

# Foreign Ownership, Employment and Wages in Brazil: Evidence from Acquisitions, Divestments and Job Movers\*

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## Abstract

How much do developing countries benefit from foreign investment? We contribute to this question by comparing the employment and wage practices of foreign and domestic firms in Brazil, using detailed matched firm-worker panel data. In order to control for unobserved worker differences, we examine both foreign acquisitions and divestments and worker mobility, including the joint estimation of firm and worker fixed effects. We find that changes in ownership do not tend to affect wages significantly, a result that holds both at the worker- and firm-levels. However, divestments are related to large job cuts, unlike acquisitions. On the other hand, movers from foreign to domestic firms take larger wage cuts than movers from domestic to foreign firms. Moreover, on average, the fixed effects of foreign firms are considerably larger than those of domestic firms, while worker selection effects are relatively small.

*Keywords:* Foreign Direct Investment, Ownership Changes, Worker Mobility.

*JEL Codes:* J31, J63, F23.

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# 1 Introduction

How much do developing countries benefit from foreign investment? This is a question with important implications in terms of how globalisation is perceived across the world. In fact, the popular assessment of the international benefits of globalisation is perhaps still influenced by the view that multinationals operate ‘sweatshops’ in developing countries. However, a considerable body of academic work indicates that foreign firms pay higher wages than domestic firms in several developing countries (Aitken et al. (1996), Velde & Morrissey (2003), Lipsey & Sjöholm (2004), etc).

In this paper, we study the case of Brazil, a large developing country which has so far not been examined in the literature about foreign-firm wage differentials. Brazil is also an interesting country to study due to the richness of its data, including a detailed matched employer-employee panel data set that we use here. The quality of the data allows us to make a contribution to the literature (which in most cases uses firm-level data, at least when considering developing countries) also on a methodological level. Specifically, we seek to address the unobserved heterogeneity problem that workers in foreign and domestic firms may be different along dimensions not quantified in the data (Abowd et al. 1999).

In order to provide a robust contribution to our understanding of the foreign-firm wage premium in developing countries, our paper pursues four different but complementary approaches. First, we examine the evolution of wages as firms change ownership type (domestic or foreign), considering not only the case of acquisitions, when domestic firms become foreign-owned (as in Conyon et al. (2002), Lipsey & Sjöholm (2006), etc), but also divestments, when foreign firms are sold to domestic investors. In our view, divestments can be as informative as acquisitions. Moreover, divestments are also interesting in their own right, particularly if one believes that ‘footloose’ multinationals are an important fact of life in a globalised world.

Our second approach involves conducting our analysis not only at the firm level but also at the worker level (Martins (2004), Heyman et al. (2007), Andrews et al. (2007), Earle & Telegdy (2007)). By considering the two levels of analysis, we are able to understand if any changes in firm-level wages that may be observed following acquisition or divestment are due to compositional differences in the workforce. Indeed, even a large set of firm-level human capital controls may not appropriately pick up workforce differences across different owners.

Third, in order to address such compositional issues in more detail, we also study how job

and worker flows evolve as firms change ownership, not only immediately after (i.e. in the first year under new ownership) but also over time. In fact, this aspect strikes us as an important oversight in most of the research about the foreign-firm wage premium, as wages tend to be studied in isolation from employment levels, although the two variables are presumably strongly related.<sup>1</sup>

Finally, we also address the unobserved heterogeneity problem mentioned above by following the same workers as they move across different domestic and foreign firms (Martins 2008). This topic has received attention recently, although the focus has been on FDI spillovers embodied in workers that move from foreign to domestic firms (Martins 2006, Poole 2007, Balsvik 2008), rather than on wage differentials between the two types of firms. Moreover, we are amongst the first to estimate jointly worker and firm fixed effects (Abowd et al. 2002) in the international economics literature. Again, this type of analysis is only possible with matched employer-employee panel data as the one we use here, so that one can follow workers over time, at different employers.

To the best of our knowledge, this is one of only two papers that considers both acquisitions and worker mobility while also studying changes from domestic to foreign firms and vice-versa. The other paper employing a similar approach is Andrews et al. (2007), which considers the case of Germany.<sup>2</sup> However, as far as we know, our paper is the first to examine foreign-firm wage differentials in a developing country using matched employer-employee panel data. As mentioned above, we also pay particular attention to employment flows and to the contrast between the firm- and the worker-levels of analysis, unlike most of the literature.

In our results, based on a matched sample of about 1350 manufacturing-sector firms, observed from 1995 to 1999, and a total of about 3.3 million worker-years, we find that both acquisitions and divestments do not tend to affect wages significantly. However, although this result holds simultaneously at the firm- and the worker-levels, divestments are related to large job cuts, while acquisitions are not followed by significant employment differences. Moreover, movers from foreign to domestic firms take larger wage cuts than movers from domestic to foreign firms (and the latter in many cases see their pay increase or at least not decrease). Finally, when estimating worker and firm fixed effects simultaneously, we find that the fixed effects of foreign

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<sup>1</sup>See Lichtenberg & Siegel (1990) for an early study of the employment effects of mergers and acquisitions.

<sup>2</sup>Andrews et al. (2007) examine approximately 14,000 firms in 2000 and 2004, across East and West Germany, and focus on the case of acquisitions. In some analyses they also assume random mobility and estimate worker and firm effects simultaneously. Overall, their results indicate small 'takeover' effects of domestic firms by foreign investors, not exceeding 3%. See Andrews et al. (2007) also for a detailed survey of the literature on the foreign-firm pay premium.

firms are on average considerably large than those of domestic firms. On the other hand, the differences in the worker fixed effects are minor.

The structure of the paper is as follows: Section 2 introduces the data; Sections 3 and 4 describe the firm- and worker-level analysis, respectively; and Section 5 discusses the results.

## 2 Data

The main data set used in this paper is RAIS (‘Relação Anual de Informações Sociais’, Annual Social Data Report), a census of all firms and all their formal-sector employees in Brazil conducted by the Ministry of Labour. The data include detailed information about each employee (wages, hours worked, education, age, tenure, gender, worker nationality, etc) and each firm (industry, region, size, establishment type, etc) in each year, plus a unique identifier for each employee, each establishment and each firm.<sup>3</sup>

Although RAIS is particularly rich, it does not include information on (foreign) firm ownership. In order to use such information, we draw on two additional firm-level data sources that we merge in using a common firm identifier. The first data source is CCE (Foreign Capitals Census), a census conducted every five years by the Central Bank of Brazil. These data consider all firms which have at least 50% of their capital owned by foreign investors. Moreover, the census collects detailed information about the foreign ownership structure of firms based in Brazil, including additional data such as exports, imports, location, activity sector, number of employees. We use the information from the 1995 census in order to classify each firm in our sample as domestic or foreign in that first year of our analysis.

The second additional firm-level data source we use is the information compiled by DeNegri (2003) about firms that changed their foreign/domestic nature after 1995. In order to obtain this information, DeNegri (2003) examined a third data set, PIA (Yearly Manufacturing Survey), which is conducted across all firms in the manufacturing sector with at least 30 employees plus a sample of firms with between 5 and 30 employees. PIA includes data about changes in firm ownership in each firm. Based on this information, DeNegri (2003) establishes if and in which year firms change their domestic/foreign status between 1995 and 2000.

When creating our data set, we decided to consider only (manufacturing sector) firms with at least 100 employees in 1995. While the firm size threshold is originally designed to meet our computational constraints, in fact such threshold is not particularly binding. As most foreign

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<sup>3</sup>See Appendix D for more details on RAIS. See also Martins & Esteves (2006) for a recent application.

firms in Brazil and elsewhere employ 100 or more workers, a rigorous ‘like-for-like’ comparison of domestic and foreign firms would in fact require disregarding smaller firms. Furthermore, in order to ensure we draw on a homogeneous group of firms, we conducted a propensity score matching analysis (Rosenbaum & Rubin 1983) to remove from our sample those firms that displayed ‘non-comparable’ observable characteristics in 1995.

Specifically, we adopted a ‘nearest-neighbour’ matching method, so that each foreign firm was matched to its most ‘similar’ domestic counterpart (in terms of their characteristics in 1995, as indicated by the propensity score). In the construction of this propensity score, we used a large set of covariates, including three-digit industry dummies, state dummies, and quadratics in firm size and the level of exports and in the averages of worker age, gender, schooling and tenure. Moreover, we also imposed a ‘common support’ condition, so that foreign firms which could not be matched (because their propensity score was ‘too’ different - more than 0.01 different - from the propensity score of the ‘closest’ domestic firm) were dropped from the data.<sup>4</sup> Finally, after selecting the matched firms in 1995, a total 678 foreign firms and 669 domestic firms, we finally match in their data for 1996 to 1999.

It is due to the richness of the data and/or our computational constraints that we consider in our analysis a period of not more than five years (1995 to 1999). Although this time frame is not particularly long, it is important to underline that this was a period characterised by a large number of mergers and acquisitions in Brazil (KPMG 2001). As mentioned in the Introduction, such changes in firm ownership play a very important role in the identification strategy adopted here. Moreover, Brazil also followed the international trend of increasing foreign direct investment flows over the period, as can be seen in Figure 1.

As only a small number of firms exit the data, there is a total of 6,337 firm-year observations. Moreover, about 8% of the firms in the data exhibit a change in foreign/domestic ownership - a total of exactly 100 changes, 51 of which being acquisitions (domestic firms acquired by foreign investors) and the remaining 49 divestments. As to the time distributions of the ownership changes, while the divestments are spread out over the 1996-1999 period, the acquisitions are very strongly concentrated in 1997, which was in fact a ‘boom year’ for such forms of firm entry/expansion (KPMG 2001). There are more than 1.1 million individuals, observed approximately 3.3 million times. 1.8 million of these worker-years are employed in foreign firms.

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<sup>4</sup>We also checked that the balancing of the covariates across the matched foreign and domestic firms was ‘satisfactory’. For instance, the pseudo  $R^2$  from the estimation of the propensity score, including all variables mentioned above and using only the matched firms, falls to less than 5%. These results are available upon request.

### 3 Firm-level analysis

#### 3.1 Descriptive statistics

Given the richness of the data, we consider a large set of firm- and worker-level variables in our analysis. Most of these variables are derived directly from the original data set, but other variables were constructed by us, based on such original variables. The latter group includes worker flow variables, which are created from the worker-level data and then merged back into the firm-level data.

All flow variables (job and workers) are defined in the way that has become standard in the literature (Davis et al. 1996). Each rate is constructed by dividing a given flow by the average employment of the firm over the two periods analysed. Specifically, the job creation rate is defined as  $JC_t = \frac{L_t - L_{t-1}}{0.5(L_t + L_{t-1})}$ , if  $L_t > L_{t-1}$ , or  $JC_t = 0$ , if  $L_t < L_{t-1}$ , in which  $L_t$  denotes the number of workers in period  $t$ . Similarly, the job destruction rate is defined as  $JD_t = \frac{L_t - L_{t-1}}{0.5(L_t + L_{t-1})}$ , if  $L_t < L_{t-1}$ , or  $JD_t = 0$ , if  $L_t > L_{t-1}$ . Moreover, the net job creation rate ( $NJCR_t$ ) corresponds to  $JC_t - JD_t$  and the job reallocation rate ( $JR_t$ ) is  $JC_t + JD_t$ .

