3019 (4.39)		-0.2362 (-2.44)
ki_1	-0.1716 (-2.88)	-0.1985 (-3.34)		
gfi_1	-0.6617 (-1.49)	-0.6660 (-1.85)		
y_1				-4.3109 (-4.02)
mfg_vsh_1	-6.9401 (4.60)	-5.0501 (4.49)		
pub_vsh_1			2.6498 (2.28)	
cos_nsh_1		9.1974 (2.45)		
align_1			-0.0511 (-2.15)	
or_1			0.0388 (1.77)	
N	360	360	360	380
r2_a	0.12	0.12	0.08	0.14
C-W	0.55	0.93	0.63	0.62
A-B	0.81	0.81	0.23	0.25
R	0.17	0.27	0.31	0.30
C-W (+)	0.61	0.89	0.63	0.62
R (+)	0.22	0.35	0.31	0.30

Table A.2a – Eq. (4.1), Total Economy, Specification without the W_{it-1} vector. The Impact of Funds on GDP per Capita, dep. var.: y

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
gfi_1	0.0222	0.0224	0.0219	0.0221	0.0223	0.0225	0.0222	0.0223	0.0222	0.0224	0.0212	0.0213
	(2.52)	(2.45)	(2.34)	(2.28)	(2.55)	(2.48)	(2.50)	(2.44)	(0.50)	(2.44)	(2.64)	(2.56)
ue	0.0034		0.0034		0.0034		0.0034		0.0034		0.0039	
	(2.72)		(2.77)		(2.72)		(2.72)		(2.71)		(2.98)	
rf		0.0043		0.0043		0.0042		0.0043		0.0043		0.0049
		(3.40)		(3.42)		(3.38)		(3.39)		(3.32)		(3.53)
cf			0.0015	0.0015								
			(1.91)	(1.96)								
ch					-0.0017	-0.0016						
					(-1.03)	(-1.00)						
ks							0.0003	0.0004				
							(0.20)	(0.30)				
ki									-0.0002	-0.0000		
									(-0.10)	(-0.02)		
nc											-0.0024	-0.0025
											(-1.70)	(-1.75)
N	360	360	360	360	340	340	360	360	340	340	360	360
r2_a	0.17	0.17	0.17	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.18	0.19
C-W	0.49	0.55	0.47	0.53	0.15	0.17	0.48	053	0.19	0.21	0.35	0.41
A-B	0.28	0.30	0.33	0.35	0.85	0.84	0.31	0.32	0.92	0.92	0.37	0.39
R	0.81	0.79	0.87	0.87	0.140	0.27	0.72	0.72	0.15	0.26	0.79	0.84
C-(x)	0.56 (ue)	0.42 (rf)	0.53 (cf)	0.68 (cf)	0.76 (ch)	0.73 (ch)	0.28 (ks)	0.24 (ks)	0.62 (ki)	0.79 (ki)	0.56 (nc)	0.50 (nc)

Table A.2a – Eq. (4.1), Total Economy, Specification with the W_{it-1} vector. The Impact of Funds on GDP per Capita, dep. var.: y

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
gfi_1	0.0255	0.0258	0.0252	0.0256	0.0331	0.0333	0.0190	0.0190	0.0339	0.0341	0.0202	0.0202
	(2.30)	(2.24)	(2.24)	(2.20)	(2.51)	(2.47)	(1.46)	(1.44)	(2.50)	(2.43)	(1.89)	(1.85)
ue	0.0038		0.0038		0.0040		0.0036		0.0040		0.0046	
	(2.64)		(2.64)		(3.11)		(2.60)		(3.33)		(3.18)	
rf		0.0048		0.0050		0.0047		0.0047		0.0048		0.0058
		(3.18)		(3.25)		(3.19)		(3.21)		(3.46)		(3.80)
cf			0.0010	0.0011								
			(1.28)	(1.42)								
ch					-0.0027	-0.0025						
					(-1.35)	(-1.29)						
ks							0.0004	0.0007				
							(0.32)	(0.68)				
ki									0.0002	0.0004		
									(0.08)	(0.23)		
nc											-0.0045	-0.0048
											(-1.41)	(-1.61)
N	360	360	360	360	340	340	360	360	340	340	360	360
r2_a	0.18	0.18	0.17	0.18	0.19	0.20	0.17	0.18	0.19	0.20	0.20	0.21
C-W	0.44	0.57	0.39	0.50	0.11	0.17	0.49	0.65	0.12	0.16	0.25	0.37
A-B	0.36	0.40	0.39	0.41	0.02	0.03	0.36	0.39	0.59	0.54	0.03	0.04
R	0.80	0.80	0.95	0.97	0.10	0.21	0.71	0.80	0.13	0.26	0.52	0.65
C-(x)	0.56 (ue)	0.42 (rf)	0.53 (cf)	0.68 (cf)	0.76 (ch)	0.73 (ch)	0.28 (ks)	0.24 (ks)	0.62 (ki)	0.79 (ki)	0.56 (nc)	0.50 (nc)

