



# Globalization and firm level adjustment with imperfect labor markets<sup>☆</sup>

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## ABSTRACT

In a model with search generated unemployment and heterogeneity on both sides of the labor market, exporting firms are bigger and pay higher wages than other firms. Moreover, there is imperfect persistence in the decision to export and liberalization increases the wage gap between high- and low-skill workers. Openness can increase aggregate productivity in export-oriented markets while generating within-firm productivity losses for the weakest firms. In contrast, openness can lead to within-firm productivity gains for the weakest firms in import-competing industries.

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## 1. Introduction

Even within narrowly defined industries, firms that produce similar products often use technologies with different levels of sophistication, employ different occupational mixes of workers and pay different wages. If one looks for patterns across firms, then recent findings suggest that firms that adopt more modern technologies tend to employ more highly-skilled workers and pay higher wages than their counterparts (Doms et al., 1997). The purpose of this paper is to show that by combining this insight with the fact that unemployed workers must search for jobs, we are able to develop a simple model of a product market that is consistent with a large number of the stylized facts about industry dynamics in open economies and the impact of openness on productivity and wages.

The stylized facts of interest can be found in two related strands of the literature. One strand consists of firm and plant level studies that establish the existence of significant differences between firms that export and those that do not. Exporting firms are typically larger, more capital intensive, more productive and pay higher wages than their counterparts (Bernard and Jensen, 1999a). These studies also indicate that there is “imperfect persistence” in the export decision in that firms often change their export position from one period to the next (Roberts and Tybout, 1997; Bernard and Jensen, 1999a).<sup>1</sup>

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<sup>1</sup> These studies also find that firms typically export only a fraction of their output (Bernard and Jensen, 1999a). As will become evident, this feature is absent from our model due to our assumption of perfect competition in the product market. We could generate this outcome by allowing for monopolistic competition, but have chosen not to do so in order to keep the analysis tractable.

Related studies have focused on the impact of openness on productivity at the firm and industry levels. One key finding in this strand of the literature is that openness tends to enhance productivity, although the mechanism is unclear.<sup>2</sup> At least three possible explanations have been offered. First, openness may allow exporting firms to take advantage of scale effects as they expand. Second, there may be increases in total factor productivity at the firm level, perhaps due to “learning-by-exporting.” Third, since more efficient firms tend to export, liberalization may lead to a reallocation of market shares away from the least productive firms, resulting in higher aggregate productivity. Note that in the latter case, there are no within-firm productivity gains, only an increase in average productivity at the industry level.

Empirical studies do not offer much support for the scale effect explanation (Tybout, 2003), and provide mixed findings for the two other theories. Aggregate productivity gains in export-oriented industries are largely attributed to the fact that (1) it is the relatively efficient firms that choose to export; and (2) openness seems to trigger a reallocation in market shares in favor of these firms (Bernard and Jensen, 1999b; Pavcnik, 2002). It has been difficult to find evidence of within-firm productivity gains in export markets (Clerides et al., 1998; Bernard and Jensen, 1999a,b; Aw et al., 2004).<sup>3</sup> On the other hand, there is evidence of within-firm productivity gains in *import-competing* markets (Pavcnik, 2002; Fernandes, 2007; Topalova, 2007).

Motivated by these stylized facts, we develop a model where the product market is perfectly competitive but the labor market is beset by frictions. Specifically, our labor market is based on Albrecht and Vroman (2002) where workers with different skill levels search across firms for a job while initially identical firms must choose the type of technology to adopt. In equilibrium, some firms adopt a basic technology, employ relatively low-skilled workers and pay low wages, whereas others adopt a more advanced technology, employ high-skilled workers and pay high wages. One of the key features of the model is that if the revenues generated by the two different types of firms are sufficiently close, it is possible for underemployment to emerge in equilibrium. This occurs when high-skill workers, who are better suited for employment at high-tech firms, accept low-tech jobs because they happen to match with them first. Consistent with other models of firm heterogeneity, we show in the current setting that it is the largest, most productive firms paying the highest wages that face the strongest incentives to export. Moreover, we show that imperfect persistence may arise when equilibrium is characterized by underemployment. This occurs whenever low-tech firms that are matched with high-skill workers prefer to export their output while low-tech firms that are matched with low-skill workers prefer to sell their output domestically. Thus, our model predicts that the weakest firms in the industry may change their export position when the skill mix of its employee base changes.

