



## Technology and outsourcing: An explanation to the rising wage gap

Sahana Roy Chowdhury\*

Monetary Research Project, ICRA Limited (Investment Information & Credit Rating Agency): An Associate of Moody's Investors Service, B-245 (Ground Floor), Lake Gardens, Kolkata-700045, West Bengal, India  
Economic Research Unit, Indian Statistical Institute, 203, B. T. Road, Kolkata-700108, West Bengal, India

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### ABSTRACT

The recent phenomenon of widening skilled–unskilled wage gap in both North and South has been either explained by a technological change or by increasing trade or globalization. The paper provides a new explanation and emphasizes that it is neither technology nor trade alone but *both* that have contributed to the widening wage inequality. It argues, using a two-country occupational choice model, that any technological improvement in North results in a rise in the skilled–unskilled wage gap in North via an increase in the productivity of skilled labor followed by a rise in the same in South via trade or the outsourcing activities of the northern firms. The extent of outsourcing or the number of northern firms that outsource jobs to South is endogenously determined in the model. The paper also analyzes some major economic impacts of such a technological upgradation in North on the southern economy.

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### 1. Introduction

Casual as well as rigorous empirical investigations show that in the recent phase of globalization there has been a substantial rise in skilled–unskilled wage gap in both the developed and developing countries. As Wood (1997) obtains, except for some East Asian countries, the general trend has been an increase in the ratio of skilled to unskilled wages, i.e., a widening wage gap between skilled and unskilled workers, in most part of the globe since 1970s. Bound and Johnson (1992) observes for US that the ratio of average wage of a college graduate to average wage of a high school graduate rose by 15%. A similar result has also been verified by Leamer (2000) for US. The following table shows the trend of widening wage gap for some developing countries studied by Robbins (1995) (Table 1).

This rise in wage inequality being a great concern for economists, several attempts, as explained below, have been made to provide ex-post justifications. While, for the developed countries, who export mostly skilled intensive commodities, simple trade theory can explain such a rise in wage inequality as an impact of opening up of economies but such theories contradict the rise in wage inequality in the developing countries that primarily export unskilled labor intensive

commodities. The basis for such an observation relate mainly to technology bias towards skilled labor (Lawrence and Slaughter, 1993), increased trade (Leamer, 1994; Borjas and Ramey, 1995) or, outsourcing activities of northern firms to South, with cheaper labor cost as well as large market for their products in South. For example, Feenstra and Hanson (1999) attribute 15% of the rise in wage gap in US to outsourcing by US MNFs. Feenstra and Hanson (1997) show that growth in FDI is positively correlated with a rise in relative demand of skilled labor, which is consistent with the hypothesis that outsourcing by the multinationals has been a significant factor in the rise in demand for skilled labor in Mexico. In another paper by Feenstra and Hanson (1995) a factor endowment model has been presented where one good is produced by continuum of goods ranked with skill intensity. North outsources relatively unskilled intensive products to South, where these are relatively skilled intensive. Thus an inflow of northern capital in South causes a rise in the relative demand for skilled labor in both the countries. Their paper could explain the fall in the relative demand for unskilled labor hence the relative fall in unskilled wage in US during 1980s. Gao (2002) presents a two-country model where outsourcing and skilled–unskilled wage are endogenously determined and shows that globalization, in terms of reduction in trade costs, leads to a rise in both outsourcing and skilled–unskilled wage in both the countries. Glazer and Ranjan (2003) provide another interesting explanation. In a two-country framework, if skilled people consume relatively skilled intensive goods compared to the unskilled people, an increase in supply of skilled labor in either country might result in an increase in demand

\* Monetary Research Project, ICRA Limited (Investment Information & Credit Rating Agency): An Associate of Moody's Investors Service, B-245 (Ground Floor), Lake Gardens, Kolkata-700045, West Bengal, India. Tel.: +91 33 40072196; fax: +91 33 40072195.

E-mail address: [sahana.isi@gmail.com](mailto:sahana.isi@gmail.com).

**Table 1**  
Relative skilled–unskilled wages (secondary/primary): Latin American case.

Country	1976	1989
Chile	2.08	2.11
Mexico	1.41	1.46
Uruguay	1.60	1.62

for skilled labor and raise skilled–unskilled wage gap in both countries. Beaulieu et al. (2004) argue, a reduction in trade barrier in hi-tech sectors might lead to such a rise in wage gap in both developed and developing countries.

In contrast to the above papers that explain the simultaneous rise in wage gaps in both North and South either by trade or by technology, the present paper builds up a simple model of outsourcing and shows that neither technology nor trade alone but *both* taken together are responsible for this recently observed and empirically tested phenomenon. Our conclusion is very similar to that of Zeira (2007) which shows that trade liberalization increases the wage gap in developed countries, but reduces it in less developed countries. Since in recent decades an increase in the wage gap in less developed countries is also observed,<sup>1</sup> he concludes that it cannot be the result of trade liberalization only and one needs to add the effect of skill-biased technical progress, which according to his model increases the wage gap both in developed and in less developed countries. Thus he emphasizes that the widening of the wage gap between skilled and unskilled workers cannot be attributed to any one factor, neither to trade liberalization nor to skill-biased technical progress. In fact, he shows the role of trade liberalization has been rather small. The changes in both the technology and trade are exogenous in his explanation which is in contrast to the present paper where an exogenous technological change raises the wage gap in North and then raises it in South via an endogenous change in trade or outsourcing. Moreover, Zeira (2007) does not take into account outsourcing in his model.

