



# Wage Effects of Trade Reform with Endogenous Worker Mobility<sup>☆</sup>



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## ABSTRACT

In this paper, we use a linked employer–employee database from Brazil to evaluate the wage effects of trade reform. With an aggregate (firm-level) analysis of this question, we find that a decline in trade protection is associated with an increase in average wages in exporting firms relative to domestic firms, consistent with earlier studies. However, using disaggregated, employer–employee level data, and allowing for the endogenous assignment of workers to firms due to match-specific productivity, we find that the premium paid to workers at exporting firms is economically and statistically insignificant, as is the differential impact of trade openness on the wages of workers at exporting firms relative to otherwise identical workers at domestic firms. We also find that workforce composition improves systematically in exporting firms, in terms of the combination of worker ability and the quality of worker–firm matches, post-liberalization. These results stand in stark contrast to the findings reported in many earlier studies and underscore the importance of endogenous matching and, more generally, non-random labor market allocation mechanisms, in determining the effects of trade policy changes on wages.

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## 1. Introduction

Central to academic and policy discussions about the process of globalization is the question of how greater trade openness impacts the labor market and the distribution of incomes in society. More narrowly, the theoretical literature in trade has recently focused on the question of whether the wage effects of trade depend upon the mode of globalization of the firm at which the worker is employed; that is, whether workers employed at exporting firms earn higher wages and experience different wage changes following trade liberalization than workers employed at non-exporting firms.

This theoretical literature offers a wide range of predictions concerning the distributional impact of trade liberalization. In neoclassical settings with competitive goods and factor markets, identical workers must earn identical wages; trade does not differentially impact the wages of workers based on the nature of the firm at which the worker is employed. However, product markets and the labor market may both be imperfectly competitive. For instance, monopolistically competitive firms of heterogeneous productivity, as in Melitz (2003), may engage in rent-sharing with homogeneous and randomly-allocated workers, as in Egger and Kreckemeier (2009) and Amiti and Davis (2012). In this case, the wages of workers employed in the more productive, exporting firms, which experience a relative improvement in profits or market share after a decline in protection, may increase compared to workers employed in firms serving only the domestic market.<sup>1</sup> Alternatively, exporters wishing to improve their product quality for foreign markets could respond to a decline in protection by paying (higher) efficiency wages in order to induce increased effort from otherwise identical

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<sup>1</sup> This follows the logic of the well-known framework of Melitz (2003) with heterogeneous, monopolistically competitive firms, where the relative profits of exporting firms compared to non-exporting firms will rise with trade liberalization, undertaken unilaterally by the liberalizing country or on a reciprocal basis with liberalizing partners. Likewise, the disciplining effect of product-market competition and foreign entry in product markets after trade reform may erode mark-ups and hence rents especially in firms serving solely the domestic market (Levinsohn (1993) and Hay (2001)). In addition, improved access to cheaper and a wider variety of imported inputs may result in export market entry through an improvement in firm-level productivity (Amiti and Konings (2007)) or the introduction of new final goods (Goldberg et al. (2010)).

workers (as in Verhoogen (2008), Frías et al. (2009), and Davis and Harrigan (2011)). Moreover, if the labor allocation process is non-random and characterized by complementarities between (unobservable) worker quality and firm technology, as in Yeaple (2005), or subject to search and (*ex-ante* unobservable) worker–firm-specific matching frictions, as in Helpman et al. (2010) and Davidson et al. (2008), the opening of the economy to trade may increase inequality by increasing the wage gap between workers employed in exporting and non-exporting firms. Thus, the theoretical predictions concerning the impact of trade liberalization on the wages of identical workers employed at exporting and non-exporting firms depend variously upon assumptions about the competitiveness of the labor market, the nature of the labor allocation process matching workers with firms, and the interplay of these factors with the product market structure, among other things. For this reason, empirical analysis, which allows for these various possibilities, is necessary to evaluate the actual outcomes.

A number of previous studies have indeed examined the links between trade and average firm-level wages, finding a relative increase in wages for workers at exporting firms post-trade reform (see, for example, Amity and Davis (2012)). We argue, however, that the analysis of average firm-level wages, although informative, is incomplete along several dimensions. First, it cannot fully account for the impact of a change in trade barriers on workforce composition in terms of observable worker characteristics that are not available in most firm-level datasets. Firm-level analyses also cannot account for factors that are observable to the managers of the firm, and hence impact wages, but are unobservable in the data, such as the innate (time-invariant) ability of the worker and any additional productivity that arises in the context of employment in the specific firm due, for example, to production complementarities between the worker and the firm (match-specific ability). Finally, the firm-level analysis is undertaken under the assumption that the assignment of workers to firms is conditionally random (conditional on the observable characteristics of workers and firms), thus ignoring the sorting of workers into firms based on unobservable characteristics, and any changes in the distribution of match-specific ability across firms following trade liberalization.

