Patterns of technical change and labour saving trends in six advanced economies

Topic: Input-Output Analysis: Employment Policies
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The aim of the paper is to study the sectoral concentration patterns of technical change and labour saving trends in six advanced industrial economies (US, UK, Germany, Japan, France and Italy) for the 1995-2015 period.

We compute technical change relying on a multisectoral physical productivity measure based on the notion of vertically hyper-integrated labour content of commodities as per Pasinetti (1988). Different from other traditional measures of productivity growth (e.g. TFP growth) which reflect additive real cost reductions rather than physical productivity changes, vertical hyper-integration makes possible to quantify and depict the concentration pattern of labour-saving trends across a set of growing subsystems (in the sense of Sraffa 1960). In order to perform our computations we articulate a dataset integrating the OECD Input-Output Database and the OECD STtructural Analysis (STAN) Database.

These computations are functional to address two research objectives.

First, we study the relationship between sectoral productivity and patterns of technological development at the country level. For each country, we create Harberger (1998) diagrams adapting the original formulation to our unit of analysis, i.e. we switch from the industry to the (growing) subsystem. This representation allows us to estimate the pervasiveness and curvature of the diagrams, following the proposal in Inklaar and Timmer (2007). The pervasiveness indicator quantifies the cumulative share of sectors with positive contributions to productivity growth while the curvature indicator measures the extent to which sectoral growth differs from the evolution of aggregate productivity. Using these two indicators we characterise the patterns of technological change across countries. We find that the pace of productivity change is positively correlated with the degree of pervasiveness and negatively correlated with the curvature. Overall, these findings suggest that the way technological progress is distributed across subsystems matters. A more balanced technological development is related to higher productivity growth.

Second, we link the estimations of labour saving trends and productivity growth to the literature on routinisation and automation (Autor et al. 2003; Acemoglu and Autor 2011; Autor 2013). According to this stream of research, occupations with a higher routine content can be more easily automated and ultimately replaced by machines and industrial robots. By knowing the occupational structure of each industry and its corresponding routine content, it is possible to estimate which sectors are more exposed to labour displacements. This procedure is followed by Marcolin et al. (2016), who create a Routine Intensity Index (RII) for 18 industries. We compare our estimation of labour saving trends and physical productivity growth with the RII to establish to what extent this index is mapping actual processes of productivity growth. We find that there is a positive relationship between labour saving trends and the degree of routinisation. The industries with the highest routine content tend to correspond to those subsystems that have recorded higher labour saving trends.

To sum up, our application of the Harberger (1998) diagram and derived indicators to the hyper-integrated labour content of commodities provides novel evidence on the relationship between sectoral productivity imbalances and the aggregate pace of productivity growth, from an input-output perspective.

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