Outsourcing being a very recent phenomenon, so far it has hardly been explored theoretically. A small number of papers on outsourcing exist in the trade literature but in different contexts. For example, Feenstra and Hanson (1996), Egger and Falkinger (2006), Grossman and Helpman (2004), Glass and Saggi (2001), Chen et al. (2004), Zhao (2001). The present paper deviates from these theoretical models of outsourcing by formally modelling outsourcing in a two-country occupational choice framework where both the micro level decisions of each economic agent as well as the macro level outcomes of their decisions in a globally integrated economy are considered and the outsourcing activity of northern firms to South is endogenously determined. In the model, agents in each of the countries have to incur an indivisible education cost for becoming skilled and a fixed set up cost has to be incurred to become entrepreneur. Within each economy people decide over their occupational choice depending upon the inheritance and the returns from different occupations. Entrepreneurs in North take the outsourcing decision in addition. The model is based on the assumption of capital market imperfection that plays a crucial role in strengthening the role of wealth inequality in occupational choice.<sup>2</sup> The paper obtains the result that any technological upgradation in North increases the skilled wage in North via an increase in the productivity of skilled workers there. The paper assumes that the outsourcing firms use the same improved technology i.e., the improved technology is immediately transferred to South by the outsourcing

firms. Thus the skilled wage of the southern laborers working in the outsourcing firms also increases for similar reason. This induces the skilled laborers working in the domestic skilled sector of South to move to the outsourcing firms till the domestic skilled wage catches up with the skilled wage offered by the outsourcing firms. Therefore, given the assumption of a fixed and exogenous unskilled wage, the skilled–unskilled wage gap increases in South purely because of outsourcing or trade reason whereas the increase in the same in North is due to a technological improvement. Thus, it is neither technology nor trade alone but *both* together have resulted in such a rise in skilled–unskilled wage gap in North and South. The paper also investigates some of the major economic impacts of a technological improvement in North on the southern economy. It obtains the condition when the aggregate income of all the southern economic agents falls and the condition of a shrinking domestic skilled sector in South relative to the entire southern skilled sector that includes the outsourcing firms.

The paper is organized as follows. In Section 2 the model economy is presented. The outsourcing equilibrium is explained in Section 2.3, the explanation for the rise in wage gaps in North and South and the change in the outsourcing equilibrium as a result of a technological improvement in North are provided in Section 2.4 and some major economic impacts of the technological improvement in North on the southern economy are discussed in Section 2.5. Finally Section 3 contains the concluding remarks.

## 2. The model

The model utilizes a two-period overlapping generations (OLG) framework. There are two countries, North and South. The northern entrepreneurs can outsource skilled jobs to South.

Each country faces a fixed interest rate due to international mobility of capital. But the credit market is imperfect with a gap between the lending and borrowing rates.

There is only one good in each country. It can be produced in two sectors: one with only unskilled labor (home production type) and the other in which entrepreneurs employ skilled workers. Full employment prevails in both the labor markets.

There are infinitely many altruistic people in each country, with population normalized to unity. An agent's choice with respect to occupational investment and employment in each country is as follows. In the first period of his life, an agent receives an inheritance and decides his occupational choice. If he decides neither to undertake education nor become an entrepreneur, he invests his wealth in the capital market and works as unskilled in the first period. Otherwise, he may choose to invest in education and become a skilled labor or invest in the set up cost and become an entrepreneur. To make any of the above investment decisions, he may borrow from the capital market if he does not have adequate wealth. In case he has adequate wealth, he makes the desired investment and lends the rest of his inheritance to the capital market. In the second period of his life, each individual earns according to the investment made in first period (unskilled people continue to work as unskilled laborers in the second period), consume, and leave a bequest. In this period, people in North who have invested in the set up cost to become entrepreneurs choose whether to outsource jobs in South or to produce in their own country.

Now, let us define North as a foreign economy, '*f*' and South as the domestic economy, '*d*'.

### 2.1. Technologies

The home production sector uses unskilled labor under a linear technology,

$$Y = wL$$

where *L* denotes unskilled labor and *w* is unskilled wage.

<sup>1</sup> Studies by Robbins (1995) covering Chile, Mexico and Uruguay as discussed earlier. In Bangladesh during 1991–92 the overall skilled–unskilled wage ratio widened, though marginally (Yearbook of Labour Statistics (Geneva: ILO, 1999)). Shariff and Gumber (1999) put forward some evidence of growing wage gap in the post-reform periods in almost all sectors of India.

<sup>2</sup> The assumption of capital market imperfection is widely used in the literature of economic development, for example, Galor and Zeira (1993); Banerjee and Newman (1993). Scott (2000) and Oh (2009) find impacts on consumption pattern while capital market is imperfect.

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