In terms of worker flows, the hiring rate is  $H_t = \frac{Hirings_{t,t-1}}{0.5(L_t + L_{t-1})}$ , in which  $Hirings_{t,t-1}$  denotes the number of workers present in the firm in the period  $t$  but not in period  $t - 1$ , and the separation rate is  $S = \frac{Separations_{t,t-1}}{0.5(L_t + L_{t-1})}$ , in which  $Separations_{t,t-1}$  denotes the number of workers present in the firm in the period  $t - 1$  but not in period  $t$ . Finally, the worker reallocation rate ( $WR_t$ ) is  $H_t + S_t$ , and the churning rate ( $CR_t$ ), a measure of ‘excessive turnover’ (Burgess et al. 2000), is defined here as  $WR_t - JR_t$ .

Before conducting regression analyses, we provide some comparisons from the raw data. We compare three types of firms, the first category (Table 1) corresponding to firms that do not switch nationality, i.e. either firms that are always domestic owned (left-hand-side columns) or firms that are always foreign owned (right-hand-side columns). The second type of firms corresponds to acquisitions - domestic firms that are acquired by foreign investors (Table 2), in which the left-hand-side columns describe those firms before they undergo their change in ownership and the right-hand-side columns describe those firms after the change in ownership. Finally, the third category (Table 3) corresponds to divestments - foreign firms that are acquired by domestic investors. Again, the left-hand-side columns describe those firms before they undergo their change in ownership and the right-hand-side columns describe those firms after the change in ownership. In all tables, the very last column displays the  $p$ -value of the test of the equality

of the means of each variables across the two subsamples.

Each table describes average worker characteristics of each firm-year, in which all firm-years are weighted equally, regardless of firm size. Besides the standard human capital variables (schooling, experience, gender, tenure), and real wages and real wage growth, we also present information about the workers' nationality (Brazilian or non-Brazilian). Finally, we also include descriptive statistics about job and worker flows and year dummy variables.

First, when comparing always-domestic and always-foreign firms (Table 1), we find that, amongst other differences, the latter group exhibits more educated workers, a greater percentage of foreign workers (1.8% against 0.6%), larger firms and higher log wages (2.61 against 2.05). Job and worker flows are also different, as foreign firms exhibit less job destruction (and more net job creation), and also less worker reallocation and churning.<sup>5</sup>

Table 2 compares firms before and after they are acquired (i.e. before and after they move from domestic to foreign ownership). We find that average education increases, that the female share falls considerably, while firm size falls only marginally (and not significantly). Job reallocation increases while churning falls but not significantly.

Finally, Table 3 compares the same firms, before and after they are divested (i.e. before and after they move from foreign to domestic ownership). We find that, again, the female share falls considerably and so does the firm size (from 230 to 97 workers), while the remaining variables generally do not change in a significant way, the main exception being job reallocation that almost doubles.

Overall, our findings from the descriptive statistics suggest that acquisitions and divestments are different processes, not only in terms of the before-after changes in firm and worker characteristics but also in terms of the type of firms subject to each type of change of ownership (i.e. when comparing the left columns of Tables 2 and 3). For instance, divested firms tend to be much smaller, to pay lower wages and to have workers with lower levels of tenure when compared to acquired firms. The divested firms also exhibit more worker turnover, more job destruction and less net job creation even before they are divested. With respect to before-after changes in firm characteristics, divestments seem to involve much higher job cuts but higher increases in pay when compared to acquisitions.

In the next section, we extend these comparisons to a regression framework.

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<sup>5</sup>Part of these differences may be driven by composition issues related to differences in the number of periods the firms are present in the data, before and after the acquisition.

### 3.2 Results

Our empirical analysis involves the estimation of wage, size and job and worker flow equations, firstly using data aggregated at the firm level. In the case of wages, the equation we consider, based on equation 12 and the discussion in Appendix C, is:

$$w_{it} = X'_{it}\beta_1 + F'_{it}\beta_2 + \beta_3 For_{it} + \alpha_i + \gamma_t + \epsilon_{it}, \quad (1)$$

in which  $w_{it}$  represents the logarithm of the average real wage of firm  $i$  in year  $t$ ,  $X$  is a vector of worker controls aggregated at the firm level (schooling, quadratics in tenure and experience, the percentage of women, and the percentage of foreign workers),  $F$  are firm controls (log firm size - measured by the number of workers -, and industry and state dummies),  $For$  is the foreign-firm dummy variable,  $\alpha_i$  are firm fixed effects and  $\gamma_t$  year fixed effects.  $\beta_3$  is the parameter of interest, indicating the average wage difference between domestic and foreign firms.

We also decompose the wage differential between acquisitions and divestments. In fact, there are no ‘a priori’ reasons for the effect of such changes in ownership to be symmetric, i.e. for the effects of divestments to be equal to minus the effect of acquisitions. We carry out this decomposition by considering the following wage equation:

$$w_{it} = X'_{it}\beta_1 + F'_{it}\beta_2 + \beta_3 DF_{it} + \beta_4 FD_{it} + \alpha_i + \gamma_t + \epsilon_{it}, \quad (2)$$

in which all variables take the same meaning as in equation 1,  $DF_{it}$  is a dummy variable taking value one if a firm-year is currently foreign owned and was in a previous period domestic owned, and  $FD_{it}$  is a dummy variable taking value one if a firm-year is currently domestic owned and was in a previous period foreign owned. More formally,

$$DF_{it} = \begin{cases} 1 & \text{if } For_{it} = 1 \text{ and } For_{i,t=1} = 0, \\ 0 & \text{if } For_{it} = 0 \text{ or } For_{i,t=1} = 1, \end{cases} \quad (3)$$

and

$$FD_{it} = \begin{cases} 1 & \text{if } For_{it} = 0 \text{ and } For_{i,t=1} = 1, \\ 0 & \text{if } For_{it} = 1 \text{ or } For_{i,t=1} = 0. \end{cases} \quad (4)$$

$\beta_3$  and  $\beta_4$  are the parameters of interest, indicating the average change in wages for firms that undergo acquisitions or divestments, respectively.



Table 4 presents the results for each one of the two specifications. Columns 1-4 consider different versions of equation 1 while columns 5-8 consider different versions of equation 2. The OLS results corroborate the standard finding that foreign firms pay higher wages, the premium ranging from more than 50%, when only firm-level control variables are included, to more than 25%, when worker-level control variables are also included.<sup>6</sup> However, once the specification includes firm fixed effects (i.e. once the identification of the foreign firm difference is based on acquisitions and divestments), we find that there are no significant wage differences between the two types of firms.

Moreover, we also find that, when disentangling the wage differences between acquisitions and divestments, there are no significant differences between the two types of ownership change. This result is robust to controlling for worker characteristics (column 6) and to restricting the sample to the last year before ownership change and the first year after that (columns 7 and 8). While there is evidence of a significant wage decrease following an acquisition, the lack of precision of the coefficient for divestments rules out the rejection of the equality of the two effects. It is also interesting to notice that changes in some worker characteristics are very significant in predicting wage changes: for instance, increases in the percentage of foreign workers tend to be associated with (particularly large) increases in wages, while increases in the percentage of female workers tend to be associated with declines in wages.

For the remaining dependent variables that we analyse in Tables 5-9 (firm size, job creation, job destruction, job reallocation, worker reallocation and churning), we consider exactly the same specifications as for wages, except that we do not include the measure of firm size in the list of regressors. In the case of firm size (Table 5), we find, as suggested by the analysis of the descriptive statistics, that foreign firms are bigger. This result also holds after controlling for firm fixed effects. Actually, it even increases once controlling for firm fixed effects, which is consistent with the fact that our sample is matched in 1995 characteristics, including size. Moreover, once we separate the foreign firm dummy into the ‘D-to-F switcher’ and the ‘F-to-D switcher’ dummies, we obtain evidence that most of the effect is driven from the downsizing of firms that undergo divestment, as there is no effect from firms that are acquired.

The results for net job creation rates (Table 6) are similar to those for firm size: Foreign firms are shown to exhibit higher net job creation rates and most of the effect comes from the lower

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<sup>6</sup>These differentials are, however, relatively large when compared to other studies. This is particularly striking as these differentials are driven from a matched sample of firms and, in the specification with worker characteristics, a control for the nationality of the worker is included.

rates exhibited by ‘F-to-D switchers’, not from higher rates for ‘D-to-F switchers’. However, the difference is not significant in two specifications, although the point estimates are still consistent with the remaining results.<sup>7</sup> Overall, the robustness of the results across Tables 5 and 6 is important as it addresses, at least in part, the possibility that firms undergoing divestment are already cutting their job levels before the process of change of ownership begins. In such a case, net job creation would already be negative just before divestment, leading to smaller and/or insignificant estimates, which we do not find in these results.

Given that job creation is very small across the firms in our sample, our results about this variable (not reported) are almost always insignificant or indicating very small differences across the two types of firms (slightly larger for foreign firms, but only in specifications without firm fixed effects). Unsurprisingly, Table 7, which presents estimates for job destruction, indicates similar results as the net job creation rate, although of the opposite sign. We find that foreign firms exhibit less job destruction than domestic firms although the differences are in some cases insignificant.

Consistent with the previous tables, we find that job reallocation (the sum of job creation and job destruction) is significantly lower in foreign firms, while ‘F-to-D’ switchers are the main drivers of such effect (Table 8). A similar result is found when addressing worker reallocation (the sum of worker hirings and worker separations - see Table 9).<sup>8</sup>

## 4 Worker-level analysis

Here we address the unobserved heterogeneity problem by following the same workers as they move across different domestic and foreign firms. Again, this is only possible using matched employer-employee panel data, so that one can trace workers over time and focus, for instance, on those who change employers.

### 4.1 Descriptive statistics

We consider five types of workers: stayers, ‘movers’ through acquisitions, ‘movers’ through divestments, movers from domestic to foreign firms and, finally, movers from foreign to domestic

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<sup>7</sup>This may be explained by the fact that considering net job creation rates (or any other job or worker flow) forces us to reduce the sample size, as such rates cannot be calculated for the first observation of each firm in the data.

<sup>8</sup>We also consider the case of churning, a measure of ‘excessive’ worker turnover, measured by the difference between worker and job reallocation but we find no significant differences (results not reported). This can be explained by the fact that firms undergoing divestment exhibit very large job destruction rates and such job cuts and separations do not tend to involve simultaneous hirings.

firms. In each table and for each type of mover we present descriptive statistics about the worker and the worker's firm before and after the movement (left and right columns, respectively). In the case of stayers, we present descriptive statistics separately for stayers in domestic and foreign firms.

