Regional growth convergence and EU policies: Empirical evidence and measuring problems

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Introduction: Policy objectives and the agenda

Regional growth and its convergence has been on the top of the EU policy agenda since the first programming period of EU Structural Funds, 1989 to 1993. Over years and programming periods, the reduction of the existing gap between countries and regions in terms of *per capita* GDP remained one the most important policy objectives of the EU. Apart from the change in its denomination (from "Objective 1" to "Convergence Objective"), the current programming period also confirms this priority: the largest part of financial resources is going to be spent in lagging regions and, if we also include the Cohesion Fund, in lagging member states.

Given this emphasis of EU policy on the regional growth divide (for simplicity, *cohesion policy*), it may be surprising to realize after almost 20 years that empirical evidence on its impact is still controversial and, in fact, incomplete. Whether growth convergence really occurred in the EU and whether *cohesion policy* played a significant positive role in this respect is an empirical question, to which no conclusive answer can be provided at the moment. Moreover, hardly any empirical evidence exists regarding the question whether the relevant EU policies as a whole – i.e. the Common Agricultural Policy (CAP) included – actually induced a reduction of the growth gap, since the combination and interaction of different types of policies and their measures could eventually offset any economic effects caused by individual measures.

The Fourth Cohesion Report released by the European Commission last year as well as its predecessors offer an optimistic view in this respect (European Commission 2001, 2004 and 2007). Generally speaking, growth convergence across regions and states in the EU has been presented as a well-established evidence in these reports. Taking a wider look at the existing empirical literature, however, sheds a different light on this subject: results are often controversial and suffer from some serious methodological and data limitations. In particular, whenever *cohesion policy* is evaluated with respect to the observed growth convergence, it is implicitly assumed that all other EU (as well as national and regional) policies are irrelevant. For instance, this is the case of the CAP, for which very little is said about its possible effect on growth processes, although this subsidy still represents the main form of financial support transferred from the EU to the regions.

Over the third programming period from 1989 to 2006, the CAP accounted for 45% of the EU budget, compared to 25% for *cohesion policy*. During the current programming period, these shares are expected to move progressively closer and their positions will be inverted by 2013, while the sum of the two will still remain at about 70% of the EU budget. In September 2007, President Barroso launched the public debate on "Budget Review", the process be which the EU is to redesign its policy and spending priorities for the coming programming period of 2014 to 2020. Commissioner Grybauskaite (responsible for Financial Programming and Budget) explicitly acknowledged that the current budget allocation is clearly in conflict with the real EU priorities, being in fact mainly an expression of old and almost completely out-of-date objectives. The CAP is evidently at the centre of this debate for being inconsistent – and even conflicting – with the overall growth and convergence objectives of the EU. In contrast, structural policies are (at least implicitly) assumed to provide good performance and, consequently, should gain room relative to the "old" and ineffective CAP. This perspective might explain the discontent about the current EU budget allocation.

This article will present an overview of the empirical findings on the role of major EU policies in regional

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growth performance and convergence, and will assess whether such widely shared opinion is actually supported by the facts.

Existing empirical findings and their inconsistency

The Fourth Cohesion Report (European Commission 2007) addresses the evaluation of the impact of structural funds on EU regional economies. Such assessment, in fact, mostly concerns the last programming period (2000 to 2006) and also aims at providing a first *ex ante* evaluation of the current programming period (2007 to 2013). The empirical evidence on which the report establishes its conclusions, however, is mainly obtained from three macro-economic models, HERMIN, QUEST and EcoMod. These models demonstrate a significant positive impact of Structural Funds (Cohesion Funds included) on the growth of lagging regions and states, thus promoting convergence. However, the computed size of this impulse, as well as the speed of convergence it induces, appreciably differs across the models.

In fact, evidence provided by such models, based on simulations rather than econometric estimations of the impact, is of major interest as an *ex ante* and *in itinere* evaluation tool. But they can hardy provide a clear *ex post* demonstration of the effect such policies have really had on growth. In other words, they cannot say much about whether growth convergence actually occurred over a long period of time and whether such a process has been actually fostered by structural policies. The major strength of macro-economic models can also be their main drawback. They are designed to fully represent the impact of policies on both the demand and supply sides of the economy, and both the short-run and the longer-run impacts (Bradley et al. 1995 and 2003). Nonetheless, the real interest in growth empirics is only on those supply side impacts that eventually produce the long-term, namely permanent, effects on growth performances.

