

# Chapter 12

## What Drives Euro Area Labour Productivity Growth?

### An International Production–Frontier Examination

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#### **ABSTRACT**

*This chapter uses a nonparametric, international production-frontier approach with a focus on euro area growth accounting. The authors uncover two robust findings for the period since 1980. First, estimated euro area efficiency scores lie much below the world production frontier (gap mostly in the range of 10% to 20%), suggesting the need for structural reform efforts to enhance resource use. Second, the use of human capital series points to a significant effect on euro area labour productivity—highlighting the positive macroeconomic return to education—while entailing a considerable reduction in the estimates of technological progress. Third, they fail to detect significant changes in cross-country distributions of labour productivity both before and after 1995. The only exception concerns the shift in the labour productivity distribution between 1980 and 1995—attributable to the role of physical capital deepening—when they employ the Barro and Lee human capital measure together with World Penn Tables data for the full set of countries, and this only at the 10% significance level.*

#### **INTRODUCTION**

There is a broad empirical literature that studies economic growth, with two basic branches standing out. One attempts to determine whether there is a tendency for the world's economies to converge over time, drawing from Baumol's (1986) cross-sectional regressions. The other, building on Solow's (1957) decomposition of US growth into two components attributable to capital deepening and technological progress, investigates what are the sources of economic growth. Most of the literature is heavily model-

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driven, relying on particular assumptions about the technology, market structure, technological change, and other aspects of the growth process.

The standard approach to growth accounting makes strong assumptions about technology at the country level (often postulating country-specific Cobb-Douglas production functions) in order to decompose labour productivity growth into the contributions of production factor accumulation and total factor productivity growth. In contrast with the traditional growth accounting approach, Kumar and Russell (2002) (henceforth KR), and more recently Henderson and Russell (2005) (henceforth HR), have employed nonparametric production-frontier methods to carry out a growth accounting exercise and analyse international macroeconomic convergence. This approach decomposes labour productivity growth into components attributable to (1) technological change (shifts in the world production frontier), (2) technological catch-up or “efficiency change” (movements toward or away from the frontier), and (3) capital accumulation (movement along the frontier) – in HR case further splitting capital deepening into its physical and human components.

The present paper employs nonparametric production-frontier methods to obtain growth accounting results for the euro area. Given the international scope of the study, we also report results for a wider number of countries. We extend the literature by undertaking extensive robustness checks of growth accounting results with the aim to identify consistent patterns. Robustness is assessed in two main ways. First, by using two different databases for labour productivity and physical capital deepening, namely, Penn World Tables (PWT) and Groningen Growth & Development Centre (GGDC). Second, by employing two series for human capital, namely, one based on Barro and Lee (2001) data on years of schooling and Alvarez and Ayuso’s (2002) measure based on public spending on education.

Another paper addressing the role of human capital as control in a production-frontier context is HR, who significantly modify KR result that productivity growth is driven solely by physical capital accumulation over 1965-1990. HR attribute about one-third of physical capital accumulation’s productivity growth contribution to human capital accumulation instead. Moreover, Salinas et al. (2006) report an rise in estimated efficiency levels when introducing public and human capital among EU-15 countries over 1980-1997.<sup>1</sup> Using PWT and Barro-Lee data for OECD countries over 1975-1990, Maudos et al. (1999) find a significant effect of human capital on productivity, while highlighting its relevance for an accurate measurement of TFP (especially in Japan).

This article is structured as follows. We start by describing all the data used. We then present the growth accounting results in the absence of human capital. A later section examines the role of introducing each of our two measures of human capital. A final section concludes.

## **Data**

We employ two main datasets for deriving measures of labour productivity growth and capital deepening.<sup>2</sup> First, we use information from PWT version 6.2. This update (like its predecessor version 6.1) lacks data on capital stocks, so the latter are obtained by applying the perpetual inventory method (PIM) to gross capital formation.<sup>3</sup>

PWT measures labour as the number of workers, with which we compute real GDP and capital per worker for 95 countries over 1980-2003. Among these countries, we distinguish between EU-15 plus the US, other advanced countries and developing economies; due to space constraints, this paper only reports results – when available – for the first group of countries.<sup>4</sup> Second, we use GGDC data from the Total Economy and Total Economy Growth Accounting Databases. These data cover 16 countries

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