



# Trade and the allocation of talent with capital market imperfections<sup>☆</sup>

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## ABSTRACT

Trade liberalization in the 1980s and 1990s has been associated with a sharp increase in the skill premium in *both* developed and developing countries. This is in apparent conflict with neoclassical theory, according to which trade should decrease the relative return on the relatively scarce factor, and thus decrease the skill premium in skill-scarce developing countries. We develop a simple model of trade with talent heterogeneity and capital market imperfections, and show that trade can increase the skill premium in a skill-scarce South that opens up to a skill-abundant North, both in the short run as well as in the long run. We show that trade has two effects: it reduces the skilled wage, and therefore drives non talented agents out of the skilled labor force. It also reduces the cost of subsistence, thereby allowing the talented offspring of unskilled workers to go to school. This compositional effect has a positive effect on the observed skill premium, potentially strong enough to outweigh the decrease in the skilled wage. In our framework, trade liberalization may trigger an increase in the skill-premium in *both* the North and the South.

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## 1. Introduction

One of the most important results in Heckscher–Ohlin models of international trade, the Stolper–Samuelson theorem, predicts that when a country opens up to international trade – and thus, its relative price of skill-intensive goods decreases – the return of unskilled workers should increase, relative to the return of skilled workers.<sup>1</sup> This prediction has been confirmed in a number of unskilled labor-abundant “early globalizers” (such as Italy, Singapore, South Korea and Taiwan) where trade has increased the unskilled wage relative to the skilled wage (thus decreasing the *skill premium*). However in the case of unskilled labor-abundant countries that have globalized in the 1980s and 1990s (such as most of Latin America, India and Hong Kong), trade seems to have *increased* the skill premium, rather than reducing it.<sup>2</sup>

This fact, sometimes called the “skill premium puzzle”, has attracted a fair bit of attention. On the one hand, the trade literature has sought to reconcile the Latin American experience with Heckscher–Ohlin theory (HO from now on) by arguing that trade liberalization disproportionately affected unskilled labor-intensive industries (Revenga, 1997), or that countries such as China, Indonesia and Pakistan made the world outside Latin America actually unskilled labor-abundant (Davis, 1996; Wood, 1999). In these contexts, HO theory would correctly predict an increase in the skill premium in Latin America. One problem with these interpretations is that they predict that skill intensity should have decreased across sectors in Latin America, a prediction that has not been confirmed in the data.<sup>3</sup> In response to these shortcomings, the literature has turned to alternative trade models to explain the generalized increase in wage inequality,<sup>4</sup> or to non-trade explanations, such as, skill biased technical change.

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<sup>1</sup> More precisely, the Stolper–Samuelson theorem predicts that the real return of unskilled workers should increase, whereas the real return of skilled workers should decrease.

<sup>2</sup> This has been documented by micro-studies of at least 7 countries: Chile, Mexico, Colombia, Argentina, Brazil, India and Hong Kong. See the survey by Goldberg and Pavcnik (2007) for more details.

<sup>3</sup> See Goldberg and Pavcnik (2007, p. 59) for a list of empirical papers finding that skill intensity has increased across most industries in Latin America.

<sup>4</sup> For example, Feenstra and Hanson (1996) study the impact of trade liberalization when this is associated with significant outsourcing flows from North to South. They find that this specific type of liberalization may increase the skill premium in both countries. Verhoogen (2008) builds a heterogeneous firm trade model where firms differ in productivity and quality of production, and shows that quality upgrading following trade liberalization may result in a higher relative white-collar wage and higher sectoral wage inequality. Helpman et al. (2010) also work with a heterogeneous firm model, but emphasize labor market frictions and differences in workforce composition across firms. They show that trade increases the dispersion of wages paid by firms, at least in the short run. For an excellent review of these and other recent theoretical developments, see Harrison et al. (2011).

In this paper, we propose a way to reconcile a traditional HO model of trade liberalization between an unskilled labor-abundant South and a skill labor-abundant North with an increase of the skill premium in the South as well as in the North. We do so by enriching the baseline model with talent heterogeneity, human capital accumulation, and credit constraints. The literature on trade liberalization in the presence of credit constraints (discussed below in detail) has shown that trade may increase human capital accumulation by relaxing the credit constraints faced by the poor, thereby improving their access to the education system. We show that when this is the case, trade may improve the allocation of talent to the skilled labor force, both in the short and in the long run. This compositional effect generates an upward pressure on the observed skilled wage, which can be strong enough to overturn the Stolper–Samuelson prediction of a lower skill premium in the South following trade liberalization. While reconciling the Stolper–Samuelson theorem with the Latin American experience, our model preserves the other main features of standard HO theory, including the fact that all industries in the South become more skill-intensive after trade liberalization.<sup>5</sup>

Our mechanism works as follows. Because of capital market imperfections, young agents cannot borrow to pay for their subsistence while attending school. Thus, only those whose parents have a high wage can possibly go to school. In an economy with little human capital, unskilled wages are low, and the cost of subsistence is high relative to the income of unskilled workers. This creates one equilibrium in which there are few skilled workers, the skilled wage is high, and all and only the offspring of skilled workers go to school. With heterogeneous talent, this equilibrium is “bad” in efficiency terms, in that many talented offspring of unskilled workers are prevented from going to school while many offspring of skilled workers go to school despite being non-talented. This is in contrast to a “good” equilibrium in which there are many skilled workers, the skilled wage is low, and all and only the talented workers go to school independently of the economic status of their families.