Table 10 refers to the latter cases, which also correspond to the largest category in our data. We find more than 0.8 million workers-year that stay in the same domestic firms between 1995 and 1999 and more than 1.2 million workers-year that stay in the same foreign firms over the same period. According to the table, some of the most important differences are related to tenure (higher for workers in foreign firms), nationality (twice as many foreign workers in foreign firms, in proportional terms), firm size, pay and pay growth (all bigger in foreign firms). The net job creation rate and the worker reallocation rate are also higher in foreign firms. (Given the large size of the data, all differences are statistically significant at any conventional levels.)

When considering instead workers that stay in firms that are subject to acquisition (Table 11), we find that tenure tends to increase while the percentage of female workers and the size of the firm falls. (Bear in mind that, although these workers are the same in the two periods, their distribution is not necessarily the same: the changes in their observable characteristics is related to differences in terms of how many times each workers appears before and after the change in his/her status.) Moreover, pay and pay growth increase while net job creation also increases.

Table 12 considers divestments. An important difference between the periods before and after the change in ownership is probably the decrease in firm size, from an average of 182 workers in foreign firms to an average of 134 when in domestic firms. We also find that pay and pay growth increase, although only the latter significantly.

We now consider the case of workers that move between firms. Table 13 presents descriptive statistics for workers that move from a domestic to a foreign firm. As expected, there is a significantly larger percentage of workers that are new hires. (However, not all are new hires, as we keep following these workers after they move.) Pay and pay growth increases significantly. Comparing firm-level job and worker flow rates, we find that movers from domestic to foreign firms tend to become employed in firms with higher job (gross and net) creation rates and worker reallocation.

Finally, we consider the case of workers that move from a foreign to a domestic firm (Table 14). Unlike in the previous case, pay and pay growth tend to fall. Comparing firm-level job and worker flow rates, we find that, amongst other results, movers from domestic to foreign firms

tend to become employed in firms with low job (gross and net) creation rates.

## 4.2 Regression results

We now estimate wage equations using data at the worker level. The wage equation we consider here is:

$$w_{it} = X'_{it}\beta_1 + F'_{it}\beta_2 + \beta_3 For_{it} + \alpha_i + \gamma_t + \epsilon_{it}, \quad (5)$$

in which  $w_{it}$  represents the logarithm of the real wage of worker  $i$  in year  $t$ ,  $X$  is a vector of worker controls (schooling, quadratics in tenure and experience, a female dummy, and a foreign worker dummy),  $F$  is log firm size and industry and region dummy variables, and  $For_{it}$  is the foreign-firm dummy variable.  $\beta_3$  is the parameter of interest, indicating the average wage difference between domestic and foreign firms.

Table 15 presents the results of equation 5 without firm-level controls and Table 16 presents the same results including firm-level controls ( $F$ ). First, we find from the simple OLS, pooled data models that wages are not significantly higher in foreign firms, although the point estimate suggests a premium of about 10%, even after controlling for several human capital variables, including the worker's nationality. However, when moving to specifications with worker fixed effects (i.e. when our estimation of the foreign-firm wage premium relies on workers that switch between firm types or workers that stay in firms that are acquired/divested), we find a much smaller premium, again insignificant.

Moreover, when decomposing such premium in the wage difference driven by acquisitions or divestments and the wage difference driven by worker mobility, we find that the wage difference in the first case is virtually zero while the difference from mobility is about 4% (columns 3 and 4). These differences hold when using only observations from the period immediately before or immediately after the change in firm status (columns 5 and 6). Moreover, all results are robust to controlling for firm characteristics (Table 16), except that the OLS result is now significant.

As before, in the firm-level analysis, we are also interested in decomposing the foreign firm effect into changes from domestic to foreign and vice-versa. In order to do this, we now estimate new individual-level wage equations as follows:

$$w_{it} = X'_{it}\beta_1 + F'_{it}\beta_2 + \beta_3 DF_{it} + \beta_4 FD_{it} + \alpha_i + \gamma_t + \epsilon_{it}, \quad (6)$$

in which all variables are defined in the same way as in equation 5, while  $DF_{it}$  is a dummy

taking value one if the worker is currently employed in a foreign firm, having been employed in a domestic firm in the previous period, and  $FD_{it}$  is a dummy taking value one if the worker is currently employed in a domestic firm, having been employed in a foreign firm in the previous period. Formally,

$$DF_{it} = \begin{cases} 1 & \text{if } For_{it} = 1 \text{ and } For_{i,t-1} = 0, \\ 0 & \text{if } For_{it} = 0 \text{ or } For_{i,t-1} = 1, \end{cases} \quad (7)$$

and

$$FD_{it} = \begin{cases} 1 & \text{if } For_{it} = 0 \text{ and } For_{i,t-1} = 1, \\ 0 & \text{if } For_{it} = 1 \text{ or } For_{i,t-1} = 0. \end{cases} \quad (8)$$

$\beta_3$  and  $\beta_4$  are the parameters of interest, indicating the average difference in wages of workers that switch from a domestic to a foreign firm or from a foreign to a domestic firm, respectively.

Table 17 presents the results of equation 6 without firm-level controls. The results indicate that foreign-to-domestic mobility is generally associated to wage cuts. On the other hand, domestic-to-foreign mobility is either associated to wage gains (column 6) or wage cuts that are smaller than those of foreign-to-domestic movers. These findings are corroborated when including firm-level controls (Table 18).

Unlike before, the overall difference between foreign and domestic firms is driven by both stayers and movers: movers that switch from a foreign to a domestic firms take a significant pay cut of about 9%, while the wage difference for switchers from domestic to foreign firms is about 7% (columns 3 and 4). When considering only workers-year observed immediately before or after the change in firm type, the coefficients either are not significant or only domestic-to-foreign movers increase their pay. All these results are generally robust to the inclusion of firm-level controls - see Table 18.

### 4.3 Firm and worker fixed effects

Finally, we estimate wage equations including simultaneously worker and firm fixed effects (Abowd et al. 1999):

$$w_{it} = X'_{it}\beta_1 + F'_{it}\beta_2 + \psi_{j(i,t)} + \alpha_i + \gamma_t + \epsilon_{it}, \quad (9)$$

in which all variables are defined as before and  $\psi_{j(i,t)}$  denotes a firm fixed effect ( $j(i,t)$  corresponding to the firm where worker  $i$  works in period  $t$ ).

As it is well known in the literature, the estimation of these models relies on workers that move between firms, a process which we have documented in some detail in this section. In practical terms, we pursue the methods discussed in Abowd et al. (2002) and the routine developed in Ouazad (2006).<sup>9</sup> These methods involve the identification in the data of a (large) group of workers and their firms amongst whom there are connections via worker mobility. In our case, this first group accounts for about 95% of the entire data. Under the assumption that mobility is exogenous (and normalising worker fixed effects so that their sum is equal to zero), one can then estimate the two sets of fixed effects.

Our results indicate a considerable degree of dispersion across either worker or firms - see Figures 2 and 3. However, the average firm effect for domestic firms is .413 while the same number for foreign firms is .644 (these averages are computed by considering all firms-year in which a firm is either domestic or foreign owned). On the other hand, we find that the average worker effect when the worker is employed by a domestic firm is -.04 while the average worker effect when the worker is employed by a foreign firm is -.026 (similarly to the previous case, these worker averages are computed by considering all workers-year in which a worker is employed in either a domestic or a foreign firm).

Overall, the results provide strong support of more generous wage policies offered by foreign firms, as the average fixed effect of the latter is approximately .23 log points higher than the average firm fixed effect of domestic firms. On the other hand, the results suggest that worker selection issues across domestic and foreign firms are of a much smaller importance, as their difference is only .066 log points, or about one fourth of the average difference documented from the firm fixed effects.

## 5 Discussion

How much do developing countries benefit from foreign investment? We contribute to this question by comparing the employment and wage practices of foreign and domestic firms in Brazil, using detailed matched firm-worker panel data. In order to control for unobserved worker differences, we examine not only acquisitions (when foreign investors acquire domestic firms) but also divestments (when domestic investors acquire foreign firms). Moreover, we also consider the wage implications of worker mobility, from foreign to domestic firms and vice-versa. Throughout our analyses we also pay particular attention to employment levels at the different

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<sup>9</sup>See Martins (forthcoming) for a recent illustration of this method in a different context.

types of firms and to the differences between the firm- and worker-levels.

We find that both types of acquisitions (domestic to foreign or vice-versa) do not tend to affect wages significantly, a result consistent with the literature (Martins 2004, Heyman et al. 2007, Andrews et al. 2007). However, although this wage result holds both at the firm- and the worker-levels, divestments tend to lead to large job cuts, unlike acquisitions. In other words, divestments appear to involve much more job reallocation than acquisitions, a new result in this area of research.

One possible implication of this result is that, in general, the comparability of acquisition and the divestment wage results may need to be considered carefully. For instance, the wage changes of workers involved in acquisitions may be more ‘representative’ than the wage changes of workers involved in divestments. This would be the case if the new owners following a divestment tend to offer lower pay to a greater share of their workforce, prompting a larger number of workers to leave, when compared to the case of foreign acquisitions. A complementary interpretation involves the reassignment of workers in divested firms to other firms of the same group of the new owner.

We also find that, while movers from foreign to domestic firms typically take (large) wage cuts when they move, movers from domestic to foreign firms tend to either take lower wage cuts or to maintain or even to increase their pay (Martins (2008) presents similar evidence using Portuguese matched data). Of course, this process of worker mobility may be subject to selection issues. In any case, the fact that workers that leave domestic firms and become employed by foreign investors receive lower wage decreases or wage increases can be interpreted as evidence of more generous wage policies being offered by foreign firms.

Moreover, such findings are reinforced by our novel estimates of worker and firm fixed effects. Although this analysis indicated considerable dispersion of both types of fixed effects - an interesting finding that merits further research -, the fixed effects of foreign firms were, on average, much higher than those of domestic firms. On top of that, our results also suggest that selection issues may not be important, as the difference of the average worker fixed effects across domestic and foreign firms were relatively small.

From a methodological point of view, the findings in our paper underline the importance of considering employment issues when studying changes in ownership, particularly when one wants to address wage differentials. We also present evidence that the related theme of worker mobility can be particularly illuminating from the point of view of assessing the role of foreign

firms in labour markets. From the point of view of the debate of the effects of globalisation, our results suggest that foreign firms play a positive role in the labour market of Brazil and, perhaps, other developing countries.

