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Wage inequality, technology, and trade

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Abstract

The recent widening of wage inequality has been attributed by some to skill-biased-technical-change and by others to trade liberalization. This paper examines the two explanations within a unified model and also presents a new modeling of skill-biased-technical-change, where skilled workers replace unskilled ones. As a result technology adoption is endogenous and does not occur in all countries. Hence, wages for both types of workers, trade patterns and also factor productivities in all countries are endogenously determined. The model sheds light on the relationship between technology and trade, on the reasons for global productivity differences and on the causes for the recent rise in wage inequality.

JEL classification: D3; F16; J31

Keywords: Wage inequality; Skill-biased technical change; International trade; Productivity differences

1. Introduction

In recent decades we have seen a dramatic rise in wage inequality in the US. Similar, though smaller, changes have been observed in other countries as well. [1] A number of explanations have been offered to this rise in wage inequality. The most popular explanations are skill-biased-technical-change on the one hand and the liberalization of international trade on the other hand. [2]

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[1] For evidence on this development see Davis and Haltwinger [12], Katz and Murphy [18], Juhn et al. [17], Davis [11] and Berman et al. [7].

[2] Bound and Johnson [8], Katz and Murphy [18], Berman, Bound and Griliches [6], Greenwood and Yorukoglu [15], Acemoglu [1], Galor and Moav [13] and many others stress the role of skill-biased-technical-change. Leamer [19], Wood [21], Hanson and Harrison [16] and others focus on the role of trade liberalization. There have been other explanations to the rise in wage inequality, such as reduction in education supply, as suggested by Goldin and Katz [14] and Card and Lemieux [9]. See also Baldwin and Cain [4].

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This paper presents two theoretical contributions to this area. One is to embed the two explanations together within a unified model of trade and technology. [3] The second contribution is a new way to model skill-biased-technical-change, as innovations that enable replacing unskilled workers by skilled ones. The novelty of this model is that such innovations are not everywhere adopted, but only where the wage rates induce adoption. Hence, wages, trade patterns, and technology adoption are all jointly determined in this model. Interestingly, differences across countries in technology adoption also lead to differences in factor productivity. As a result the paper contains contributions also to the literature on productivity differences. [4]

The paper presents a model in which the final good is produced by many intermediate goods. There exist primitive technologies that enable production of all intermediate goods by unskilled workers. New innovations enable producers to replace unskilled workers in production of some intermediate goods by fewer but skilled workers. Hence, technical progress replaces one input by another. This has two results. The first is that technology adoption increases demand for skilled workers and reduces demand for unskilled ones, so that the wage gap between the two types of workers increases. The second result is that such innovations are not everywhere adopted by producers, as adoption depends on input prices, namely on the wage ratio between skilled and unskilled workers. [5] Hence technology adoption differs across countries.

This result leads not only to endogenous technology adoption, but also to endogenous determination of trade patterns. Countries with many skilled workers adopt all new technologies and are called developed, while countries with fewer skilled workers do not adopt all available technologies and are called less developed. Hence, countries specialize in different intermediate goods, thus leading to international trade. We assume that only some intermediate goods are tradable and trade liberalization is modeled as increasing the set of tradable goods. While technical progress and trade liberalization are assumed to be independent, the patterns of trade are clearly endogenous and are affected by technical progress.

The model has many results. While some are already known, some results are new and surprising. The more standard results are that in developed countries both technical progress and trade liberalization increase wage inequality, while in less developed countries technical progress increases wage inequality but trade liberalization reduces it. What happens to the patterns of trade between developed and less developed countries is more surprising. While trade liberalization increases the share of trade in income in both countries, technical progress increases the share of trade in income only in the developed countries, while it reduces this share in less developed countries. This surprising prediction of the model is contrasted with some data and according to these, trade between developed and less developed countries, measured as shares in GDP, did not change much over the last 20 years. This might suggest that the effect of trade liberalization on the recent rise in wage inequality has been rather small.

Another interesting set of results refers to the emergence of productivity differences between countries. These differences are a result of differences in human capital, but are also amplified by endogenous technology adoption. Thus, countries with more skilled workers produce more intermediate goods by use of skilled technologies, which are more labor saving. Hence such countries have higher productivity. Another interesting result is that international trade

[3] Acemoglu [2] also combines technology and trade in explaining the skill premium, but in a very different way, as discussed below.

[4] This recent literature contains theoretical contributions, like Acemoglu and Zilibotti [3] and much empirical research, called 'development accounting', which is surveyed and assessed by Caselli [10].

[5] A similar result appears also in Zeira [22], but in a different context with labor and capital.