We consider an economy that is skill-scarce because it is stuck at the bad equilibrium, and study its reaction to the liberalization of trade with a skill-abundant world. By putting a downward pressure on the skilled wage, trade may induce many non-talented skilled workers to drop out of the skilled labor force. At the same time, it reduces the cost of subsistence for unskilled workers, thus making it easier for their offspring to go to school. Because many of these previously-excluded agents are highly talented, they may still find it optimal to join the skilled labor force despite the trade-induced drop in the skilled wage. These two effects may move the economy from its initial equilibrium to the good equilibrium, thus increasing the average quality of the skilled labor force. This creates an upward force on the average observed skill premium, that can more than compensate the negative effect of trade on the skilled wage. Thus, the skill premium may increase in the skill-scarce country, both in the short run and in the long run.<sup>6</sup> Our results suggest that the Stolper–Samuelson theorem needs to be modified in the context of talent heterogeneity and imperfect credit markets, to account for the possibility of compositional changes in the skilled labor force.

<sup>5</sup> Another HO feature that is preserved in our model is the fact that labor reallocates towards labor-intensive industries in the South. While Verhoogen (2008) finds evidence of such reallocation for Mexico, Wacziarg and Wallack (2004) find little evidence of labor re-allocation across sectors following trade liberalization in a sample of 20 countries. Importantly, we argue that our mechanism would survive if we allowed for labor market frictions (such as a high cost of firing) to slow down the inter-sectoral reallocation of labor. Rigid labor market has been indicated as one of the main reasons why labor reallocation to industries where a country has comparative advantage has been very slow in many countries (see, for example, Kambourov, 2009).

<sup>6</sup> A similar result applies in the two-country version of the model (see the working paper version of the paper: Bonfatti and Ghatak, 2011). There, we show that trade may increase the skill premium in the skill-scarce country, while it always increases it in the skill-abundant country.

The literature on trade with capital market imperfections is now quite large. An important part of it has focused on how comparative advantage and the pattern of trade are determined by cross country heterogeneity in the efficiency of capital markets (see for example Kletzer and Bardhan, 1987; Wynne, 2005; and Manova, 2008). Although our result is compatible with the idea that comparative advantage in the export of skill-intensive products may be driven by differences in capital market development, the focus of our paper is different. More connected to our paper is the literature on trade liberalization and skill acquisition in the presence of credit market frictions. This literature has studied several ways in which trade liberalization may affect domestic credit constraints and, through this channel, skill acquisition. In an important contribution Cartiglia (1997) shows that trade liberalization reduces the cost of schooling in a skill-scarce South by reducing the relative wage of skilled workers à la Stolper–Samuelson, thus making it easier for poor, credit constrained households to send their children to school. This effect may be large enough to offset the standard result that trade discourages the accumulation of the scarce factor (via the Stolper–Samuelson decrease in its relative return; see Findlay and Kierzkowski, 1983, and Grossman and Helpman, 1991), thus creating a positive association between trade liberalization and skill accumulation in the South. Ranjan (2001a, 2003) enriches the setting in Cartiglia (1997) by studying how trade may affect credit constraints also through the distribution of income and wealth. The main intuition here is that trade increases (decreases) the wage income and long-run wealth of unskilled workers in the South (North). Assuming that credit constraints affect mainly the children of unskilled workers, trade results in a lessening of credit constraints in the South, and a strengthening of credit constraints in the North (unless credit constraints are institutionally less present in the North).<sup>7</sup> Building on this latter result, Chesnokova and Krishna (2009) show that the supply of skill-intensive goods in the North may actually decrease following trade liberalization, due to a strengthening of credit constraints. This carries the intriguing implication that trade may decrease welfare in such a country.<sup>8</sup>

We borrow from this literature the basic insight that, in the presence of credit constraints, trade may increase the supply of skilled labor in the South. In particular, our result that trade may shift South from a low-skill equilibrium to a high-skill equilibrium in the long run has much in common with the results in Ranjan (2003). Our main innovation lies in the introduction of the kind of talent heterogeneity that maps into heterogeneity in *productivity per worker*. This allows us to investigate the compositional effects of the trade-induced increase in the skilled-labor supply.<sup>9</sup> Our main finding – that trade may lead to an increase in the observed skill premium – is novel to the literature.<sup>10</sup> It points to the importance of considering compositional effects of trade

<sup>7</sup> In contrast with this literature, Chesnokova (2007) provides an interesting example in which, rather than lessening the credit constraints of workers in comparative advantage sectors, trade strengthens the credit constraints of workers in non-comparative advantage sectors. This may lead to underinvestment in non-comparative advantage sectors, possibly making trade liberalization welfare-decreasing.

<sup>8</sup> Our paper is also related to the literature on trade, credit constraints and child labor, see in particular Ranjan (2001b).

<sup>9</sup> Ranjan (2003) and Chesnokova and Krishna (2009) assume talent heterogeneity that maps into heterogeneity in the *cost of education*. While yielding similar predictions for the impact of trade on the supply of skilled labor, this approach is not well-suited to investigate the impact of trade on the average productivity of the skilled labor force. Ranjan (2001a) and Das (2005) assume talent heterogeneity that maps into heterogeneity in productivity per worker. They do not, however, look at the consequences of this for the distribution of productivity in the skilled labor force.

<sup>10</sup> Bardhan et al. (2010) have also argued that trade liberalization in the presence of credit constraint may lead to an increase in wage inequality in South. Their mechanism is, however, substantially different from our own. In their model, credit constraints allow only a few Southern entrepreneurs (or “managers”) to invest in scale, which is a pre-requisite for accessing a market of quality-conscious consumers in North. This creates reputational rents for managers in labor-intensive industries in the South. In this context, an export-led boom in the labor-intensive industries in the South may lead to higher reputational rents and skill premium in this country.

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