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# A Figures

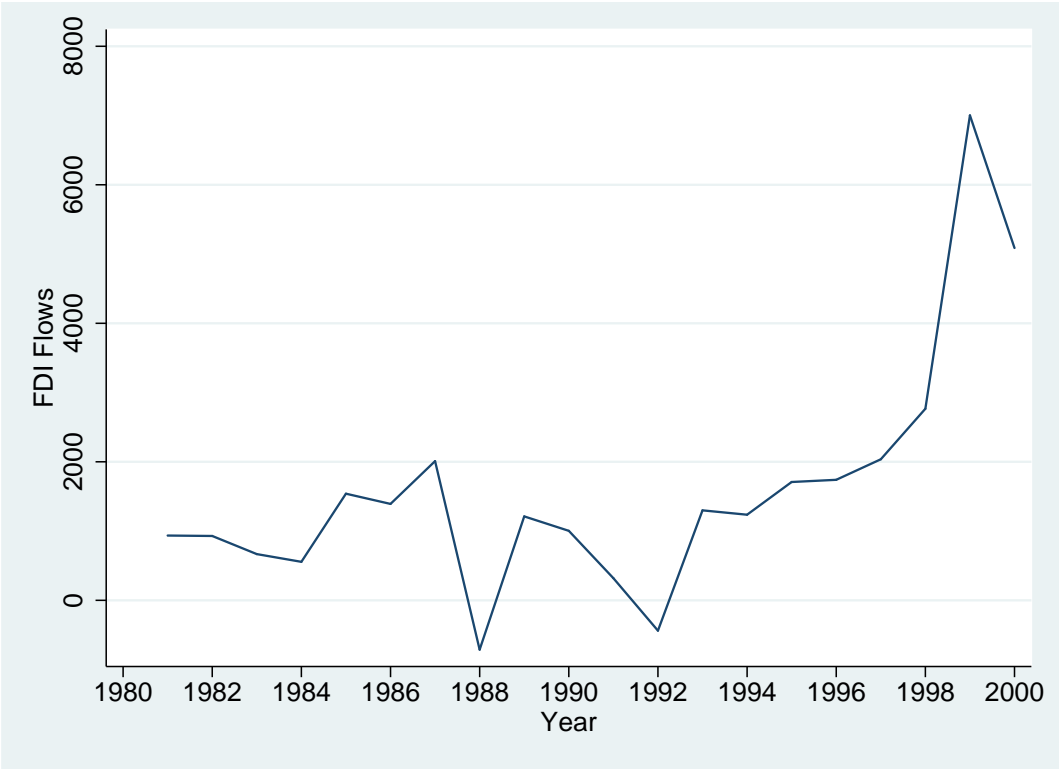


Figure 1: Foreign Direct Investment in Brazil (Manufacturing), 1980-2000

Source: Muendler (2003). Unit: Millions of US dollars.

# B Tables

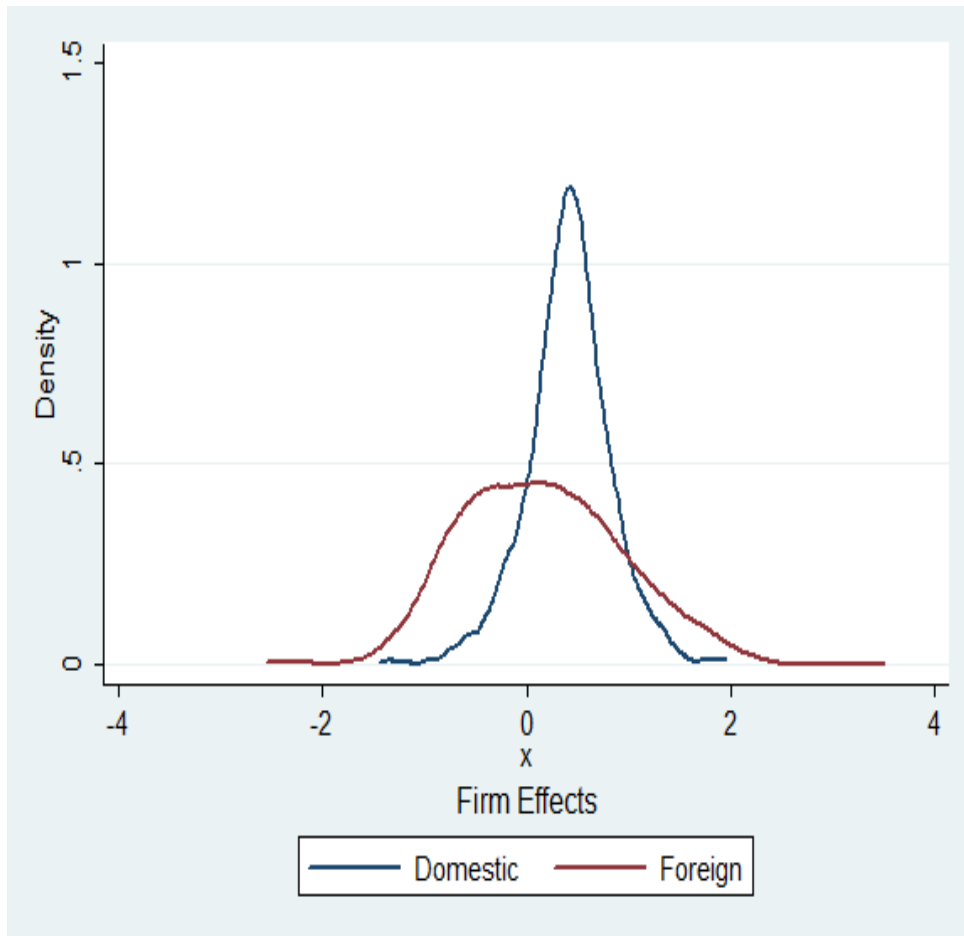


Figure 2: Distribution of firm effects

Source: Authors' calculations.

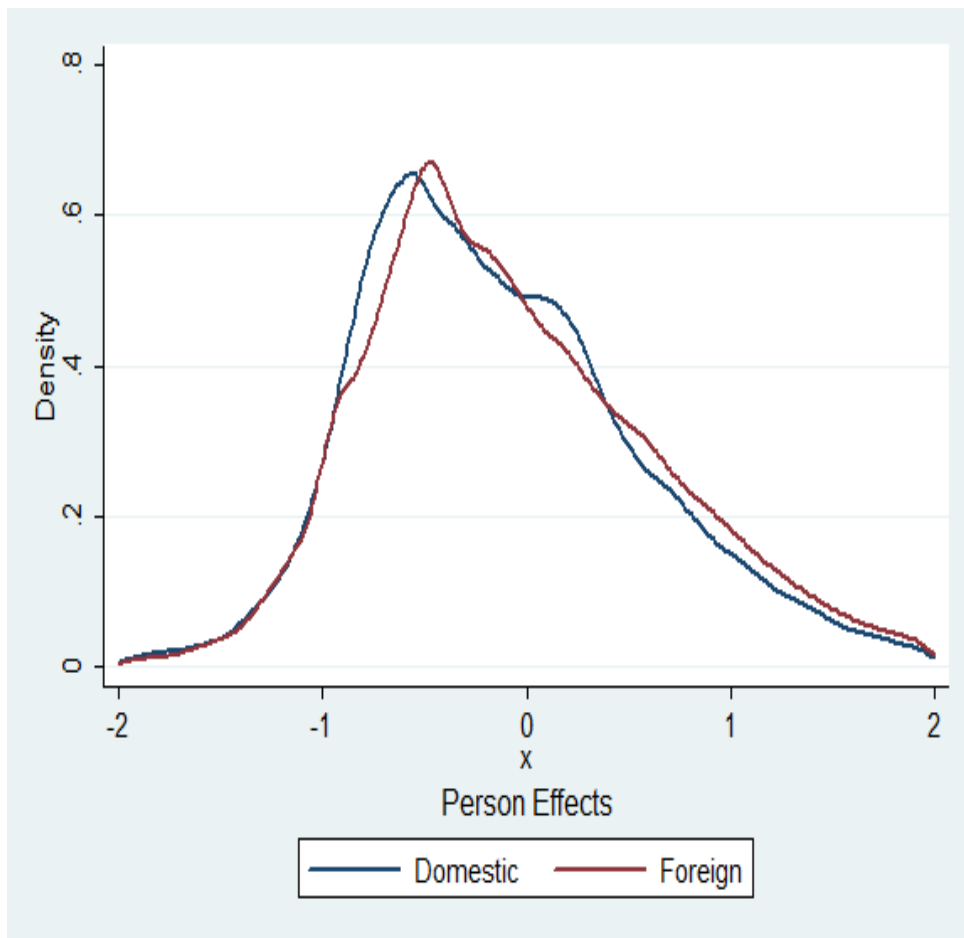


Figure 3: Distribution of worker effects

Source: Authors' calculations.

Table 1: **Non-acquired firms - descriptive statistics.** Sample: only firms that are either always domestic or always foreign owned over the period 1995-1999

Variable	Always domestic			Always foreign			p-test
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Schooling	7.551	1.978	2788	9.375	2.085	3088	0.000
Experience	20.447	4.827	2786	17.861	3.746	3087	0.000
Tenure	63.640	32.069	2788	64.943	28.302	3088	0.098
Female	0.185	0.195	2788	0.187	0.177	3088	0.608
Foreign Worker	0.006	0.016	2788	0.018	0.049	3088	0.000
Firm Size	317.428	819.872	2788	413.229	1077.781	3088	0.000
Log avg. hourly pay	2.045	0.556	2786	2.608	0.561	3085	0.000
Change in log pay	0.007	0.257	2160	0.015	0.275	2429	0.338
Foreign firm	0.000	0.000	2788	1.000	0.000	3088	.
Job creation rate	0.053	0.133	2164	0.060	0.152	2434	0.075
Job destruction rate	0.176	0.328	2184	0.133	0.275	2445	0.000
Net job creation rate	-0.124	0.381	2164	-0.073	0.339	2434	0.000
Job reallocation rate	0.228	0.327	2184	0.193	0.287	2445	0.000
Worker reallocation rate	0.504	0.336	2164	0.452	0.327	2434	0.000
Churning rate	0.273	0.246	2164	0.258	0.249	2434	0.040
1995	0.217	0.412	2788	0.208	0.406	3088	0.431
1996	0.215	0.411	2788	0.207	0.405	3088	0.437
1997	0.199	0.399	2788	0.201	0.401	3088	0.843
1998	0.188	0.391	2788	0.195	0.396	3088	0.496
1999	0.181	0.385	2788	0.189	0.392	3088	0.453

**Notes:** This table describes the characteristics of firms that do not change their domestic/foreign status over the 1995-1999 period. Each firm-year carries the same weight. Schooling refers to the average schooling (measured in years) of the workforce of the firm in each year; experience is defined as Mincer experience; tenure is measured in months; ‘foreign worker’ is a dummy taking value one for workers who are not Brazilian nationals, ‘firm size’ is measured as the (spell-weighted) number of workers in the firm, and pay is measured in 2006 ‘reais’. Job creation rate and the following job and worker flow rates are defined in the standard way (see main text). ‘1995’, ‘1996’, etc, are dummy variables for each year.

