



Convergence and growth. Labour productivity dynamics in the European Union



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ABSTRACT

This paper investigates labour productivity dynamics for 1263 regional economies of the European Union during 1991–2007. Despite convergence is usually found to occur conditionally to economy-wide factors, results reveal a clear process of unconditional convergence for financial and business-related market services. Such an evidence is not found for manufacturing and aggregate productivity, for which long run distribution dynamics are characterized by bimodality. The decomposition of the growth rate of aggregate labour productivity reveals that pure productivity gains drive growth. Structural change plays a minor role in the process, however it halves the contribution of the manufacturing sector for the richest regions, while it enhances the weight of financial market services.

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1. Introduction

The neoclassical model implies that one should find evidence of *absolute* convergence, in the sense that poor economies are expected to grow unconditionally faster than richer ones (Barro and Sala-i Martin, 1992; Mankiw et al., 1992). The theoretical groundings of such an hypothesis are in the original model by Solow (1956), from whose steady state condition the empirical equation is derived¹. Such a line of research dates back to Gerschenkron (1962) and has been the main core of growth theory and empirical work, also in historical perspective (Baumol, 1986). However, the standard empirical result tends to provide little support to the *absolute* hypothesis, usually reporting convergence only conditionally to economy-wide factors (Barro, 1991; Barro and Sala-i Martin, 1992). Nevertheless, recent empirical studies, notably by Rodrik (2011) and Rodrik (2013), find evidence of unconditional convergence whenever the focus is displaced from the aggregate level to the manufacturing sector. These results are consistent with the idea that convergence does not need to apply to the economy as a whole, but it can still take place in some specific modern sectors particularly suited for the flow and adoption of innovative activities². The relevance of these findings is strengthened by the heterogeneity of countries included in Rodrik's analysis, compared to previous studies in which absolute convergence was found for homogeneous samples, such as the OECD countries in Baumol (1986) or the US states in Bernard and Jones (1996c). Less attention has been devoted to the services sector. Nevertheless, there is reason to suspect that absolute convergence could apply because of the standardized technologies of production. Empirical evidence consistent with such an argument is reported by Bernard and Jones (1996a) in a sample of 14 OECD countries.

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¹ The equation to be empirically estimated commonly is a general version of the original Solow model, known as Barro's equation (Caselli et al., 1996; Durlauf and Quah, 1999).

² For instance, this argument is proposed by Bernard and Jones (1996b), which however find no empirical support for absolute convergence in manufacturing.

This paper sets in this framework by providing empirical evidence for the European Union (EU). Adopting both a non parametric approach and distributional analysis tools, convergence and growth are investigated for a large sample of EU regional economies, focusing on aggregate, manufacturing and market services labour productivity. Is unconditional convergence observed at the aggregate level? Does it take place for sectors? How do sectoral dynamics explain differences in aggregate growth rates? These questions are of interest for at least a couple of reasons. First, the present analysis is an empirical test of the Solow model using a sample for which one should suspect selection bias to apply. Indeed, the EU is reasonably homogeneous and the inclusion of the Eastern regions should favour the emergence of the canonical negatively sloped curve. Moreover, it is a common market in which commodities, capital and people are free to circulate (Single European Act 1992). Finally, policies addressing internal inequalities have been implemented over the years, under the label of Convergence and Cohesion Objective. Despite this, results do not satisfy these expectations. Secondly, empirical evidence of (non) convergence may have some relevant policy implications in the EU scenario. Indeed, social and economic cohesion is the issue which European policies have been addressing the most. However, the EU does not seem to be on track in reducing regional disparities and the last economic crisis has exacerbated such an issue³ (European Commission, 2013). The present analysis does not address directly the role of policy factors. However it is informative about the dynamics of labour productivity for almost two decades in which European, national and regional programs have been implemented. Therefore, finding no evidence of unconditional convergence for aggregate labour productivity signals that policies were not able to reduce disparities within the EU, despite this has been the primary target of regional programs. A similar result at the sectoral level - especially for manufacturing - would also suggest that EU integration policies aimed at promoting innovation and technological transfers have been unsuccessful in favouring increased efficiency and market integration of less productive regions.

