Economic convergence: Policy implications from a heterogeneous agent model [☆]

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ABSTRACT

In this paper we study the effectiveness of different types of cohesion policies with respect to convergence of regions. A two-region agent-based macroeconomic model is used to analyze short-, medium- and long-term effects of policies improving human capital and fostering adoption of technologies in lagging regions. With fully integrated labor markets the human capital policy positively affects the economically stronger region but reduces production in the targeted weaker region. Subsidies for high technology investment in the weaker region have a positive local output effect and a negative effect on the neighboring region, thereby fostering convergence. When labor markets are not integrated both policies support convergence.

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1. Introduction

There is a persistent gap in terms of economic performance and growth between different European regions. Despite large efforts to integrate European economies the problem of real convergence in the European Union (EU) area is to a large degree still unsolved and the effectiveness of the cohesion policy measures is contested (see, e.g., Boldrin and Canova, 2001; Cappelen et al., 2003; Aiello and Pupo, 2012).

EU policies to facilitate convergence of per capita income and productivity refer to two broad areas. First, there is the funding of regional policies. The European Fund for Regional Development (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), and the Instrument for Pre-Accession Assistance (IPA) are the major pillars to spur cohesion. Second, European integration has to a large degree, also been associated with the reduction of barriers for a free flow of goods, labor, and capital.

This free flow of goods and production factors, however, makes it hard to predict the spatial distribution of the policy effects and to specifically target economic policy measures on the lagging regions. It is ex ante not clear how a policy affects the economic performance of neighboring regions, and how the neighboring regions' economic performance feeds back on the region at which the policy is targeted. Due to such feedbacks the overall effect might well be negative such that a policy intended to accelerate the convergence actually leading to divergence.

In our paper we analyze exactly these questions by considering short-, medium- and long-term effects of policy measures, which aim at fostering convergence, on output and real convergence in a two-region setup of an agent-based macroeconomic model (the Eurace@Unibi model). We define two policies that can be implemented in the less developed region. The first policy is a human capital policy that leads to an upgrade of the general skill level in the population. The second policy provides subsidies to those firms that invest in the most recent technological vintages. These subsidies give firms incentives to modernize their capital stock which can close the technological gap to the superior region.

The choice of these policies for our experiments is strongly motivated by the regional policies funded by the European Union.[1] The ERDF aims at strengthening economic and social cohesion in the EU by correcting imbalances between its regions. In short and among other things, the ERDF finances direct aid to investments in companies (in particular small and medium sized enterprises) in order to create sustainable jobs. Large parts of this fund are spent to support investments in physical capital, mostly through non-repayable grants, but also other tools, such as soft loans. The ERDF also supports the build-up of infrastructures notably linked to research and innovation, telecommunications, environment, energy and transport. The ESF is set up to improve employment and job opportunities in the European Union. This fund supports actions in the member states in the areas of adapting workers and enterprises, lifelong learning schemes, designing and spreading innovative working organizations. It also targets at strengthening human capital by reforming education systems and setting up a network of teaching establishments. This short description shows that under the roof of these funds, we find mostly policies targeted at helping to build up human capital and/or technology improvements.

The available budget for the ERDF and ESF is sizeable. For the period from 2007 to 2013, 277 bn Euros are allocated which makes about 28.5% of the total EU budged. As all the cohesion policy programs are matching funds with co-financing by the member countries, total available funding is almost 560 bn Euros which is about one quarter of the Italian and more than one half of the Spanish yearly gross domestic product.

Although there is a vivid debate about the past success of EU cohesion policy, which is based on a variety of econometric techniques (see Becker et al., 2010, for a recent contribution and a brief survey of the relevant literature), the model-supported basis for a prediction of the effect of such measures, which target either the quality of human capital or technology upgrading in a spatial framework with labor market frictions, is weak.[2] Considering the well established complementarity between workers' skills and the level of technology employed by firms (see our brief discussion in the next section) it is clear, that each of these policies, if successful, should affect the dynamics of both human and physical capital. The effective use and the adoption of different vintages of technology in a region are influenced not only by policies directly subsidizing physical investments, but also by the skill distribution in that region, which is in turn influenced both by the local human capital policies and by the mobility of workers. Hence, although these cohesion policies all aim at the improvement of the productivity in the target region, they rely on quite different mechanisms and might therefore be differently affected by varying degrees of spatial labor market frictions. For this reason, a systematic comparison of the effectiveness of policies targeting human capital endowment and diffusion of technologies into weaker regions as well as the interplay of these policies with the policies fostering labor mobility between the regions needs further investigation. More specifically we seek to answer the following policy related questions:

1. How does each of the considered cohesion policies affect output growth in both regions and convergence?
2. How are the cohesion policy effects influenced by labor mobility?

Our aim is to address these questions under consideration of the complementarity of the dynamics of skills and quality of production technology on the firm level, where this complementarity is due to learning by doing of workers and endogenous technology choice by firms. Dealing with this complementarity requires a model that captures technology choices of individual firms, where these choices are affected by firm specific characteristics like the availability of appropriate skills in the own workforce, as well as the evolution of the distribution of (specific skills) in the workforce and skill specific labor flows across regions.

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[1] See http://ec.europa.eu/regional_policy/thefunds/index_en.cfm, accessed on August 9th, 2012.
[2] A rare model-based contribution related to the issues raised here is Arcalean et al. (2012), where the authors study in the framework of a two region, two sector overlapping generations model the effects of the allocation of structural funds between public education and infrastructure. However, the paper differs in several respects from our main focus. First, infrastructure provides a public good increasing productivity of all firms, whereas the technology policy in this paper provides incentives for individual firms to acquire capital goods of high quality thereby improving productivity of some selected firms (those who invest). Second, a major aspect of our analysis, namely the complementarity between the dynamics of skills of workers and technology choices of firms, is not present in Arcalean et al. (2012). Also, spatial labor market frictions play no role in their analysis.