Evaluating the impact of Structural and Cohesion Funds may definitely involve many other relevant issues and the above-mentioned macro-economic models represent excellent instruments in this respect.[1] Nevertheless, we must also acknowledge, in the words of the European Commission, that "transfers from the Structural Funds added directly to demand and economic activity, but more importantly, since they were concentrated on investment [. . .], they were aimed at increasing growth potential in the medium and long term. [. . .] The estimates of the "supply-side" effects on growth [. . .] become predominant in the long term. [. . .] Although structural policies are ultimately judged in terms of their effect in narrowing regional disparities in GDP *per* head of employment, it is their impact on the underlying factors which determine economic development" (European Commission 2001, 131).

As a consequence, firstly, a correct evaluation in this respect should be performed over a long enough period of time (namely, more than one programming period). Secondly, whenever the main objective of policy evaluation concentrates on these long-term and persistent effects on the supply side of regional economies, approaches exclusively targeting on such aspects may indeed be preferable. If we agree that the key objective of evaluation is the long-term supply-side effect eventually generating persistent growth and its convergence, we may understand why several empirical studies evaluate these policies within a neoclassical conditional growth convergence framework. This framework admits an empirically tractable, and relatively straightforward, model specification that allows the estimation of growth-enhancing effects over a large-enough number of years and regions or countries.

This empirical approach is also adopted in previous Cohesion Reports for the evaluation of "Objective 1 Structural Funds". The Third Cohesion Report (European Commission 2004) provides an unconditional convergence rate estimate of 0.5 percent for the 1980 to 1988 period over the whole EU area; this rate increases to 0.7 and 0.9 percent in periods 1989 to 1993 and 1994 to 2000, respectively. During these two programming periods the convergence rate observed only across Objective 1 regions has been much higher, at 3.1 and 1.6 percent, respectively. This latter evidence, in fact, would demonstrate a positive impact of Structural Funds on this convergence process.

The almost contemporaneous "Sapir Report" (Sapir et al. 2004) is actually less optimistic in this respect than several empirical studies. In spite of an analogous growth convergence framework adopted, this report provides fairly different empirical findings.

[1] A more complete picture on the whole set of issues, as well as approaches, about the EU structural policy evaluation is also provided by Bachtler and Wren (2006).

Moreover, in this report the possible negative role of the CAP on growth is mentioned parallel to the growth-enhancing impact of Structural Funds, although it is not clarified how this contrasting effect could be actually generated. Among various Cohesion Reports published, the latest one (European Commission 2007) actually refers to the likely contribution of the CAP to regional cohesion, with the conclusion that the distribution of CAP funds seems to favour richer regions in the case of the first pillar (i.e. expenditures related to market support and direct payment to farmers), and is less related to regional growth levels in the case of the second pillar (i.e. expenditures related to rural development-oriented accompanying measures, investment in holdings, agri-tourism, etc.). This evidence, extensively analysed in Shucksmith et al. (2005), would suggest some relevant implications of the CAP on growth convergence and cohesion across EU territories. On this, however, more in-depth empirical analysis is still lacking.