Table 2: **Acquisitions - descriptive statistics.** Sample: firms that are initially domestic owned and are then acquired by foreign investors

Variable	Domestic ownership			Foreign ownership			p-value
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Schooling	8.505	1.704	98	9.289	1.665	140	0.000
Experience	18.595	3.111	98	17.956	2.983	140	0.111
Tenure	77.501	27.522	98	77.268	30.865	140	0.952
Female	0.212	0.168	98	0.138	0.168	140	0.001
Foreign Worker	0.007	0.007	98	0.008	0.012	140	0.319
Firm Size	775.857	768.731	98	689.171	693.513	140	0.365
Log avg. hourly pay	2.517	0.449	98	2.513	0.465	140	0.945
Change in log pay	0.001	0.108	50	0.003	0.114	139	0.882
Foreign firm	0.000	0.000	98	1.000	0.000	140	.
Job creation rate	0.045	0.093	50	0.051	0.188	139	0.814
Job destruction rate	0.083	0.115	50	0.113	0.198	140	0.313
Net job creation rate	-0.038	0.172	50	-0.063	0.294	139	0.583
Job reallocation rate	0.128	0.119	50	0.164	0.250	140	0.327
Worker reallocation rate	0.393	0.186	50	0.422	0.334	139	0.562
Churning rate	0.265	0.217	50	0.257	0.365	139	0.880
1995	0.490	0.502	98	0.000	0.000	140	0.000
1996	0.490	0.502	98	0.000	0.000	140	0.000
1997	0.010	0.101	98	0.329	0.471	140	0.000
1998	0.010	0.101	98	0.336	0.474	140	0.000
1999	0.000	0.000	98	0.336	0.474	140	0.000

**Notes:** This table describes the characteristics of firms that switch from domestic to foreign status over the 1995-1999 period. The left columns describe these firms while they are domestic owned and the right columns describe these same firms when they are foreign owned. See Table 1 for description of variables and weights.

## C Identification

Let  $Y_{it}^D$  be the potential outcome of interest for individual  $i$  (a firm or a worker, in our context) at time  $t$  had (s)he been in state  $D$ , where  $D = 1$  if exposed to the treatment (owned by a domestic or foreign investor or employed by a domestic or foreign firm) and 0 otherwise. Let the treatment take place at time  $t$ . The fundamental identification problem lies in the fact that we do not observe, at time  $t$ , individual  $i$  in both states. Therefore, we cannot compute the individual treatment effect,  $Y_{it}^1 - Y_{it}^0$ . One can, however, if provided with a convenient control group, estimate the average effect of the treatment on the treated.

The idea behind a difference-in-differences (DID) estimator is that we can use an untreated comparison group to identify temporal variation in the outcome that is not due to the treatment. However, in order to achieve identification of the general DID estimator we need to assume that the average outcomes for the treated and control groups would have followed parallel paths over time. This is known as the time invariance assumption,

$$E[Y_{it}^0 - Y_{it'}^0 \mid D = 1] = E[Y_{it}^0 - Y_{it'}^0 \mid D = 0], \quad (10)$$

where  $t'$  is a time period before the program implementation. The assumption states that, over time, the outcome variable of treated individuals ( $D = 1$ ), in the event that they had not been exposed to the treatment, would have evolved in the same fashion as actually observed for the individuals not exposed to the treatment ( $D = 0$ ).

Table 3: **Divestments - descriptive statistics.** Sample: firms that are initially foreign owned and are then acquired by domestic investors

Variable	Foreign ownership			Domestic ownership			p-value
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Schooling	8.315	2.190	65	9.061	2.793	38	0.136
Experience	19.878	3.624	65	20.406	7.592	38	0.634
Tenure	57.403	29.748	65	57.272	43.017	38	0.986
Female	0.173	0.151	65	0.098	0.128	38	0.011
Foreign Worker	0.013	0.013	65	0.013	0.054	38	0.926
Firm Size	230.923	368.663	65	97.026	130.192	38	0.033
Log avg. hourly pay	2.422	0.636	65	2.480	0.639	38	0.657
Change in log pay	0.044	0.244	40	0.027	0.350	35	0.812
Foreign firm	1.000	0.000	65	0.000	0.000	38	.
Job creation rate	0.025	0.050	40	0.100	0.324	35	0.152
Job destruction rate	0.321	0.518	40	0.577	0.749	38	0.083
Net job creation rate	-0.297	0.536	40	-0.526	0.902	35	0.178
Job reallocation rate	0.346	0.505	40	0.669	0.741	38	0.027
Worker reallocation rate	0.654	0.504	40	0.824	0.762	35	0.254
Churning rate	0.308	0.304	40	0.098	0.581	35	0.050
1995	0.385	0.490	65	0.000	0.000	38	0.000
1996	0.292	0.458	65	0.132	0.343	38	0.064
1997	0.215	0.414	65	0.158	0.370	38	0.481
1998	0.108	0.312	65	0.342	0.481	38	0.003
1999	0.000	0.000	65	0.368	0.489	38	0.000

**Notes:** This table describes the characteristics of firms that switch from foreign to domestic status over the 1995-1999 period. The left columns describe these firms while they are foreign owned and the right columns describe these same firms when they are domestic owned. See Table 1 for description of variables and weights.



Table 4: Firm wage equations

	OLS-1	OLS-2	FE-1	FE-2	FE-3	FE-4	FE-5	FE-6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Schooling		.183 (.005)***		.070 (.009)***		.070 (.009)***		.0007 (.020)
Experience (years)		.057 (.008)***		.071 (.017)***		.070 (.017)***		.131 (.060)**
Tenure (months)		.003 (.0008)***		.0004 (.0009)		.0004 (.0009)		.003 (.005)
Female (%)		-.404 (.036)***		-.154 (.063)**		-.155 (.063)**		-.418 (.447)
Foreigners (%)		.627 (.658)		.136 (.569)		.138 (.569)		3.147 (.635)***
Foreign firm	.550 (.014)***	.288 (.013)***	-.005 (.026)	-.003 (.024)				
D-to-F switch (acquisition)					-.046 (.020)**	-.048 (.020)**	.046 (.281)	-.264 (.159)*
F-to-D switch (divestment)					-.064 (.093)	-.080 (.088)	.091 (.301)	-.167 (.160)
Obs.	6197	6197	6197	6197	6197	6197	139	139
$R^2$	.411	.64	.845	.851	.845	.852	.959	.982

**Notes:** Dependent variable: Log average real hourly wage. All columns includes firm-level controls (size, industry dummies and state dummies) and year dummies. Even columns includes worker-level controls (average of the following characteristics of workers: schooling, experience and its square, tenure and its square; and the share of female workers and of foreign workers). ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F switcher’ is a dummy taking value one if the firm was domestic owned in the previous period(s) and is foreign owned in the current period(s) (and value zero otherwise). ‘F-to-D switcher’ is a dummy taking value one if the firm was foreign owned in the previous period(s) and is domestic owned in the current period(s) (and value zero otherwise). All firm-years used in all specifications, except in the final two columns (only firms that switch ownership, domestic or foreign, are observed, and only in the last period before changing and in the first period after changing). All firm-years receive the same weight. Robust standard errors. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 5: Firm size equations

	OLS-1	OLS-2	FE-1	FE-2	FE-3	FE-4	FE-5	FE-6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Schooling		-.127 (.015)***		-.192 (.020)***		-.189 (.020)***		.005 (.106)
Experience (years)		-.039 (.025)		-.002 (.040)		-.001 (.040)		-.002 (.314)
Tenure (months)		.027 (.002)***		.004 (.003)		.003 (.003)		.028 (.031)
Female (%)		-.614 (.135)***		-.091 (.160)		-.091 (.159)		3.304 (1.885)*
Foreigners (%)		-4.044 (.428)***		-2.181 (.400)***		-2.179 (.399)***		-3.844 (3.725)
Foreign firm	.219 (.034)***	.091 (.036)**	.487 (.099)***	.334 (.094)***				
D-to-F switch (acquisition)					-.005 (.051)	-.024 (.047)	-.082 (.801)	.233 (.617)
F-to-D switch (divestment)					-1.199 (.301)***	-.905 (.266)***	-1.113 (.778)	-.538 (.653)
Obs.	6247	6244	6247	6244	6247	6244	146	146
$R^2$	.11	.297	.873	.912	.874	.913	.92	.95

**Notes:** Dependent variable: Log firm size (number of workers in each year, weighted by length of spell of each individual). All columns includes firm-level controls (industry dummies and state dummies) and year dummies. Even columns includes worker-level controls (average of the following characteristics of workers: schooling, experience and its square, tenure and its square; and the share of female workers and of foreign workers). ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F switcher’ is a dummy taking value one if the firm was domestic owned in the previous period(s) and is foreign owned in the current period(s) (and value zero otherwise). ‘F-to-D switcher’ is a dummy taking value one if the firm was foreign owned in the previous period(s) and is domestic owned in the current period(s) (and value zero otherwise). All firm-years used in all specifications, except in the final two columns (only firms that switch ownership, domestic or foreign, are observed, and only in the last period before changing and in the first period after changing). All firm-years receive the same weight. Robust standard errors. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 6: Net job creation equations

	OLS-1	OLS-2	FE-1	FE-2	FE-3	FE-4	FE-5	FE-6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Schooling		-.024 (.006)***		-.082 (.014)***		-.081 (.014)***		.067 (.150)
Experience (years)		.012 (.009)		-.032 (.024)		-.031 (.024)		-.051 (.265)
Tenure (months)		.00002 (.0008)		-.006 (.002)***		-.006 (.002)***		.015 (.024)
Female (%)		-.140 (.054)***		-.108 (.094)		-.107 (.094)		2.649 (1.538)*
Foreigners (%)		-1.168 (.235)***		-.483 (.437)		-.469 (.433)		-2.340 (3.767)
Foreign firm	.053 (.011)***	.059 (.012)***	.146 (.070)**	.104 (.075)				
D-to-F switch (acquisition)					-.022 (.059)	-.019 (.059)	.195 (.354)	.500 (.324)
F-to-D switch (divestment)					-.418 (.232)*	-.417 (.240)*	-.572 (.280)**	-.187 (.316)
Obs.	4862	4859	4862	4859	4862	4859	136	136
R <sup>2</sup>	.023	.127	.401	.472	.403	.475	.58	.661

**Notes:** Dependent variable: Net job creation rate (defined as in the text: the change in firm size divided by the average firm size, if positive, zero otherwise). All columns includes firm-level controls (industry dummies and state dummies) and year dummies. Even columns includes worker-level controls (average of the following characteristics of workers: schooling, experience and its square, tenure and its square; and the share of female workers and of foreign workers). ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F switcher’ is a dummy taking value one if the firm was domestic owned in the previous period(s) and is foreign owned in the current period(s) (and value zero otherwise). ‘F-to-D switcher’ is a dummy taking value one if the firm was foreign owned in the previous period(s) and is domestic owned in the current period(s) (and value zero otherwise). All firm-years used in all specifications, except in the final two columns (only firms that switch ownership, domestic or foreign, are observed, and only in the last period before changing and in the first period after changing). All firm-years receive the same weight. Robust standard errors. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 7: Job destruction equations

