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Technological progress, structural change and productivity growth: a comment

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Abstract

In a recent article, Fagerberg [Struct. Change Econ. Dyn. 11 (2000) 393] finds changes in the employment share of the electrical machinery industry to positively impact the manufacturing sector productivity growth. Fagerberg's approach has some methodological drawbacks, however. This note seeks to complement Fagerberg's analysis by estimating the impact of the employment share of technologically progressive industries using a more adequate methodology. Fagerberg's claim that the share of the 'electronics' industry positively affects manufacturing is confirmed. However, the size of the impact, and as a consequence the extent of spill-overs, is found to be much smaller than estimated by Fagerberg.

JEL classification: O14; O33

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1. Introduction

In a recent article, Fagerberg (2000) focuses on the relationship between the economic structure of a country and its productivity growth. He argues that the 'electronics revolution' will have impacted labour productivity in the manufacturing

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sector through important spill-over effects. This argument is given empirical backing by estimation results of an increase in the share of the electrical machinery industry (ISIC 383) in total manufacturing to have a positive and significant effect on the growth of total manufacturing productivity in the same period. Fagerberg uses a sample of 37 countries for the 1973–1990 period and finds that a 1% increase in the share of employment working in the electrical machinery industry has a predicted 0.5% higher growth of total manufacturing productivity. He shows that the size of this impact is very stable across different specifications. These results would suggest very strong spill-over effects of the 'electronics revolution'.

In the present note I will show that the specification and sample used by Fagerberg are likely to give biased results. I propose a more accurate procedure and use the OECD STAN Database providing data on the high-technology industries at a lower level of aggregation to obtain more reliable estimates. My results confirm Fagerberg's finding that the share of the 'electronics' industry has a positive and significant impact on total manufacturing productivity. The estimated size of the impact is much more modest though. I find a 1% increase in the employment share of the electrical machinery industry to have a 0.2% higher subsequent growth of total manufacturing productivity. That is, the extent of spill-over effects is estimated to be much lower than in Fagerberg's results.

2. Fagerberg's specification and sample

Fagerberg uses the following type of specification to estimate the impact of the share of an industry in a country i (x_i) on labour productivity (y_i being the logarithm of value added over employment)

$$y_{it} - y_{i,t-L} = \alpha + \beta y_{i,t-L} + \gamma(x_{it} - x_{i,t-L}) + \varepsilon_{it} \qquad i = 1, \ldots, N \tag{1}$$

where N is the number of countries and L is the length of the period under consideration. The sample that Fagerberg uses has N equal to 37 and L equal to 17 years. There are two important potential problems with this specification. First, the growth in labour productivity is measured in the same period as the change in the industry share. This may adversely affect the possibility of testing of (Granger) causality. The reason is that it is impossible to statistically discriminate between a situation in which the change in the industry share or productivity change takes place largely in the first part of the period or the second part of the period. Therefore, it is possible that most of the productivity growth of a country precedes the growth in the industry employment share. The length of the period of 17 years over which the changes are computed implies that there can be a lot of intra-period variation.

Second, the industry share at the start of the period ($x_{i,t-L}$) is not incorporated in Eq. (1). As a consequence, countries with equal changes in the industry employment share but vastly different levels of this share are not distinguishable. Fagerberg pays attention to this issue on p. 406 (footnote 12) but does not provide empirical results