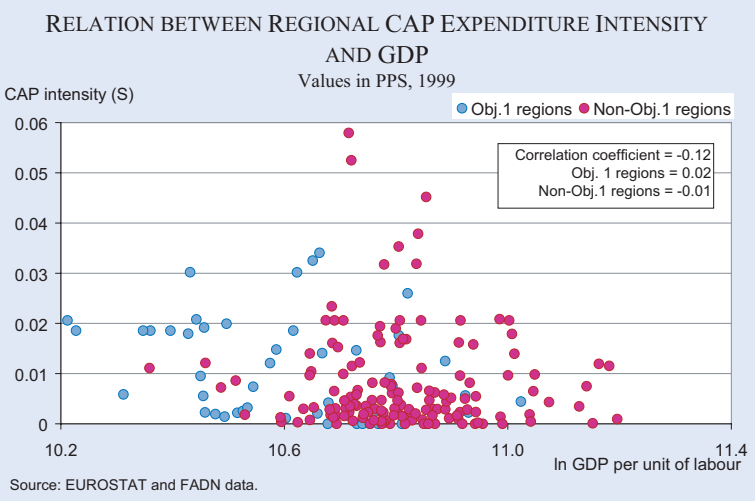
Taking a wider look at the empirical evidence on growth convergence across the EU and the role of policies indeed confirms that a conclusive answer can hardly be given (Fagerberg and Verspagen 1996; Neven and Gouyette 1995). The large body of studies (in the order of hundreds) on growth convergence across EU regions and countries provides mixed and controversial results. This may be caused by the large number of different model specifications, data (for instance, period under investigation) and econometric methods used in this literature. Croci Angelini (2002) surveyed 16 different estimations of "unconditional" β-convergence across the EU published from 1992 to 2000; the convergence rate varies between 0.4 and 2.9 percent, but several studies actually provide evidence against regional convergence (Abraham and Van Rompuy 1995; Molle and Boeckhout 1995). Adopting a panel and dynamic specification, Canova and Marcet (1995) report a very high convergence speed (about 11 percent for countries and 23 percent for regions in the EU), while, expressed again in specific statistical terms, other studies do not show any clear evidence of "unconditional" convergence (Boldrin and Canova 2001). Within this approach, the "conditional" convergence is strongly supported by some empirical works, while contested by others. Moreover, several empirical studies are also consistent with the so-called "club"-convergence which is the convergence observed within subgroups of regions (Chatterji 1993; Quah 1996; Canova 1999).

Within this large amount of empirical literature, Dall'erba and de Groot (2006) review eleven papers focusing on the impact of Objective 1 Structural Funds on growth convergence. In all these cases, the period under investigation at maximum covers the two programming periods from 1989 to 1999, as final data on 2000 to 2006 payments were only recently released (European Commission 2007). Except for Rodrìguez-Pose and Fratesi (2002), Bivand and Brunstad (2003) and Esposti (2007), none of these studies acknowledges a possible role of the CAP payments. These eleven papers report the impressive number of 200 different estimates of the impact of Structural Funds on regional growth. On average, the estimated impact is small, though positive, but an extreme variability is observed. Eight papers admit a negative impact, while a mean negative effect is obtained in four papers. Moreover, the Structural Fund payments enter the conditional growth convergence model according to *ad hoc,* thus arbitrary, specifications. Consequently, comparability across results is highly questionable.

Differences in data under consideration may also explain such major disparities. For instance, in order to evaluate the Objective 1 Structural Funds, Beugelsdijk and Eijffinger (2005) apply the growth convergence model to the EU15 countries and not to regions – the actual recipients of these funds. Moreover, they specify the policy support in terms of a growth rate instead of the level, the former apparently being much less regular and potentially more statistically "noisy" over a short period of time. In addition, these empirical studies often concentrate on different time periods. Cappelen et al. (2003) consider a long time period (1980 to 1997), but they evaluate structural policy by limiting the estimation to the "treatment" years from 1989 to 1997. Beugelsdijk and Eijffinger (2005) examine the period of 1995 to 2001. Rodrìguez-Pose and Fratesi (2002) investigate the whole 1989 to 1999 period but they also estimate the conditional convergence for the 1989 to 1993 and the 1994 to 1999 sub-periods.

In most of these applications, as mentioned before, the CAP expenditure is not taken into account. This can be also explained by the fact that analysis of the territorial or regional impact of CAP has become a major research concern only in the last fifteen years (Sotte 1995; Laurent and Bowler 1997; Shucksmith, Thomson and Roberts 2005). The main finding often reported is the positive – or at least not significantly

Figure 1



negative – statistical correlation between first pillar CAP expenditure per unit of agricultural land (or labour) and regional *per capita* GDP (Shucksmith, Thomson and Roberts 2005).[2] If we consider the "CAP intensity" (i.e. the CAP expenditure per unit of GDP) and both pillars' payments, we actually do not observe any relation with regional per capita GDP (Figure 1). This is the *distributional argument* on the inconsistency of CAP with the economic and social cohesion objectives of the EU (Tarditi and Zanias 2001).