When we turn to the impact of openness on productivity, we find that the relationship is complicated by the fact that there are two types of equilibria that are possible. Following Albrecht and Vroman, we define a “Cross-Skill Matching” (CSM) equilibrium as one in which high-skill workers will accept low-tech jobs (i.e., they are mismatched) and an “Ex-Post Segmentation” (EPS) equilibrium as one in which they are not willing to do so. If the economy starts in a CSM equilibrium and remains in one after liberalization, then we find that openness enhances productivity in export-oriented markets by reallocating market shares in favor of high-tech firms. However, within-firm productivity is unchanged. As for wages, since openness increases the surplus created by high-tech matches, high-skill workers employed by high-tech firms gain from liberalization. This increases the outside opportunities for high-skill workers with low-tech jobs, forcing the low-tech firms to increase the wages of these workers as well. On the other hand, since the number of low-tech firms shrinks, low-skill workers see their bargaining power eroded and may therefore lose from liberalization.

The fact that liberalization increases the spread between the revenues earned by the two types of firms opens up the possibility that it could cause the economy to move from a CSM equilibrium to an EPS equilibrium. When this occurs, liberalization's impact on productivity and wages is somewhat different. The main reason for this is that when high-skill workers start rejecting low-tech jobs, the number of low-tech firms falls dramatically. As a result, the aggregate productivity gains can be quite large and there is a greater likelihood that low-skill wages fall. In addition, since low-tech firms can now only attract low-skill workers, there are within-firm productivity losses for these firms. Thus, this case yields a surprising prediction: openness can dramatically increase aggregate productivity in export-oriented industries while generating within-firm productivity losses for the weakest firms.

In the latter part of the paper we examine the impact of openness on productivity in import-competing industries. Since import competition *reduces* the gap between the revenues earned by the two types of firms, it opens up the possibility that liberalization could shift the market from an EPS equilibrium to a CSM equilibrium. If so, then the fact that high-skill workers start to accept low-tech jobs means that import competition will generate within-firm productivity gains for low-tech firms.

Our model can be viewed as a contribution along the lines of Melitz (2003), Bernard et al. (2003) and Yeaple (2005). These papers attempt to explain why exporting firms are different from their counterparts, and generate aggregate productivity gains as the result of market share reallocations. In Melitz (2003) and Bernard et al. (2003), heterogeneity on the firm side is exogenous in that productivity is determined by a random draw. Firms make their exporting decision after learning their productivity, and, as in our setting, it is the high-productivity firms that choose to export. Openness then leads to a reallocation of market shares towards high-productivity firms and results in some low-productivity firms exiting the market. Yeaple (2005) generates endogenous heterogeneity across firms in the same manner that we do: initially identical firms make technology choices knowing that different choices allow them to employ different types of workers.<sup>4</sup> He shows that since the high-tech firms gain more from exporting, they

<sup>2</sup> For a survey of this literature see Tybout (2003).

<sup>3</sup> This is actually quite a complex issue. Many papers report increases in productivity just before a firm starts to export that persist and grow after exporting starts. Since the initial increase in productivity comes *before* the firm starts to export, papers such as those cited in the text, view this as something other than “learning-by-exporting.” However, others such as Castellani (2002), Baldwin and Gu (2003, 2004), Blalock and Gertler (2004), Girma et al. (2004), Van Biesebroeck (2005) and Greenaway and Kneller (in press) point to the productivity gains *after* exporting begins and conclude that there is evidence of learning-by-exporting.

<sup>4</sup> In our opinion, Yeaple's approach is more satisfying since the firm-side heterogeneity is a direct result of profit-maximizing decisions made by the firms.

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