Table A.3a – Eq. (4.3), Various sectors, Specifications including ue, without the W_{it-1} vector. Impact of funds on sectoral VA per capita, dep. var's.: x_s

Var.\Sector	agr	agr	iss	iss	cos	cos	ser	ser	pri	pri	pub	pub	mfg	mfg	uti	uti
gfi_1	0.0172	0.0216*	0.0206**	0.0206*	0.0190	0.0230*	0.0219**	0.0236**	0.0161	0.0147	0.0242**	0.0268**	0.0201**	0.0204*	0.0163	0.0136
ue	0.0041***	0.0141	0.0035**	0.0093**	0.0042***	0.0087	0.0042***	0.0105***	0.0039**	0.0040***	0.0041***	-0.0007	0.0037**	0.0068*	0.0037**	0.0031
x_AGR_gfi		-0.0020														
x_ISS_gfi				-0.0015												
x_COS_gfi						-0.0029										
x_SER_gfi								0.0060								
x_PRI_gfi										-0.0295						
x_PUB_gfi												-0.0041				
x_MFG_gfi														-0.0007		
x_UTI_gfi																-0.0110
x_AGR_ue		-0.0027														
x_ISS_ue				-0.0039*												
x_COS_ue						-0.0017										
x_SER_ue								0.0067**								
x_PRI_ue										0.0027						
x_PUB_ue												0.0038				
x_MFG_ue														-0.0018		
x_UTI_ue																-0.0014
N	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380
r2_a	0.9810	0.9810	0.9586	0.9586	0.9801	0.9800	0.7275	0.7291	0.8522	0.8519	0.8938	0.8937	0.9751	0.9750	0.7766	0.7756

Table A.3b – Eq. (4.3), Various sectors, Specifications including ue, with the W_{it-1} vector. Impact of funds on sectoral VA per capita, dep. var's.: x_s

Var.\Sector	agr	agr	iss	iss	cos	cos	ser	ser	pri	pri	pub	pub	mfg	mfg	uti	uti
gfi_1	0.0203*	0.0227*	0.0229**	0.0207*	0.0241**	0.0251*	0.0260**	0.0247*	0.0182	0.0167	0.0287***	0.0290**	0.0257**	0.0234*	0.0175	0.0134
ue	0.0043***	0.0174*	0.0039**	0.0094**	0.0044***	0.0105	0.0047***	0.0111***	0.0042**	0.0042**	0.0045***	0.0005	0.0042***	0.0063	0.0042**	0.0039
x_AGR_gfi		-0.0005														
x_ISS_gfi				0.0013												
x_COS_gfi						-0.0006										
x_SER_gfi								-0.0001								
x_PRI_gfi										-0.0241						
x_PUB_gfi												-0.0009				
x_MFG_gfi														0.0021		
x_UTI_gfi																-0.0166
x_AGR_ue		-0.0036*														
x_ISS_ue				-0.0036*												
x_COS_ue						-0.0023										
x_SER_ue								0.0066**								
x_PRI_ue										0.0034						
x_PUB_ue												0.0032				
x_MFG_ue														-0.0011		
x_UTI_ue																-0.0009
N	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
r2_a	0.9796	0.9796	0.9524	0.9524	0.9793	0.9792	0.7177	0.7191	0.8437	0.8433	0.8898	0.8894	0.9711	0.9710	0.7603	0.7593