In any case, this does not necessarily imply that the CAP offsets, even partially, structural policies and thus acts as a counter-treatment (the *counter-treatment hypothesis,* see Esposti 2008). Explicitly testing whether the CAP actually acts against *cohesion policy* requires a more careful approach, as we need to model how the CAP interferes with structural policies in affecting regional growth processes. The use of an appropriate theoretical framework to analyze the CAP's possible inconsistency with regional cohesion has been, in fact, suggested by some recent empirical work (Rodrìguez-Pose and Fratesi 2002; Bivand and Brunstad 2003; Esposti 2007). Yet their results are controversial and, as a matter of fact, not fully comparable. Also in these cases, the inclusion of CAP payments in conventional conditional growth convergence is largely *ad hoc.* Moreover, the construction of a complete and consistent regional dataset for CAP payments is particularly critical and may lead to substantially different results.

[2] Though this conclusion is based on the CAP before the 2003 reform there is evidence suggesting that such a reform is not doing very much to remove this inconsistency (Shucksmith, Thomson and Roberts 2005).

Issues regarding research improvement

We wonder why an apparently simple research question – Do *cohesion policy* and the CAP affect regional growth and growth convergence? – within a well-established and widely adopted theoretical framework (the "neoclassical growth convergence model") generates so different and controversial results. There are three sets of fundamental issues on which empirical research has not provided a conclusive answer so far: (i) how the conditional convergence model has to be appropriately augmented to include EU policies; (ii) which policy data are actually available; and (iii) what appropriate econometric techniques are required to estimate policy impacts.

As mentioned above, most empirical studies include policy support by augmenting the growth convergence model with largely arbitrary solutions. This happens because it is not so obvious on which growth conditioning variables the *cohesion policy* and the CAP actually intervene. About fifteen years ago, two seminal empirical works by Barro and Sala-i-Martin (1992) and Mankiw et al. (1992) rigorously derived the conventional linear regression specification of growth convergence from the transition dynamics of the neoclassical growth model (in both the Solow-Swan and Cass-Koopmans versions). In this "formal" or "model-based" specification of the growth convergence model, *per capita* GDP growth depends on the initial per capita income level, as well as on other conditioning variables, these being strictly and exclusively justified by the underlying theoretical framework. Accordingly, the conditional β-convergence model takes this form:

(1)

$$E\left(y_{it}|Y_{i0}, X_{i0}\right) = t\,g + \left(1-e^{-\lambda t}\right)\ln A_{i0} + \left(1-e^{-\lambda t}\right)\frac{\alpha}{1-\alpha}\ln s_{i0} - \left(1-e^{-\lambda t}\right)\frac{\alpha}{1-\alpha}\ln\left(n_{i0}+g+\delta\right) - \left(1-e^{-\lambda t}\right)\ln Y_{i0}$$

On the left-hand side, y_{it} is the i-th region's (or country) *per capita* (or *per* unit of labour) income growth rate over period t; Y_{i0} is the i-th region's initial (at time 0) *per capita* income; X_{i0} denotes a set of other

conditioning variables. The right-hand side makes explicit the whole set of these conditioning variables X_{i0}; g is the total factor productivity (TFP) growth rate; λ is the speed (or rate) of convergence with

$$\beta = -\left(1 - e^{-\lambda t}\right)$$

expected to be < 0 for β-convergence to occur; A_{i0} is the i-th region's initial TFP; $0 < \alpha < 1$ is the coefficient (indicating the capital share or capital intensity within the economy) of the underlying Cobb-Douglas production function with two factors (capital K and labour L) and constant returns to scale; s_{i0} is the i-th region's initial investment rate; n_{i0} is the i-th region's initial population (or employment) growth rate; δ is the capital depreciation rate.

According to the underlying neoclassical growth model, however, g, δ, α and λ are usually assumed to be constant across regions and over time. Thus, the remaining really conditional variables beside Y_{i0} are A_{i0}, s_{i0} and n_{i0}. These are the only legitimate conditioning variables in this conditional convergence model. As equation (1) describes the regional growth convergence pattern toward the respective steady-state, it implies different regional steady-states, therefore the conditional convergence, whenever regions show different conditioning variables.

Augmenting equation (1) to include policy variables thus means to ask how policies affect one of the conditioning variables A_{i0}, s_{i0} and n_{i0}. In this respect, two different modelling solutions can be proposed for the Structural Funds and the CAP payments, respectively. The former makes *capital formation* within equation (1) explicit (Esposti and Bussoletti 2008); the latter obtains an alternative specification of equation (1) from a *two-sector balanced growth* model (Esposti 2007).