Our paper empirically studies the question of whether trade openness affects differently workers employed in firms with different modes of globalization, placing particular emphasis on the possibility of the non-random matching of workers to firms. We use a matched employer–employee dataset from Brazil for the years 1990–1998 (covering the country's main trade liberalization episode), which traces individually-identifiable workers across employers over time and contains detailed information on wages and worker characteristics.<sup>2</sup>

While our analysis is primarily conducted at the disaggregated level of individual workers, in order to ensure the comparability of our results with earlier work, we begin by studying the links between trade and aggregate (average) firm-level wages instead. Consistent with earlier findings in the literature, we observe that a decline in trade protection is associated with an increase in average wages in exporting firms relative to domestic firms. However, as we have already discussed, this analysis is potentially problematic as it ignores the endogenous sorting of workers based on unobservables. We test for this possibility and find that the data indeed decisively reject the assumption of exogenous worker mobility.<sup>3</sup> We then evaluate the wage effects of trade reform

<sup>2</sup> There is a small but growing literature exploring the links between trade openness and wages using matched employer–employee data. See for instance, Frías et al. (2009) on wage differentials between exporting and non-exporting firms following a depreciation in Mexico; Hummels et al. (forthcoming) on the impact of outsourcing on wages in Denmark; Davidson et al. (2010) on the impact of globalization on efficiency of labor market sorting in Sweden and, Helpman et al. (2013) on the effect of trade on inequality in Brazil.

<sup>3</sup> Specifically, as we discuss in Section 4, we test whether wage behavior at the worker level confirms the maintained assumption of conditionally random worker–firm assignment (conditional on observable characteristics of workers and firms) using a test statistic introduced in Abowd et al. (2010).

by allowing for the non-random matching of workers with firms based on time-invariant, worker–firm-specific productivity effects.

Our main finding is that, once we use detailed information on worker and firm characteristics to control for compositional effects and allow for the endogenous assignment of workers to firms which may arise due to unobserved (time-invariant) firm–worker match-specific productivity, the data indicate an economically and statistically insignificant differential effect of trade openness on wages at exporting firms relative to domestic firms. Moreover, we find that once we allow for match-specific productivity, the premium paid to workers at exporting firms is also economically and statistically insignificant.<sup>4</sup> In addition, consistent with the models of Yeaple (2005), Davidson et al. (2008), and Helpman et al. (2010), we find that workforce composition, in terms of innate worker ability and the quality of worker–firm matches, improves systematically in exporting firms relative to domestic firms following liberalization.<sup>5</sup> This finding serves to explain the difference between the results at the firm level and those at the worker level. If average (innate or match-specific) worker ability improves systematically in exporting firms following trade liberalization, and this change is not addressed, it will appear that trade liberalization leads to a differential wage improvement for workers at exporting firms.

Our findings imply that following trade liberalization, a given worker (with fixed innate ability) who continues to be employed at a given exporting firm (with fixed worker–firm match-specific ability) will not experience any differential effect on her wage relative to another worker who continues to be employed at a non-exporting firm. *Ceteris paribus*, a worker who transitions to a firm with which she is better matched will, however, earn a higher wage because of her higher productivity there. Nevertheless, exporting firms will pay a differentially higher average wage post-liberalization because of the improvement in the composition of the workforce in terms of innate worker ability and worker–firm match quality.

In sum, our main result of an insignificant differential effect of trade on the wages of workers employed at exporting and non-exporting firms suggests a different picture of the links between trade liberalization and wages than that obtained by analyzing the data at a more aggregate (firm) level and underscores the importance of allowing for labor market frictions and endogenous matching in studying the effects of trade policy changes on wages. To our knowledge, this paper is the first in the trade literature to highlight the problematic issue of the endogenous mobility of workers across firms and its potential to lead to biased parameter estimates regarding the link between trade and wages.<sup>6</sup> We believe this to be the core contribution of our paper.

The remainder of this paper is organized as follows. Section 2 presents a background discussion on Brazil's trade policy reforms and describes the data we use. We begin our analysis of the data by presenting, in Section 3, the empirical methodology and estimation results for the aggregate (firm-level) analysis. In Section 4, we discuss endogenous worker mobility and its relevance in our empirical context. Section 5 describes the results we obtain using matched employer–employee data, and Section 6 concludes.

<sup>4</sup> This finding is consistent with Schank et al. (2007) who report an insignificant export-premium for Germany using matched worker–firm data.

<sup>5</sup> Though our findings are consistent with the predictions of Yeaple (2005), Davidson et al. (2008), and Helpman et al. (2010), we do not attempt to distinguish between the specific channels highlighted in these various models.

<sup>6</sup> As we will discuss in greater detail later in the paper, our estimation methodology, which allows for time-invariant worker–firm match effects in the specification, does not “solve” the problem of endogenous mobility (as worker mobility may also depend upon time-varying match effects). However, by taking time-invariant match effects into account, our specification corrects for endogenous mobility that is based on time-invariant match productivity and thus proceeds under weaker assumptions than much of the previous literature that has investigated these questions. Furthermore, in an additional test, we allow for a particular form of time variation in the worker–firm effects, by allowing for the magnitude of the worker–firm match effect to change when firms change export status, and find that our results are not affected by this modification.

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