	OLS-1	OLS-2	FE-1	FE-2	FE-3	FE-4	FE-5	FE-6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Schooling		.025 (.006)***		.062 (.012)***		.061 (.013)***		-.080 (.072)
Experience (years)		-.003 (.009)		.031 (.020)		.031 (.020)		.114 (.190)
Tenure (months)		-.002 (.0009)**		.001 (.002)		.002 (.002)		-.020 (.018)
Female (%)		.120 (.048)**		.081 (.080)		.081 (.079)		-2.548 (1.232)**
Foreigners (%)		1.146 (.231)***		.660 (.423)		.657 (.421)		3.095 (2.701)
Foreign firm	-.046 (.009)***	-.052 (.011)***	-.118 (.064)*	-.075 (.067)				
D-to-F switch (acquisition)					.052 (.036)	.048 (.037)	.860 (.726)	-.067 (.752)
F-to-D switch (divestment)					.336 (.195)*	.269 (.198)	1.217 (.740)	.316 (.712)
Obs.	4897	4894	4897	4894	4897	4894	140	140
$R^2$	.025	.135	.445	.504	.447	.506	.597	.735

**Notes:** Dependent variable: Job destruction rate (defined as in the text: the absolute value of the change in firm size divided by the average firm size, if change is negative, zero otherwise). All columns includes firm-level controls (industry dummies and state dummies) and year dummies. Even columns includes worker-level controls (average of the following characteristics of workers: schooling, experience and its square, tenure and its square; and the share of female workers and of foreign workers). ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F switcher’ is a dummy taking value one if the firm was domestic owned in the previous period(s) and is foreign owned in the current period(s) (and value zero otherwise). ‘F-to-D switcher’ is a dummy taking value one if the firm was foreign owned in the previous period(s) and is domestic owned in the current period(s) (and value zero otherwise). All firm-years used in all specifications, except in the final two columns (only firms that switch ownership, domestic or foreign, are observed, and only in the last period before changing and in the first period after changing). All firm-years receive the same weight. Robust standard errors. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 8: Job reallocation equations

	OLS-1	OLS-2	FE-1	FE-2	FE-3	FE-4	FE-5	FE-6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Schooling		.027 (.006)***		.049 (.012)***		.048 (.012)***		-.062 (.061)
Experience (years)		.001 (.009)		.026 (.018)		.026 (.018)		.128 (.146)
Tenure (months)		-.005 (.001)***		-.004 (.002)**		-.004 (.002)**		-.022 (.015)
Female (%)		.100 (.047)**		.065 (.076)		.065 (.076)		-2.418 (1.124)**
Foreigners (%)		1.104 (.232)***		.782 (.425)*		.780 (.423)*		3.388 (2.374)
Foreign firm	-.040 (.009)***	-.044 (.011)***	-.112 (.064)*	-.078 (.062)				
D-to-F switch (acquisition)					.083 (.041)**	.082 (.040)**	.963 (.688)	-.025 (.683)
F-to-D switch (divestment)					.352 (.190)*	.254 (.183)	1.128 (.691)	.163 (.630)
Obs.	4897	4894	4897	4894	4897	4894	140	140
R <sup>2</sup>	.027	.143	.465	.506	.468	.508	.638	.801

**Notes:** Dependent variable: Job reallocation rate (defined as in the text: the sum of job creation and job destruction divided by the average firm size). All columns includes firm-level controls (industry dummies and state dummies) and year dummies. Even columns includes worker-level controls (average of the following characteristics of workers: schooling, experience and its square, tenure and its square; and the share of female workers and of foreign workers). ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F switcher’ is a dummy taking value one if the firm was domestic owned in the previous period(s) and is foreign owned in the current period(s) (and value zero otherwise). ‘F-to-D switcher’ is a dummy taking value one if the firm was foreign owned in the previous period(s) and is domestic owned in the current period(s) (and value zero otherwise). All firm-years used in all specifications, except in the final two columns (only firms that switch ownership, domestic or foreign, are observed, and only in the last period before changing and in the first period after changing). All firm-years receive the same weight. Robust standard errors. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 9: **Worker reallocation equations**

	OLS-1	OLS-2	FE-1	FE-2	FE-3	FE-4	FE-5	FE-6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Schooling		.023 (.005)***		.062 (.012)***		.062 (.012)***		-.065 (.099)
Experience (years)		.002 (.008)		.029 (.018)*		.028 (.018)		.029 (.141)
Tenure (months)		-.014 (.0009)***		-.018 (.002)***		-.018 (.002)***		-.035 (.014)***
Female (%)		.087 (.042)**		.018 (.074)		.017 (.074)		-1.258 (1.079)
Foreigners (%)		.882 (.241)***		.534 (.400)		.526 (.397)		2.877 (2.302)
Foreign firm	-.050 (.010)***	-.042 (.010)***	-.088 (.065)	-.077 (.049)				
D-to-F switch (acquisition)					.095 (.056)*	.096 (.048)**	.087 (.257)	-.283 (.207)
F-to-D switch (divestment)					.488 (.194)**	.301 (.162)*	.568 (.222)**	.225 (.209)
Obs.	4862	4859	4862	4859	4862	4859	136	136
R <sup>2</sup>	.041	.313	.509	.599	.514	.601	.627	.824

**Notes:** Dependent variable: Worker reallocation rate (defined as in the text: the sum of hirings and separations divided by the average firm size). All columns includes firm-level controls (industry dummies and state dummies) and year dummies. Even columns includes worker-level controls (average of the following characteristics of workers: schooling, experience and its square, tenure and its square; and the share of female workers and of foreign workers). ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F switcher’ is a dummy taking value one if the firm was domestic owned in the previous period(s) and is foreign owned in the current period(s) (and value zero otherwise). ‘F-to-D switcher’ is a dummy taking value one if the firm was foreign owned in the previous period(s) and is domestic owned in the current period(s) (and value zero otherwise). All firm-years used in all specifications, except in the final two columns (only firms that switch ownership, domestic or foreign, are observed, and only in the last period before changing and in the first period after changing). All firm-years receive the same weight. Robust standard errors. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 10: **Worker-level descriptive statistics:** Only workers that always stay in firms that are either always domestic or always foreign owned over the period 1995-1999

Variable	Always Domestic			Always Foreign			p-test
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Schooling	7.921	3.740	883147	8.827	3.779	1254490	0.000
Experience	18.782	11.120	882008	17.239	10.088	1254236	0.000
Tenure	67.485	69.466	883278	71.833	72.941	1254988	0.000
Female	0.192	0.394	883278	0.174	0.379	1254988	0.000
Foreign Worker	0.005	0.069	883278	0.010	0.097	1254988	0.000
Firm Size	2402.242	4054.423	883278	3197.021	5151.050	1254988	0.000
New hire	0.200	0.400	883278	0.204	0.403	1254988	0.000
Log avg. hourly pay	2.131	0.841	852499	2.355	0.845	1227190	0.000
Change in log pay	0.037	0.370	517186	0.044	0.328	765046	0.000
Foreign firm	0.000	0.000	883278	1.000	0.000	1254988	.
Foreign status switch	0.000	0.000	883278	0.000	0.000	1254988	.
Firm mover	0.000	0.000	883278	0.000	0.000	1254988	.
Job creation rate	0.063	0.170	653049	0.072	0.166	962365	0.000
Job destruction rate	0.092	0.146	656934	0.079	0.152	973334	0.000
Net job creation rate	-0.029	0.249	653049	-0.008	0.250	962365	0.000
Job reallocation rate	0.155	0.196	656934	0.150	0.198	973334	0.000
Worker reallocation rate	0.381	0.251	653049	0.411	0.279	962365	0.000
Churning rate	0.226	0.311	653049	0.259	0.269	962365	0.000
1995	0.256	0.437	883278	0.224	0.417	1254988	0.000
1996	0.224	0.417	883278	0.211	0.408	1254988	0.000
1997	0.200	0.400	883278	0.205	0.404	1254988	0.000
1998	0.165	0.371	883278	0.181	0.385	1254988	0.000
1999	0.154	0.361	883278	0.179	0.383	1254988	0.000

**Notes:** This table describes the characteristics of workers that do not change their affiliation between domestic or foreign firms over the 1995-1999 period. However, workers may move between firms, provided they are in the same ‘sector’. Schooling is measured in years; experience defined as Mincer experience; tenure measured in months; ‘foreign worker’ is a dummy taking value one for workers who are not Brazilian nationals, ‘firm size’ is measured in terms of the number of workers in the firm in 31 December of the year, ‘dismissal without cause’ is a dummy variable taking value one if the worker was fired without cause from his/her previous job, ‘new hire’ is a dummy taking value one if the worker is in the first year in the current firm, ‘reemployed’ is a dummy taking value one if the worker left and then returned to the current firm, pay is measured in 2006 ‘reais’, ‘foreign firm’ is a dummy taking value one for firms owned at least at 50% by foreign investors. Job creation rate and the following job and worker flow rates are defined in the standard way (see main text). ‘1995’, ‘1996’, etc, are dummy variables for each year.

Table 11: **Worker-level descriptive statistics:** Only workers that stay in firms that are initially domestic owned and are then acquired by foreign investors

Variable	Domestic ownership			Foreign ownership			p-value
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Schooling	8.347	3.778	50816	8.844	3.694	67515	0.000
Experience	18.578	10.127	50814	19.822	10.007	67511	0.000
Tenure	88.920	77.001	50818	107.273	79.733	67515	0.000
Female	0.184	0.387	50818	0.130	0.337	67515	0.000
Foreign Worker	0.006	0.076	50818	0.006	0.074	67515	0.474
Firm Size	1518.361	921.666	50818	1399.844	795.025	67515	0.000
New hire	0.157	0.364	50818	0.030	0.171	67515	0.000
Log avg. hourly pay	2.421	0.785	50240	2.441	0.790	65401	0.000
Change in log pay	0.007	0.317	22739	0.019	0.334	64825	0.000
Foreign firm	0.000	0.000	50818	1.000	0.000	67515	.
Foreign status switch	1.000	0.000	50818	1.000	0.000	67515	.
Firm mover	0.000	0.000	50818	0.000	0.000	67515	.
Job creation rate	0.066	0.126	27978	0.063	0.215	66933	0.038
Job destruction rate	0.107	0.154	27978	0.071	0.124	67515	0.000
Net job creation rate	-0.041	0.232	27978	-0.008	0.266	66933	0.000
Job reallocation rate	0.173	0.160	27978	0.134	0.229	67515	0.000
Worker reallocation rate	0.392	0.207	27978	0.335	0.292	66933	0.000
Churning rate	0.219	0.274	27978	0.200	0.406	66933	0.000
1995	0.449	0.497	50818	0.000	0.000	67515	0.000
1996	0.536	0.499	50818	0.000	0.000	67515	0.000
1997	0.007	0.082	50818	0.375	0.484	67515	0.000
1998	0.008	0.087	50818	0.330	0.470	67515	0.000
1999	0.000	0.000	50818	0.295	0.456	67515	0.000

**Notes:** This table describes the characteristics of workers that change their affiliation from domestic to foreign firms over the 1995-1999 period because their firms are acquired and they stay in that firm. Schooling is measured in years; experience defined as Mincer experience; tenure measured in months; ‘foreign worker’ is a dummy taking value one for workers who are not Brazilian nationals, ‘firm size’ is measured in terms of the number of workers in the firm in 31 December of the year, ‘dismissal without cause’ is a dummy variable taking value one if the worker was fired without cause from his/her previous job, ‘new hire’ is a dummy taking value one if the worker is in the first year in the current firm, ‘reemployed’ is a dummy taking value one if the worker left and then returned to the current firm, pay is measured in 2006 ‘reais’, ‘foreign firm’ is a dummy taking value one for firms owned at least at 50% by foreign investors. Job creation rate and the following job and worker flow rates are defined in the standard way (see main text). ‘1995’, ‘1996’, etc, are dummy variables for each year.