As far as the Structural Funds are concerned, the most natural way to include them into a regional growth convergence model is through the investment rate s_{i0}. After all, it should be fairly obvious to regard the Objective 1 Structural Funds as investments, given that most of them (92% in the whole 1989 to 1999 period, 98% in the 1994 to 1999 programming period) aim at building regional stock in three different areas: infrastructure; human capital; other (mainly private) investments including in R&D (European Commission 2001 and 2004; Rodriguez-Pose and Fratesi 2004). According to this straightforward argument, these funds may be interpreted as an increase of the capital stock in the unit of time, i.e.

$$\dot{K} = \partial K / \partial t \,,$$

and, consequently, of the investment rate

$$s = \dot{K} / \bar{Y} \,,$$ where $\bar{Y}$ is the regional GDP.

Considering the Structural Funds expenditure as capital accumulation also has the advantage to allow modelling the different effects of the aforementioned areas of intervention (infrastructure, human capital and R&D, for instance), and how they interact in shaping the growth convergence process. In some studies, structural policy itself is explicitly distinguished among these different investment categories, but this is done only at the country level or considering single regional cases (Bradley et al. 2003; Rodriguez-Pose and Fratesi 2004). Unfortunately, in fact, current available data do not allow attributing the whole Objective 1 expenditure to different investments at the regional level. However, it is often neither possible nor appropriate to associate the expenditure of a given EU Structural Fund to a specific investment typology. One possible way to proceed, therefore, is to model at the regional level the interaction between the overall amount of policy expenditure and the different capital assets (infrastructure, human capital, R&D), or some proxies of them, as this interaction depends on the underlying unobserved share of structural funds invested in that specific asset.

These aspects can thus be modelled by specifying a *capital formation function.* Firstly, we can cumulate past expenditure in new capital formation as a weighted sum of past policy expenditure *per capita* (or labour unit) within the region, that is

$$T_{it} = \sum_{s=0}^{Z} w_s M_{it-s} \,,$$

where w_s is the weight indicating the "portion" of the policy expenditure M, delivered at time t-s and affecting the outcome at time t, and Z is the maximum time lag. Secondly, we can specify a relation between the regional investment rate s and this policy treatment, representing how this public expenditure converts into the above-mentioned different capital assets and interacts with them:[3]

[3] Esposti and Bussoletti (2008) adopt a flexible function specification of equation (2). Beside, *H*, *I* and *RD* other, and more detailed, assets can be evidently considered.

(2)

$$\ln s_{i0} = f(T_{i0}, I_{i0}, H_{i0}, RD_{i0})$$

where I_{i0} = initial regional infrastructure endowment; H_{i0} = initial human capital in the i-th region; RD_{i0} = initial regional R&D expenditure *per capita* (or labour unit).

By substituting equation (2) in equation (1), we obtain an augmented growth convergence model where the impact of Structural Funds on growth and conditional convergence (by affecting the regional steady-state) and, in addition, this impact is actually allowed to differ across regions or groups of regions. This difference may occur either for the different amount of funds but also for the different initial resource endowment across regions in terms of infrastructure, human and knowledge capital, with which structural funds themselves interact.

It is less obvious how to include the regional CAP expenditure in the conventional growth convergence model. The basic idea is that the CAP, as any other sectoral policy, may influence the growth process because it is directly related to the share of agriculture. The underlying hypothesis is that growth in poorer regions is greatly hampered by an unfavourable sectoral structure dominated by agriculture (Cappelen et al. 2003). The formal conditional convergence model shown in equation (1), however, receives sound theoretical justification from the one-sector neoclassical growth model. One possible way to proceed is to enter multiple sectors through term A_{i0} in equation (1). The general idea can be simplified as follows: (i) assume that the regional economy is made of two sectors, agriculture *(F)* and non-agriculture *(N)*; (ii) the share of *F* is related to the CAP expenditure within the region; and (iii) A_{i0} then depends on the shares of the two sectors, therefore on the CAP expenditure itself.

