

Abstract for “Complementarities between ICT and Intangible Capital and its Differences across Countries”

Wen Chen (University of Groningen, Netherlands)
Thomas Niebel (Centre for European Economic Research, Germany)
Marianne Saam (Centre for European Economic Research, Germany)

Investment in ICT is important for productivity growth, as has been demonstrated in a wide range of studies. However, there is a disconnect between studies that rely on firm-level data (Gilchrist et al., 2001; Hall et al., 2012) and those that use industry or country-level data (Stiroh, 2002, 2005; Inklaar, et al. 2008). Firm-level studies tend to conclude that ICT investment has a larger effect on productivity than might be expected from the cost of the investments, while country-level studies tend to find productive returns in line with marginal cost. This paper aims to resolve this discrepancy by considering investment in intangible assets as the necessary ingredient to reap greater productive benefits from ICT investment. This hypothesis is in line with firm-level studies, such as Bresnahan et al. (2002), who find that ICT has a larger productive impact when combined with complementary investments.

In this paper, we use a newly developed cross-country intangible investment data (i.e. INTAN-Invest database) broken down to the 1-digit industry-level (NACE 1.1) and estimate a Cobb-Douglas production function augmented by intangible capital. By specifying an industry characteristic (the extent to which industries rely on ICT), we apply the differences-in-differences approach—akin to Rajan and Zingales (1998)—to investigate whether intangibles have a greater impact on productivity in more ICT intensive industries. The significant positive coefficient we find for this interaction term confirms that ICT capital has a larger impact on productivity growth when complemented by investment in intangible assets, echoing the prior evidence found at the firm-level. This finding also holds true across various sensitivity checks, ranging from alternative measures of cross-industry ICT intensities to dichotomously splitting industries into ICT-intensive and non-intensive groups.

The cross-country setting of the dataset also provided us with the first opportunity to probe whether complementarities are a common feature or whether the degree of complementarities varies depending on certain country-specific features. It seems plausible that in countries with rigid labor market regulations, the organizational experimentation necessary to make ICT investments a success is less likely to be undertaken since high firing costs imply higher costs for such experimentations. To empirically test it, we first split the sample according to countries with low and high employment protection legislation (EPL). Country group with relatively lower EPL is found to feature strong complementarities between intangibles and ICT; while this effect is absent in the latter country group (i.e. high EPL). This evidence is, however, not robust in the alternative specification when we introduce a further interaction term between ICT, intangibles and the OECD’s country-level EPL index in the full sample, adding at the same time interaction terms with EPL and single terms for ICT and intangibles. The coefficient of the three-way interaction term takes the expected negative sign but with no statistical significance. Thus, the evidence we find is only suggestive that there are variations in complementarities across countries.