

Growth on average labour productivity in the euro zone

From the mid 1990s to 2000, the USA experienced a growth on average labour productivity (gALP) and on employment (gE). Some studies try to explain the role of information and communication technologies (ICT) on making both those achievements possible, but few have focused in the Euro zone. Among the reasons for existing less Euro area studies, is the quality of the (un)available data, which sometimes only accounts the private sector, hence not being directly comparable to official national statistics, because of different methodologies.

On its working paper #122, dated February 2002, the European Central Bank (ECB) tries to compensate the situation by studying some EU countries, based on data from OECD and from national accounts, comparing such evidence with known data for the USA.

gALP is possible either by capital deepening (an increase in the amount of capital available per hour worked) or by gains in total factor productivity (gTFP), but while the first can be measured directly, the second can not. However, estimating gTFP can suggest interesting relations; for example, if a study finds that gALP is due to gTFP – the growth that can't be explained just by higher labour or capital inputs – , than can signal the general-purpose nature of some technology, which is spilling-over across sectors.

ECB's paper questions the general-purpose characteristics of ICT, by (1) directly accounting the contribution of ICT capital for gALP, and (2) estimating gTFP, by checking data for (and making a difference between) intensive ICT *using* sectors (ICTu) and intensive ICT *producing* sectors (ICTp).

According to OECD, an ICTp industry can be one *manufacturing* office, accounting, computing and communications machinery; or one providing computer based *services*, including communication services. ICTu sectors are roughly considered the ones having a significant (relative to their output) investment on ICT capital. However, I think that this can be a misleading classification, as referred by many other papers; in fact I am just remembering Keith Smith's words – «*there is no such thing as a low tech industry*» – when I had the chance to listen to him, participating on the lecture titled «*Innovation policy in the globalizing learning economy*», at ISEG, Lisbon, Portugal, on 2002-11-15.

It happens that relatively affordable ICTs can have humongous effects on industries and/or services normally not considered intensive on

technology, precisely because they just don't spend much on it, and consequently get excluded in studies like the current one. For example, hydroponics – the cultivation of plants in nutrient solutions without using soil – is usually a process heavily dependent on ICT, but not requiring a great ICT capital investment: a single computer can compute the nutrient mix, remotely control the valves and pipes that are the irrigation network, and move the robotized platforms that host the plants when their time for harvesting is due... The ECB's paper recognizes this issue.

In order to assess the relevance of ICT to the Economy, ECB's study does a shift share analysis to find the contribution of each sector (ICTp manufacturing, ICTp services, ICTu manufacturing and ICTu services) to the overall productivity growth.

Let P , Y and L be – respectively – the ALP, capital factor and labour factor for the whole economy; let Y_i , L_i , P_i and S_i be – respectively – the capital, the labour, the productivity share and the labour share for some sector i , then $P = \sum (P_i * S_i)$, for all sectors i . In other words, this analysis writes ALP as the sum of all individual sectorial contributions, weighted by labour share.

Applying the analysis to Germany, France, Italy, Finland and the Netherlands, in the period 1991 to 1998, the study highlights that the producing sectors (ICTp manufacturing + services) had a considerable growth in real value; however, in the same period, they had a decrease in share in employment with negative employment growth. Despite ICTp sectors' gALP (up to +14.3% in 1995-1998), they sum just 3% of the total employment and the ECB's study infers that their impact in the euro zone is limited.

Across time, the shift share analysis can be seen as the sum of (1) a within effect, (2) a static effect, and (3) a dynamic effect. (1) can be interpreted as the rate of productivity growth, when keeping the same production structure; (2) is positive when there is employment shifting from a low productivity sector to a higher productivity one; and (3) is the product of employment sectorial shift by sectorial productivity growth, hence positive when employment shifts to a sector with above average productivity growth.

In a rough, much simplified, representation, $P(\text{across time}) = (1) + (2) + (3)$

This is interesting because ICTp sectors (manufacturing and services) had negative employment growth (-5.2% and -0.2%), meaning that

their contribution was built on the within effect, with shift effects actually reducing their relevance.

ICTp sectors tend to rely ever more heavily on completely automated processes, barely requiring human intervention, but delivering goods that will (indirectly) require workers elsewhere.

ECB's numbers seem to reflect this, as ICT using sectors for services, show the highest employment growth (+3.2% in 1991-1998) plus the highest share in employment (+8.1%).

However, the same ICTu sectors, show no gALP (services) or relatively modest gALP (manufacturing) and a much smaller (than ICTp) growth in real value added. Such contrast suggests that in 1991-1998, there weren't many positive spillover effects from the use of ICT.

Considering the paper's results, and comparing them to studies relative to the USA, the ECB document concludes that the importance of the ICT for gTFP in the euro zone is positive, and increasing its contribution to output growth, in the late 1990s (when software more than tripled its relevance), like it did in America, but not showing significant positive spillover effects. The main difference is that gTFP decreased in Europe in the period of the study, while it increased in the USA, suggesting that other factors, maybe like labour laws and production structure, are in play.