By formulating a two-sector balanced growth model it is possible to express ln A_{i0} as a function of the CAP expenditure as follows (Esposti 2007):

(3)

$$\ln A_{i0} = d_{i0}\left[S_{i0} - F_{i0}^{L}\frac{(1-\alpha)}{(1-\alpha')}\right].$$

where d_{i0} expresses the *agricultural technological gap,* i.e. the difference between the TFP of sectors *N* and *F*; S_{i0} is the regional CAP expenditure *per* unit of GDP or *CAP intensity;*

F_{i0}^{L} is the share of agriculture on regional employment; α and α' are capital intensities in sectors *N* and *F*, respectively. By substituting equation (3) in equation (1), it becomes clear that, through different TFP levels, steady-state levels as well as convergence process itself are allowed to differ across regions as a consequence of different CAP intensity and agricultural employment share. Moreover, together with equation (2), equation (3) also provides the testing possibilities regarding whether the regional CAP expenditure really counteracts the effect of structural funds, thus assuming the above-mentioned counter-treatment hypothesis (Esposti 2007).

Introducing EU policies in equation (1) as an appropriate augmentation of the base model, however, does not necessarily ensure more robust and concordant results from different empirical applications. Some further data and estimation issues remain. Among the former issues, we may mention the lack of official datasets containing policy data at the regional level. EU institutions do not provide the harmonized and long-term series of Structural Fund payments at the EU regional level. This information can indeed be reconstructed from EU and regional documentation but actual comparability of data across regions and over years is highly questionable. Without a shared and univocal solution in this respect, researchers adopt arbitrary or *ad hoc* solutions. This is the case with Multiregional Funds that are a very important part of the whole Objective 1 Structural Fund payments over the period 1989 to 1999 (Table 1), but their actual distribution across regions is unknown. Consequently, they are ignored in some applications or distributed proportionally in other cases. Yet both solutions may eventually lead to biased empirical results.

Analogously, information is lacking on the time when these funds actually generate investments within the region and when they finally produce an impact on growth (i.e. how to compute the term

$$T_{it} = \sum_{s=0}^{Z} w_s M_{it-s}$$

above). Available information often reports years when political decision on fund allocation is taken but not when funds are actually spent within the regional economy. This is evident when one looks at the remarkable and increasing volatility of *annual* expenditure observed over years 1989 to 1999 (Table 1). Also the attribution of funds across prior-

Table 1
Statistical dispersion of *per capita* Structural Fund payments (in PPS) in Objective 1 regions, 1989 to 1999 – CV expressed in %

		Average		Coefficient of variation (CV)	
Year	No. of regions	Total funds	Share of multiregional funds (in %)	Total funds	Multi-regional funds
1989	45	148.9	45.0	57.7	104.3
1990	45	188.0	47.6	108.4	193.7
1991	51	149.8	42.9	65.2	122.1
1992	51	221.4	33.3	89.4	147.5
1993	51	231.7	42.9	58.7	106.8
1994	58	342.5	61.8	230.9	314.0
1995	58	287.4	53.9	105.4	137.9
1996	58	356.0	64.3	220.6	280.2
1997	57	344.4	57.3	162.3	217.4
1998	57	443.2	64.5	175.3	227.2
1999	57	336.8	52.6	95.5	140.6

Source: Esposti and Bussoletti (2008).

ities or items (infrastructure, human capital, etc.) is almost completely lacking as mentioned before. And, if available, it does not necessarily represent the actual expenditure made at the local level.

This incomplete information on policy implementation at regional level is even more severe for the CAP. Building a regional dataset of the CAP expenditure is complex and controversial. With respect to the CAP support, previous studies have calculated a regionalized producer support estimate (PSE). This might be appropriate because, at least in the past, a large part of the support granted by the CAP was not delivered directly in the form of subsidies but through market price support. Unfortunately, defining the PSE at regional level is particularly complex (Tarditi and Zanias 2001; Anders et al. 2004).

Even if only the explicit and direct CAP supports were considered, serious problems would still be encountered. Firstly, this amount should include either the first and second pillar payments. However, the second pillar payments cannot always be regarded as constituting support of agricultural income (Shucksmith, Thomson and Roberts 2005) and, in previous programming periods and in the Objective 1 regions, a part of the structural CAP support was delivered together with the Structural Funds, so that they cannot be distinguished or separated. In any case, the European Commission does not provide regional series of the first pillar payments. EUROSTAT provides NUTS II-level series of agricultural subsidies, but these subsidies cannot be directly and univocally treated as the first pillar CAP expenditure, although they have been used as such in previous work on the regional impact of the CAP (Bivand and Brunstad 2003). Therefore, as Shucksmith, Thomson and Roberts (2005) suggest, the only consistent source of the CAP payments appears to be FADN (Farm Accountancy Data Network), which unfortunately does not cover the whole post-1989 period and may not be fully representative of the actual CAP payments granted to the entire regional agriculture.