Table A.4a – Eq. (4.3), Various sectors, Specifications including rf, without the W_{it-1} vector. Impact of funds on sectoral VA per capita, dep. var's.: x_s

Var.\Sector	agr	agr	iss	iss	cos	cos	ser	ser	pri	pri	pub	pub	mfg	mfg	uti	uti
gfi_1	0.0173	0.0247**	0.0208**	0.0224*	0.0196*	0.0250*	0.0221**	0.0250**	0.0162	0.0151	0.0242**	0.0293***	0.0203**	0.0220*	0.0162	0.015
rf	0.0052***	0.0236**	0.0043***	0.0079*	0.0053***	0.0147	0.0048***	0.0103***	0.0047***	0.0048***	0.0047***	0.0064	0.0047***	0.0059	0.0041**	0.006
x_AGR_gfi		-0.0029														
x_ISS_gfi				-0.0027												
x_COS_gfi						-0.0037										
x_SER_gfi								0.0073								
x_PRI_gfi										-0.0288						
x_PUB_gfi												-0.0072				
x_MFG_gfi														-0.0019		
x_UTI_gfi																-0.005
x_AGR_rf		-0.0049*														
x_ISS_rf				-0.0023												
x_COS_rf						-0.0035										
x_SER_rf								0.0057*								
x_PRI_rf										0.0048						
x_PUB_rf												-0.0012				
x_MFG_rf														-0.0007		
x_UTI_rf																0.004
N	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380
r2_a	0.9811	0.9813	0.9588	0.9587	0.9802	0.9802	0.7283	0.7288	0.8529	0.8528	0.8941	0.8937	0.9753	0.9752	0.7768	0.776

Table A.4b – Eq. (4.3), Various sectors, Specifications including rf, with the W_{it-1} vector. Impact of funds on sectoral VA per capita, dep. var's.: x_s

Var.\Sector	agr	agr	iss	iss	cos	cos	ser	ser	pri	pri	pub	pub	mfg	mfg	uti	uti
gfi_1	0.0220*	0.0267**	0.0251**	0.0245*	0.0254**	0.0276**	0.0278**	0.0280**	0.0199*	0.0190	0.0298***	0.0323***	0.0283***	0.0272**	0.0196	0.0175
rf	0.0057***	0.0269***	0.0051***	0.0076	0.0057***	0.0193	0.0057***	0.0112***	0.0053***	0.0054***	0.0055***	0.0078	0.0057***	0.0055	0.0052***	0.0084*
x_AGR_gfi		-0.0011														
x_ISS_gfi				0.0000												
x_COS_gfi						-0.0011										
x_SER_gfi								0.0018								
x_PRI_gfi										-0.0212						
x_PUB_gfi												-0.0033				
x_MFG_gfi														0.0013		
x_UTI_gfi																-0.0126
x_AGR_rf		-0.0057**														
x_ISS_rf				-0.0017												
x_COS_rf						-0.0051										
x_SER_rf								0.0056*								
x_PRI_rf										0.0062						
x_PUB_rf												-0.0018				
x_MFG_rf														0.0001		
x_UTI_rf																0.0070*
N	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
r2_a	0.9799	0.9801	0.9528	0.9526	0.9795	0.9795	0.7194	0.7196	0.8449	0.8449	0.8904	0.8899	0.9714	0.9713	0.7621	0.7625

Table A.5 – Eq. (4.3), Various sectors, Specifications including ue and cf, with the W_{it-1} vector. Impact of funds on sectoral VA per capita, dep. var's.: x_s

