Robust Measurement of National Technological Progress

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Abstract

We propose a measure of technological progress based on the information embedded in standard input-output tables. A connection is established between the quantities necessary as inputs, the associated output and auxiliary prices. It is argued that the wage-profit frontiers and the associated production prices together provide a robust basis for measuring technological progress and productivities. The computation of the wage-profit frontiers is a non-trivial exercise because of high combinatorial complexity. An algorithm that renders this computation feasible is presented. We analyze technological progress and productivities among 30 countries between 1995-2011 using the latest multi-regional input-output data.

Keywords: Technological Change, Input–Output analysis, Wage Profit Frontier, Productivity

1. Introduction

In this paper we propose a measure of technological progress of a region or nation based on the information embedded in its standard input–output tables by computing the wage-profit curves, and the wage-profit frontier. Our aim is to measure the technical efficiency of the economic system, but we depart from the conventional practice of estimating a surrogate physical aggregate production function\textsuperscript{1}. Instead, we resort to computing the wage-profit frontier\textsuperscript{2}.

We do not aggregate quantities that have conceptually different physical units. We do not follow methods that require the computation of an aggregate production function as proposed by Farrell (1957). He proposed a way to measure productive

\textsuperscript{1}For an investigation on the aggregate production function and its neoclassical properties see the companion paper Zambelli (2017).

\textsuperscript{2}Throughout this paper, we have used the term wage-profit frontier consistently for reasons of clarity, even though one find other terms by which it is referred to in the literature, such as: factor price frontier, as in Samuelson (1962, p.195), Hicks (1965, p.140), Diamond (1965, p.1134), or optimal transformation frontier (Bruno, 1969, p.39). Though different terms have been used, they are all concerned with the choice of efficient techniques (Robinson, 1953; Pasinetti, 1966; Garegnani, 1966; Bruno, 1969; Sato, 1974; Pasinetti, 1977).

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