Estimation issues are a major source of highly volatile empirical results, too. The first aspect to be considered is that the use of panel data, instead of more traditional cross-sectional ones, has become prevalent in growth convergence studies. Islam (2003) details the main advantages of panel data in growth convergence studies; in such context, dynamic panel-data specifications are increasingly adopted (Caselli, Esquivel and Lefort 1996; Yudong and Weeks 2000; Carmeci and Mauro 2003), with some recent applications also to evaluation of Objective 1 expenditure (Beugelsdijk and Eijffinger 2005; Esposti and Bussoletti, 2008). Such dynamic models explicitly take into account the serial correlation which often affects growth figures, especially in the short term.

Therefore, the use of dynamic panel specifications should significantly improve robustness and consistency of convergence model estimations. However, these formulations may raise further empirical issues as well. In particular, a major problem is the short frequency of data with respect to the medium or long-term horizon of the estimated relations (see Islam 2003). Moreover, these models involve the generalized method of moments (GMM) estimators, small-sample performance of which is often unpredictable. And these problems may be particularly critical when panels with many cross-sectional observations in a form of short-time series are in use – this is evidently the case of Structural Funds across EU regions. Eventually, the relevance of all these econometric concerns is revealed by the sys-

tematic differences emerging between panel-data and cross-sectional studies, as well as dynamic and static specifications. Different choices of moment restrictions and instruments in performing the GMM estimations may also generate systematically different estimates.

Some concluding remarks

On all these open issues, empirical research is expected to make some progress in coming years. This could be greatly supported by the availability of updated statistical information on both growth performance and policy expenditure over the programming periods 2000 to 2006 and later 2007 to 2013. Despite these longer time series, however, it must be also noted that the inclusion of regions of new EU Member States will remain particularly difficult, as policy data will inevitably cover only few years, and reliability of regional growth data before accession is often questionable. Moreover, better and more detailed information on regional expenditure granted through EU policies has still to be provided, especially for the CAP, which will not be available either for the periods 2000 to 2006 and 2007 to 2013.

Aside from these improvements, empirical research on regional growth convergence across the EU is also expected to take care of relevant theoretical and empirical aspects almost completely disregarded in the empirical literature so far. One of them involves the extreme regional heterogeneity now observed across the EU27 in terms of initial capital endowment, sector structure and EU policy implementation. This heterogeneity is often neglected even in panel-data applications, although it should be more explicitly included in the formal model specification. Related to this, one should also consider the cross-sectional dependence which often occurs across regions, but is quite often ruled out in empirical studies. The spatial dependence of growth performance and conditioning policy variables not only raises critical estimation issues but also concerns the representation of regional growth processes and policy impacts within the formal convergence model (Byrne et al. 2008). Badinger et al. (2004) suggests the cross-regional dependence within a conditional convergence model but also admits that a consistent estimator considering the correlation over time and across space at once is currently lacking.

The proposed integration of EU policies in the conventional convergence model may also be further improved. First of all, most studies discussed above exclusively analyse the policy impact within the β-convergence framework, thus assuming that such impact occurs in the region-specific steady-state situation. This does not seem to fully consider the aspect which is more plausible related to the intentions of policy makers – namely that policy actually affects convergence speed, i.e. the β parameter itself. Nevertheless, policies directly affecting β might not be appropriately represented within the conventional neoclassical growth framework. Other approaches should thus be developed in this respect (Croci Angelini 2002), aimed at exploring appropriate links with the above-mentioned macro-economic models. More generally, it would be helpful to re-design the analysis of the policy impact on regional growth performance taking into account all possible policies contributing to the final outcome, as many of them are actually often ignored. For instance, in evaluating the impact of Structural Funds on former Objective 1 regions, those still granted to Non-Objective 1 territories as well as Cohesion Funds flowing into the lagging countries (and, consequently, to their regions) in the EU, are often neglected. Making a policy evaluation in terms of the "treatment effects" (Esposti 2007) would require a more careful consideration of all "treatments" actually contributing to generate (or to counteract) such effects as well as of all methodological implications suggested by the so-called treatment-effect literature (Frölich 2004).

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