In the literature there are two main approaches for investigating convergence: growth (β) regressions and distributional analysis (Durlauf and Quah, 1999). The methodology used in this paper implements both of them in a complementary way, also modifying the former in order to provide more accurate information on the growth process. Indeed, a standard growth regression usually estimates a cross-sectional model with the growth rate of labour productivity (income) expressed as a linear function of its initial level. Evidence of a negative relationship would suggest that a convergence process is in place, as in Rodrik (2013). However, results are heavily affected by the imposed linear relationship and non-linearities cannot be identified. Hence, in what follows the standard β regression is replaced by a semiparametric model in which the growth rate of labour productivity is expressed as an unspecified function of its initial level. This allows to identify both non-linearities and the existence of more than one potential *steady state* equilibrium in the growth path. However, regressions inform only on the average behaviour of the sample and on convergence towards the steady state, while no information concerning relative performance, mobility and persistence within the distribution can be drawn (Quah, 1996). Therefore, the second main approach is used by performing distributional analysis following Quah (1996) and Quah (1997). Results will (i) inform on relative performance of economies, (ii) allow to trace the evolution of the overall distribution overtime and (iii) provide complementary information for interpreting results of semiparametric regressions. A comparison between the methodology of this paper and alternative approaches is in Appendix B.

Finally, the structural composition of economies heavily affects their capacity to produce output. Some sectors are intrinsically less productive, while others are characterized by high innovation opportunities, which in turn imply higher growth rates. Aggregate growth is driven by both increases in output per worker and structural change, i.e. switches from less to more productive sectors. For instance, Bernard and Jones (1996b) find that productivity gains are the main source of aggregate catching up, while structural change is found to be marginal. Thereafter, empirical studies focused on the sectoral determinants of productivity growth and on differences among countries. An analysis of this kind is done in the last Section, following the decomposition of productivity growth as in Cimoli et al. (2011). This informs about the sectoral sources of aggregate growth⁴.

The paper proceeds as follows. Section 2 presents the data and the methodology. Section 3 reports the non parametric estimates for aggregate, manufacturing and market services productivity. In Section 4, distributional analysis tools are used to analyse aggregate productivity dynamics and its sectoral determinants. In Section 5, aggregate productivity growth is decomposed in pure gains and structural change components and sectoral contributions are computed. Concluding remarks follow.

2. Data and methodology

The analysis draws upon territorial units at the NUTS3 level according to the classification adopted by Eurostat⁵. Data on Gross Value Added (GVA) and employment are taken from the Cambridge Econometrics (CE) database. The sample includes 1263 regional economies of the European Union, belonging to Belgium, Czech Republic, Denmark, Germany, Estonia, Greece,

³ In particular, it has been argued that German policies and the European conservative response package have been damaging the poorest economies, while favouring the richest. See for instance Davanzati et al. (2009). The discussion on this point was already ongoing before the surge of the crisis. Indeed, economic theory does not provide unique results about the effects of austerity policies on economic activity and output growth. The same holds for the consequences of fiscal retrenchment on neighbours' economies. See Blinder (1997) and Barba (2001).

⁴ Further insights about the determinants of productivity growth can be obtained by decomposing the growth rate in output per hour worked and hours per employees. This is not the scope of this paper, also data on hours per employee were not available. For an approach of this kind, see Gordon (2003), Gordon (2010) and Van Ark et al. (2005).

⁵ The NUTS classification (Nomenclature of Territorial Units for Statistics) is a hierarchical system for dividing up the economic territory of the EU. In particular, NUTS0 corresponds to the country level, while NUTS1 to NUTS3 correspond to smaller territorial units, listing 98 regions at NUTS1, 276 regions at NUTS2 and 1342 regions at NUTS3 level.

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