Table 12: **Worker-level descriptive statistics:** Only workers that stay in firms that are initially foreign owned and are then acquired by domestic investors

Variable	Foreign ownership			Domestic ownership			p-test
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Schooling	8.748	4.291	1949	9.867	4.152	1277	0.000
Experience	20.139	10.307	1948	20.295	9.944	1277	0.670
Tenure	70.565	66.534	1949	79.816	64.334	1277	0.000
Female	0.144	0.351	1949	0.104	0.306	1277	0.001
Foreign Worker	0.014	0.119	1949	0.012	0.108	1277	0.526
Firm Size	182.455	124.963	1949	134.033	93.096	1277	0.000
New hire	0.176	0.381	1949	0.031	0.172	1277	0.000
Log avg. hourly pay	2.577	0.829	1916	2.619	0.912	919	0.220
Change in log pay	-0.080	0.370	1033	0.085	0.412	905	0.000
Foreign firm	1.000	0.000	1949	0.000	0.000	1277	.
Foreign status switch	1.000	0.000	1949	1.000	0.000	1277	.
Firm mover	0.000	0.000	1949	0.000	0.000	1277	.
Job creation rate	0.037	0.062	1228	0.063	0.237	1194	0.000
Job destruction rate	0.251	0.382	1228	0.240	0.396	1277	0.453
Net job creation rate	-0.215	0.410	1228	-0.193	0.502	1194	0.256
Job reallocation rate	0.288	0.362	1228	0.298	0.426	1277	0.512
Worker reallocation rate	0.516	0.361	1228	0.503	0.447	1194	0.416
Churning rate	0.229	0.142	1228	0.184	0.434	1194	0.001
1995	0.370	0.483	1949	0.000	0.000	1277	0.000
1996	0.318	0.466	1949	0.090	0.286	1277	0.000
1997	0.180	0.384	1949	0.300	0.458	1277	0.000
1998	0.132	0.339	1949	0.305	0.460	1277	0.000
1999	0.000	0.000	1949	0.305	0.461	1277	0.000

**Notes:** This table describes the characteristics of workers that change their affiliation from foreign to domestic firms over the 1995-1999 period because their firms are acquired and they stay in that firm. Schooling is measured in years; experience defined as Mincer experience; tenure measured in months; ‘foreign worker’ is a dummy taking value one for workers who are not Brazilian nationals, ‘firm size’ is measured in terms of the number of workers in the firm in 31 December of the year, ‘dismissal without cause’ is a dummy variable taking value one if the worker was fired without cause from his/her previous job, ‘new hire’ is a dummy taking value one if the worker is in the first year in the current firm, ‘reemployed’ is a dummy taking value one if the worker left and then returned to the current firm, pay is measured in 2006 ‘reais’, ‘foreign firm’ is a dummy taking value one for firms owned at least at 50% by foreign investors. Job creation rate and the following job and worker flow rates are defined in the standard way (see main text). ‘1995’, ‘1996’, etc. are dummy variables for each year.

Table 13: **Worker-level descriptive statistics:** Workers that move from domestic to foreign firms

Variable	Domestic ownership			Foreign ownership			p-test
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Schooling	8.559	3.541	22729	9.586	3.554	20899	0.000
Experience	15.011	9.017	22714	15.632	8.695	20899	0.000
Tenure	51.001	50.312	22734	38.187	52.606	20900	0.000
Female	0.264	0.441	22734	0.096	0.294	20900	0.000
Foreign Worker	0.005	0.070	22734	0.005	0.069	20900	0.940
Firm Size	2691.429	2304.134	22734	3132.178	3178.156	20900	0.000
New hire	0.229	0.420	22734	0.456	0.498	20900	0.000
Log avg. hourly pay	2.248	0.754	21887	2.378	0.797	20390	0.000
Change in log pay	0.038	0.434	11409	0.050	0.395	19269	0.015
Foreign firm	0.000	0.000	22734	1.000	0.000	20900	.
Foreign status switch	1.000	0.000	22734	1.000	0.000	20900	.
Firm mover	1.000	0.000	22734	1.000	0.000	20900	.
Job creation rate	0.076	0.132	14513	0.250	0.408	20162	0.000
Job destruction rate	0.062	0.119	14664	0.092	0.156	20364	0.000
Net job creation rate	0.013	0.203	14513	0.157	0.487	20162	0.000
Job reallocation rate	0.137	0.149	14664	0.340	0.379	20364	0.000
Worker reallocation rate	0.470	0.231	14513	0.625	0.429	20162	0.000
Churning rate	0.332	0.283	14513	0.282	0.279	20162	0.000
1995	0.355	0.479	22734	0.026	0.158	20900	0.000
1996	0.308	0.462	22734	0.073	0.261	20900	0.000
1997	0.238	0.426	22734	0.151	0.358	20900	0.000
1998	0.083	0.275	22734	0.337	0.473	20900	0.000
1999	0.017	0.128	22734	0.413	0.492	20900	0.000

**Notes:** This table describes the characteristics of workers that change their affiliation from domestic to foreign firms over the 1995-1999 period because they move between firms. Schooling is measured in years; experience defined as Mincer experience; tenure measured in months; ‘foreign worker’ is a dummy taking value one for workers who are not Brazilian nationals, ‘firm size’ is measured in terms of the number of workers in the firm in 31 December of the year, ‘dismissal without cause’ is a dummy variable taking value one if the worker was fired without cause from his/her previous job, ‘new hire’ is a dummy taking value one if the worker is in the first year in the current firm, ‘reemployed’ is a dummy taking value one if the worker left and then returned to the current firm, pay is measured in 2006 ‘reais’, ‘foreign firm’ is a dummy taking value one for firms owned at least at 50% by foreign investors. Job creation rate and the following job and worker flow rates are defined in the standard way (see main text). ‘1995’, ‘1996’, etc, are dummy variables for each year.

Table 14: **Worker-level descriptive statistics:** Workers that move from foreign to domestic firms

Variable	Foreign ownership			Domestic ownership			p-test
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Schooling	10.169	3.632	6665	10.496	3.478	6563	0.000
Experience	14.464	8.649	6665	15.179	8.253	6553	0.000
Tenure	46.079	55.315	6668	26.644	38.200	6563	0.000
Female	0.172	0.377	6668	0.119	0.324	6563	0.000
Foreign Worker	0.010	0.098	6668	0.007	0.083	6563	0.067
Firm Size	1639.543	2378.396	6668	1838.680	2382.716	6563	0.000
New hire	0.330	0.470	6668	0.455	0.498	6563	0.000
Log avg. hourly pay	2.515	0.879	6341	2.444	0.921	6056	0.000
Change in log pay	0.022	0.389	2876	-0.025	0.508	5450	0.000
Foreign firm	1.000	0.000	6668	0.000	0.000	6563	.
Foreign status switch	1.000	0.000	6668	1.000	0.000	6563	.
Firm mover	1.000	0.000	6668	1.000	0.000	6563	.
Job creation rate	0.137	0.280	3834	0.094	0.176	6266	0.000
Job destruction rate	0.078	0.161	3877	0.073	0.160	6395	0.130
Net job creation rate	0.059	0.355	3834	0.020	0.267	6266	0.000
Job reallocation rate	0.213	0.287	3877	0.165	0.207	6395	0.000
Worker reallocation rate	0.513	0.340	3834	0.446	0.315	6266	0.000
Churning rate	0.297	0.303	3834	0.277	0.302	6266	0.001
1995	0.419	0.493	6668	0.026	0.158	6563	0.000
1996	0.249	0.432	6668	0.196	0.397	6563	0.000
1997	0.156	0.362	6668	0.230	0.421	6563	0.000
1998	0.103	0.304	6668	0.232	0.422	6563	0.000
1999	0.074	0.262	6668	0.316	0.465	6563	0.000

**Notes:** This table describes the characteristics of workers that change their affiliation from foreign to domestic firms over the 1995-1999 period because they move between firms. Schooling is measured in years; experience defined as Mincer experience; tenure measured in months; ‘foreign worker’ is a dummy taking value one for workers who are not Brazilian nationals, ‘firm size’ is measured in terms of the number of workers in the firm in 31 December of the year, ‘dismissal without cause’ is a dummy variable taking value one if the worker was fired without cause from his/her previous job, ‘new hire’ is a dummy taking value one if the worker is in the first year in the current firm, ‘reemployed’ is a dummy taking value one if the worker left and then returned to the current firm, pay is measured in 2006 ‘reais’, ‘foreign firm’ is a dummy taking value one for firms owned at least at 50% by foreign investors. Job creation rate and the following job and worker flow rates are defined in the standard way (see main text). ‘1995’, ‘1996’, etc, are dummy variables for each year.

Table 15: **Worker-level wage equations**

	OLS1 (1)	All-FE (2)	Stayers1 (3)	Movers1 (4)	Stayers2 (5)	Movers2 (6)
Schooling	.102 (.004)***	.013 (.003)***	.012 (.003)***	.021 (.004)***	-.004 (.007)	.031 (.008)***
Experience	.047 (.004)***	.030 (.003)***	.029 (.003)***	.037 (.005)***	.022 (.012)*	.033 (.008)***
Experience <sup>2</sup> /100	-.062 (.005)***	-.054 (.005)***	-.054 (.006)***	-.068 (.008)***	-.038 (.021)*	-.037 (.013)***
Tenure/10	.041 (.007)***	.021 (.002)***	.019 (.003)***	.027 (.004)***	.028 (.010)***	.035 (.004)***
Tenure <sup>2</sup> /1000	-.007 (.002)***	-.008 (.001)***	-.008 (.001)***	-.009 (.001)***	-.014 (.004)***	-.011 (.002)***
Female	-.418 (.033)***					
Foreign worker	.304 (.017)***					
Foreign firm	.099 (.061)	-.008 (.017)	-.027 (.024)	.040 (.017)**	-.044 (.026)*	.078 (.011)***
Obs.	2295926	2295926	2196359	99567	55626	27665
No. Firms	1348	1348	1348	1214	70	1067
R <sup>2</sup>	.523	.939	.941	.902	.963	.92

**Notes:** Dependent variable: log real hourly wage. Worker-level controls are schooling, experience and its square, tenure and its square, a female dummy variable and a foreign worker (non-Brazilian) dummy variable. All columns except (1) include worker fixed effects. ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F mover’ is a dummy taking value one if the worker was employed in a domestic firm in the previous periods and is employed in a foreign owned firm in the current period (and value zero otherwise). ‘F-to-D mover’ is a dummy taking value one if the worker was employed in a foreign firm in the previous periods and is employed in a domestic owned firm in the current period (and value zero otherwise). All specifications include year dummies. Robust standard errors, clustered at the firm level. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 16: **Worker-level wage equations, including firm-level controls**