Var.\Sector	agr	agr	iss	iss	cos	cos	ser	ser	pri	pri	pub	pub	mfg	mfg	uti	uti
gfi_1	0.0164	0.0209	0.0212*	0.0196	0.0204*	0.0234*	0.0241**	0.0224*	0.0137	0.0152	0.0260**	0.0295**	0.0236**	0.0228*	0.0175	0.0172
ue	0.0045***	0.0176*	0.0041**	0.0076*	0.0046***	0.0109	0.0047***	0.0094**	0.0040**	0.0043***	0.0047***	0.0026	0.0043***	0.0053	0.0042**	0.0054*
cf	0.0015	-0.0043	0.0011	0.0054**	0.0010	-0.0052	0.0009	0.0033	0.0013	0.0008	0.0024**	-0.0076**	0.0013	0.0043*	0.0014	-0.0028
x_AGR_gfi		-0.0011														
x_ISS_gfi				0.0017												
x_COS_gfi						-0.0020										
x_SER_gfi								-0.0013								
x_PRI_gfi										-0.0320						
x_PUB_gfi												-0.0008				
x_MFG_gfi														0.0014		
x_UTI_gfi																-0.0185
x_AGR_ue		-0.0036*														
x_ISS_ue				-0.0023												
x_COS_ue						-0.0023										
x_SER_ue								0.0049*								
x_PRI_ue										0.0039						
x_PUB_ue												0.0019				
x_MFG_ue														-0.0005		
x_UTI_ue																0.0017
x_AGR_cf		0.0016														
x_ISS_cf				-0.0034*												
x_COS_cf						0.0023										
x_SER_cf								0.0031								
x_PRI_cf										-0.0083*						
x_PUB_cf												0.0062**				
x_MFG_cf														-0.0019		
x_UTI_cf																-0.0070*
N	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
r2_a	0.9800	0.9799	0.9528	0.9529	0.9797	0.9795	0.7209	0.7213	0.8466	0.8471	0.8913	0.8923	0.9712	0.9710	0.7594	0.7602

Table A.6 – Eq. (4.3), Various sectors, Specifications including ue and cofin, with the W_{it-1} vector. Impact of funds on sectoral VA per capita, dep. var's.: x_s

Var.\Sector	agr	agr	iss	iss	cos	cos	ser	ser	pri	pri	pub	pub	mfg	mfg	uti	uti
gfi_1	0.0181	0.0251**	0.0230**	0.0235*	0.0231*	0.0294**	0.0261**	0.0267**	0.0189*	0.0200*	0.0281***	0.0320***	0.0249**	0.0255**	0.0212*	0.0239*
ue	0.0060***	0.0253**	0.0054***	0.0085*	0.0061***	0.0268	0.0061***	0.0116***	0.0057***	0.0060***	0.0056***	0.0061	0.0059***	0.0064	0.0057***	0.0084**
cofin	0.0100***	0.0465**	0.0074**	-0.0002	0.0093**	0.0782	0.0071*	0.0052	0.0085**	0.0097**	0.0064*	0.0305***	0.0083**	0.0028	0.0073*	0.0236**
x_AGR_gfi		-0.0024														
x_ISS_gfi				-0.0017												
x_COS_gfi						-0.0033										
x_SER_gfi								0.0034								
x_PRI_gfi										0.0060						
x_PUB_gfi																
x_MFG_gfi																
x_UTI_gfi																
x_AGR_ue		-0.0052*										-0.0038				
x_ISS_ue				-0.0021										-0.0005		
x_COS_ue						-0.0076										-0.0070
x_SER_ue								0.0058*								
x_PRI_ue										0.0073*						
x_PUB_ue												-0.0001				
x_MFG_ue														-0.0003		
x_UTI_ue																0.0044
x_AGR_cofin		-0.0097*														
x_ISS_cofin				0.0050												
x_COS_cofin						-0.0254*										
x_SER_cofin								-0.0020								
x_PRI_cofin										0.0174*						
x_PUB_cofin												-0.0172**				
x_MFG_cofin														0.0031		
x_UTI_cofin																0.0303**
N	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
r2_a	0.9803	0.9804	0.9534	0.9532	0.9798	0.9799	0.7214	0.7217	0.8471	0.8469	0.8912	0.8919	0.9717	0.9715	0.7645	0.7682