Network Effects and Productive Externalities from ICT and Knowledge Capital

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In previous work (Goodridge et al., 2016) we have documented the contribution to growth of ICT equipment, and in particular communications (CT) equipment, in both the US and Europe over the period 1995 to 2013. In this paper, using an international growth-accounting dataset composed of the US and thirteen European countries, we seek to estimate whether there is also an indirect effect from growth in ICT capital input on growth in total factor productivity via network effects (or spillovers) over a similar time period. In doing so, we disaggregate ICT equipment into IT and CT capital, and attempt to estimate distinct effects from each. Our model also incorporates potential spillovers from activity in R&D, both private R&D conducted by firms and also public R&D. We find: a) evidence of a robust correlation between growth in ICT capital services and growth in TFP, which is consistent with the presence of network effects or spillovers, implying an output elasticity over and above the share of ICT capital costs in production; b) that disaggregation of ICT equipment creates two collinear variables, so we are unable to determine whether the ICT effect is driven by CT equipment, IT hardware, or both; c) that the correlation is stronger when taking longer differences, which is consistent with measurement error in the observed explanatory variable causing a downward bias to the estimated coefficient; d) that the estimated indirect contribution of CT spillovers potentially overexplains TFP growth in the aggregate of the countries studied; e) that if there are distinct spillovers from IT hardware, they appear to operate with longer lags (which is consistent with other findings in the literature) and so may reflect the returns of complementary co-investments in communications technology and/or intangible capital; f) evidence of spillovers from the conduct of private R&D by firms, although the data again suggest that spillovers may operate with long lags; g) and finally, evidence of a high social rate of return to the conduct of public R&D undertaken by the Government and Higher Education sectors, albeit with a surely overestimated rate of return.