	OLS1 (1)	All-FE (2)	Stayers1 (3)	Movers1 (4)	Stayers2 (5)	Movers2 (6)
Schooling	.092 (.002)***	.013 (.003)***	.012 (.004)***	.022 (.004)***	-.004 (.007)	.033 (.007)***
Experience	.047 (.002)***	.030 (.003)***	.029 (.003)***	.038 (.005)***	.022 (.012)*	.035 (.008)***
Experience <sup>2</sup> /100	-.062 (.003)***	-.053 (.005)***	-.053 (.006)***	-.068 (.008)***	-.039 (.021)*	-.038 (.013)***
Tenure/10	.038 (.004)***	.021 (.003)***	.020 (.003)***	.028 (.004)***	.028 (.009)***	.033 (.004)***
Tenure <sup>2</sup> /1000	-.007 (.0009)***	-.009 (.001)***	-.008 (.001)***	-.009 (.001)***	-.015 (.004)***	-.011 (.001)***
Female	-.350 (.016)***					
Foreign worker	.317 (.017)***					
Foreign firm	.127 (.041)***	-.011 (.017)	-.026 (.023)	.037 (.019)*	-.052 (.027)*	.066 (.012)***
Obs.	2295926	2295926	2196359	99567	55626	27665
No. Firms	1348	1348	1348	1214	70	1067
$R^2$	.585	.939	.941	.903	.964	.922

**Notes:** Dependent variable: log real hourly wage. Worker-level controls are schooling, experience and its square, tenure and its square, a female dummy variable and a foreign worker (non-Brazilian) dummy variable. All columns except (1) include worker fixed effects. ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F mover’ is a dummy taking value one if the worker was employed in a domestic firm in the previous periods and is employed in a foreign owned firm in the current period (and value zero otherwise). ‘F-to-D mover’ is a dummy taking value one if the worker was employed in a foreign firm in the previous periods and is employed in a domestic owned firm in the current period (and value zero otherwise). All specifications include year dummies. Robust standard errors, clustered at the firm level. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 17: Worker-level wage equations, by mobility type

	OLS1	All-FE	Stayers1	Movers1	Stayers2	Movers2
	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	.101 (.004)***	.019 (.007)***	.017 (.007)**	.022 (.006)***	-.002 (.008)	.036 (.011)***
Experience	.045 (.004)***	.025 (.004)***	.023 (.004)***	.036 (.008)***	.028 (.010)***	.028 (.011)***
Experience <sup>2</sup> /100	-.061 (.005)***	-.039 (.007)***	-.037 (.008)***	-.056 (.011)***	-.044 (.019)**	-.009 (.019)
Tenure/10	.026 (.009)***	.012 (.002)***	.011 (.002)***	.014 (.004)***	.013 (.008)	.025 (.004)***
Tenure <sup>2</sup> /1000	-.003 (.002)	-.005 (.0008)***	-.005 (.0009)***	-.005 (.001)***	-.008 (.003)***	-.008 (.002)***
Female	-.453 (.035)***					
Foreign worker	.284 (.019)***					
F-to-D mover	-.073 (.063)	-.091 (.013)***	-.065 (.017)***	-.086 (.015)***	-.043 (.086)	-.019 (.026)
D-to-F mover	.008 (.050)	-.038 (.017)**	-.034 (.021)	-.045 (.026)*	-.088 (.081)	.065 (.019)***
Obs.	1459828	1459828	1386945	72883	50477	21600
No. Firms	1311	1311	1309	1112	69	948
R <sup>2</sup>	.501	.945	.946	.926	.969	.946

**Notes:** Dependent variable: log real hourly wage. Worker-level controls are schooling, experience and its square, tenure and its square, a female dummy variable and a foreign worker (non-Brazilian) dummy variable. All columns except (1) include worker fixed effects. ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F mover’ is a dummy taking value one if the worker was employed in a domestic firm in the previous periods and is employed in a foreign owned firm in the current period (and value zero otherwise). ‘F-to-D mover’ is a dummy taking value one if the worker was employed in a foreign firm in the previous periods and is employed in a domestic owned firm in the current period (and value zero otherwise). All specifications include year dummies. Robust standard errors, clustered at the firm level. Significance levels: \*: 0.10; \*\*: 0.05; \*\*\*: 0.01.

Table 18: Worker-level wage equations, by mobility type, with firm-level controls

	OLS1	All-FE	Stayers1	Movers1	Stayers2	Movers2
	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	.092 (.003)***	.019 (.007)***	.017 (.007)**	.023 (.006)***	-.002 (.008)	.039 (.010)***
Experience	.045 (.002)***	.025 (.004)***	.023 (.005)***	.037 (.008)***	.028 (.011)***	.031 (.011)***
Experience <sup>2</sup> /100	-.060 (.003)***	-.039 (.008)***	-.037 (.008)***	-.057 (.011)***	-.045 (.019)**	-.015 (.019)
Tenure/10	.025 (.005)***	.012 (.002)***	.012 (.002)***	.014 (.004)***	.013 (.008)*	.023 (.004)***
Tenure <sup>2</sup> /1000	-.004 (.001)***	-.005 (.0009)***	-.005 (.0009)***	-.005 (.001)***	-.008 (.003)***	-.008 (.001)***
Female	-.383 (.018)***					
Foreign worker	.303 (.018)***					
F-to-D mover	-.077 (.052)	-.087 (.013)***	-.043 (.014)***	-.088 (.016)***	-.021 (.099)	-.023 (.026)
D-to-F mover	-.025 (.044)	-.041 (.018)**	-.030 (.021)	-.056 (.027)**	-.089 (.085)	.034 (.019)*
Obs.	1459828	1459828	1386945	72883	50477	21600
No. Firms	1311	1311	1309	1112	69	948
R <sup>2</sup>	.566	.945	.946	.927	.969	.947

**Notes:** Dependent variable: log real hourly wage. Worker-level controls are schooling, experience and its square, tenure and its square, a female dummy variable and a foreign worker (non-Brazilian) dummy variable. All columns except (1) include worker fixed effects. ‘Foreign firm’ is a dummy taking value one if the firm-year is foreign owned (and value zero otherwise). ‘D-to-F mover’ is a dummy taking value one if the worker was employed in a domestic firm in the previous periods and is employed in a foreign owned firm in the current period (and value zero otherwise). ‘F-to-D mover’ is a dummy taking value one if the worker was employed in a foreign firm in the previous periods and is employed in a domestic owned firm in the current period (and value zero otherwise). All specifications include year dummies. Robust standard errors, clustered at the firm level. Significance levels: \*, 0.10; \*\*, 0.05; \*\*\*, 0.01.

If assumption (10) holds, the DID estimate of the average treatment effect on the treated can be obtained by the sample analogs of

$$\widehat{\alpha}_{\text{DID}} = \{E[Y_{it} | D = 1] - E[Y_{it} | D = 0]\} - \{E[Y_{it'} | D = 1] - E[Y_{it'} | D = 0]\}. \quad (11)$$

The expression above simply states that the impact of the program is given by the difference between participants and nonparticipants in the before-after difference in outcomes.

The time invariance assumption can be too stringent if the treated and control groups are not balanced in covariates that are believed to be associated with the outcome variable (Ashenfelter 1978). The DID setup can be extended to accommodate a set of covariates and this is usually done in a linear way, taking into account eligibility specific effects and time/aggregate effects. In the following model,  $\widehat{\alpha}_D$  corresponds to the DID estimate obtained on a sample of treatment and control units:

$$Y_{it} = \lambda D + \tau_t + \theta' Z_{it} + \alpha_D D \tau_t + \varepsilon_{it}, \quad (12)$$

where  $D$  is as before and represents the eligibility-specific intercept,  $\tau_t$  captures time or aggregate effects and equals 0 for the ‘before’ period and 1 for the ‘after’ period, and  $Z$  is a vector of covariates included to correct for differences in observed characteristics between individuals in treatment and control groups.

This estimator controls for both differences in the  $Z$ s and for time-specific effects, but it does not impose common support on the distribution of the  $Z$ 's across the cells defined by the D-in-D approach (namely, before and after, and treatment and control). In our case, we minimise problems of common support by drawing on a particularly homogeneous sample across domestic and foreign firms.<sup>10</sup>

## D RAIS

RAIS (‘Relação Anual de Informações Sociais’, Annual Social Information Report) is an administrative report filed by all tax registered Brazilian establishments. Since the information may be used for investigation about labor legislation compliance, firms that do not comply with it do not file in RAIS. Thus, this data set can be considered a census of the formal Brazilian labor market (State-owned enterprises, public administration and non-profit organizations are also required to file the report.) Firms that do not provide accurate information will be committing an offense sanctioned by law, a threat that is likely to lead to very high standards of data quality.

RAIS covers the whole country and is carried out annually. The information is collected every year in the first quarter, referring to the previous year. Every tax registered enterprise receives a unique tax number (CNPJ). This number is composed by a specific firm part and a complement for each unit (local plant or establishment) that the firm operates.

The main variables available from the survey at the establishment level are:

- Geographic location: State, metropolitan region, county;
- Activity sector: CNAE (National Economic Activity Classification); sector Level (10 categories); activity (42 categories); sub-activity (about 560 categories);
- Establishment Size: number of workers, number of wage earners, number of owners;

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<sup>10</sup>In any case, we believe it would be worthwhile to conduct a difference-in-differences matching analysis (Martins 2004). Another approach is to take as a control group not the firms that are not acquired but those that are acquired by investors of the same nationality. In this way one could isolate the foreign effect from the change in ownership change effect. We leave these two complementary approaches for future work.



- Establishment Type: Private enterprise, private foundation, State-owned enterprise, State foundation, joint public-private enterprise, non-governmental organization, government, nonprofit enterprise, notary.

At the employee level, the following information is available (although we did not obtain access to all variables listed):

- Occupation: occupation classes (CBO-Brazilian Occupation Classification system - about 350 categories); subgroup (84 categories); group (11 categories);
- Personal Characteristics: schooling (9 classes), age, gender, nationality.
- Contract Information: month of admission, month of separation, December wage rate (13th monthly salary), average yearly wage, tenure, separation cause (fired with/without fair reason, separation with/without fair reason, retiring, transfer to other units or firm), contract type (work card, civil service, isolated worker, temporary worker), contract status (in activity or paid leave, leave without paid, occupation accident, military service, maternity leave, sick leave, inactive), admission type (first placement in firm, re-employment, transferred), contract hours (exclusive overtime).

As some other matched employer-employee panels, RAIS is based on worker spells, defined by an occupation-establishment-contract group in each year. In other words, if a worker changes his/her occupation or establishment or contract type in a given year, there will be one separate observation for each case.

With the establishment identification number (CNPJ) it is possible to follow all establishments that file the RAIS survey. Moreover, with the worker's national insurance number, it is possible to follow all workers that remain in the formal sector and to match the worker's characteristics with those of the establishment. Therefore, we can create a panel that matches workers to their establishments and follow each of them over time. It was using the firm identification numbers that we have merged the three data sets described in this appendix.