Foreign capital and gender differences in promotions: Evidence from the Brazilian transformation industry

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Resumo: Este trabalho investiga se mulheres enfrentam um "teto de vidro" dificultando a ascensão em grandes firmas da indústria de transformação no Brasil. Além do natural interesse em avaliar esse tipo de questão em um país em desenvolvimento, os dados brasileiros são particularmente interessantes, pois permitem examinar promoções intra- e inter-firmas. A análise empírica mostra que existem diferenças significativas apenas em firmas de capital nacional. Em contraste, não encontramos nenhum efeito de "teto de vidro" em firmas multinacionais. Os resultados são extremamente robustos, uma vez que variações da amostra e da especificação do modelo não produzem nenhuma mudança qualitativa nas estimativas.

Abstract: This paper examines whether there exists a glass ceiling to women's ascension in the largest firms of the Brazilian transformation industry. In particular, we check whether gender matters in the time it takes to get a promotion to a managerial position. Apart from the natural interest in assessing gender differences in a developing country, the motivation also lies on the fact that the Brazilian data allow us to address both intra-firm and interfirm promotions. We find that, although there are significative gender differences in promotions within domestic firms, the same does not apply for foreign-owned firms. The results are very robust in that there are no qualitative changes if one employs different samples and model specifications. Finally, although our main focus in on gender differences in terms of how much time it takes to get a promotion, we also evince similar gender differences within domestic firms in terms of promotion likelihood and of wage gains.

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Palavras-chave: mobilidade ocupacional, duração, capital estrangeiro, diferenas de gênero, promoção, multinacional

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1 Introduction

There is a widespread consensus that occupational segmentation is the chief determinant for gender differences in wages in the Brazilian labor market. Although women correspond to 39% of the legal workers in Brazil, they amount to only 23% of the employees in the sectors paying relative higher wages in 2004. As well, segmentation increases if one restricts attention to managerial positions in that women hold only 14% of the latter. This suggests that there may exist a glass-ceiling effect (Arulampalam, Booth and Bryan, 2006) in the Brazilian job market to the extent that women may experience implicit barriers to ascension in their jobs.

This paper contributes to the literature by examining data from the largest firms of the Brazilian transformation industry. In particular, our goal is to verify whether there indeed exists a glass ceiling to women's ascension by checking whether gender matters in how much time it takes to get a promotion to a managerial position. This is in stark contrast with most papers that tackle gender differences in promotions in that they mainly focus on computing the promotion probability rather than duration. Investigating differences in promotions is particularly difficult because observationally similar male and female workers may display equal promotion rates and durations even in the presence of gender differences (e.g., promotions may differ in quality).

As far as we know, this is the first study to examine gender differences in promotions using micro-data from a developing country. Apart from the obvious interest in verifying whether the main stylized facts hold in a Latin American country, the motivation also lies on the quality, reliability and availability of the Brazilian data. In contrast to the many studies that employ data from individual firms (see, e.g., Baker, Gibbs and Holmstrom, 1994), we rely on a homogeneous sample of recently hired workers from the Brazilian transformation industry in the period running from 1996 to 2004. This allows us to portray the big picture in that we may address not only intra-firm promotions, but also inter-firm promotions (see discussion in Booth and Francesconi, 2000).

Our data set is particularly convenient for the empirical analysis of gender differences in promotions. First, it conveys information not only on promotions, but also on wage growths, allowing us to control for promotion quality. Second, the data include a wide array of controls for worker and firm characteristics. Third, as opposed to Blau and deVaro (2006), we observe multiple workers per establishment at different occupations and hierarchical levels as well as their career paths in terms of occupation, promotions, and wage increases even if they move from one firm to another within the Brazilian transformation industry. A potential limitation is that our data set does not include any direct measure of on-the-job productivity and hence we must come up with indirect controls.

Interestingly, we find that, although there are significative gender differences in promotions within domestic firms, the same does not apply for foreign-owned firms in the Brazilian transformation industry. Our findings complements to some extent the literature on the differences between multinationals and purely domestic firms (Doms and Jensen, 2006; Greene, Hornstein, White and Yeung, 2006) as well as deVaro and Samuelson's (2005) evidence that gender differences may depend on the nature of the firm (e.g., nonprofit versus for-profit). We conjecture that such differences are due to the fact that multinationals face different interest group pressures (e.g., labor unions and environmental groups) than domestic firms. This is especially true in Latin America, where multinationals have historically been among the usual suspects, and hence perfect candidates for scapegoats. Finally, it turns out that our main empirical finding is extremely robust to variations in the sample, model specification, and estimation methods as well as to the definition of promotion. As for the latter, we evince similar results for wage growth and interfirm (rather than intra-firm) promotions.

This paper mainly relates to the literature on gender differences in career mobility. On the one hand, the theoretical literature on career mobility mainly focus on schooling (Sicherman and Galor, 1990), abstracting away from gender differences. There are a few exceptions, though. Booth, Francesconi and Frank (2003) derive a model that distinguishes between the initial pay increase upon promotion and subsequent pay increases. Under the assumption that women have worse market alternatives, the model implications are consistent with their empirical findings that gender does not affect promotion rates, though women receive lower wage gains. Baldwin, Butler and Johnson (2001) identify the effects of occupational segregation on gender wage gaps using a hierarchical discrimination model in which men dislike supervision by female managers. They predict an exponential decline in the relative proportion of female workers in the top tiers of the job ladder, which is in line with the evidence from a 1988 CPS sample of workers in the insurance industry.

On the other hand, it is common practice in the empirical literature to also include gender among the determinants of job mobility and promotion likelihoods (see, e.g., Groot and van den Brink, 1996; Booth and Francesconi, 2000; Blau and deVaro, 2006) in view that men and women may differ in alternative opportunities (Mincer and Ofek, 1982; Lazear and Rosen, 1990; Royalty, 1998) as well as in job search costs (Meitzen, 1986). For instance, women may face more constraints either to work longer hours or even to remain in the labor market. If women are more likely to quit, firms will have less incentives to train and promote them. On the other hand, if women view promotion as unlikely due to discriminatory promotion practices, they may refrain to put themselves forward for training programmes at the firm (Arrow, 1972).

Our mixed evidence of gender differences in promotions complements well the collection of empirical findings concerning the glass-ceiling effect. Cannings and Montmarquette (1991) evince significant gender differences in the promotion rate among mid-level managers in a Canadian services firms. Ransom and Oaxaca (2005) employ a panel data set from a large grocery retailer in US to estimate a Markov chain model of job mobility for the periods running from 1976 to 1979 and from 1983 to 1986,[1] as well as the probability of food clerk in 1978 to become store-level manager by 1982. Their results are consistent with Cannings and Montmarquette (1991) in that a male food clerk is about six times more likely to become a store-level manager than a female food clerk. In addition, they also conclude that the lawsuit had a dramatic impact on occupational assignments and mobility. See also Cabral, Ferber and Green (1981), Spurr (1990), Barnett, Baron and Stuart (2000), Acosta (2006), and Blau and deVaro (2006) for additional evidence supporting gender differences as well as Lewis (1986), Powell and Butterfield (1994), Paulin and Mellor (1996), Petersen and Saporta (2004), and Giuliano, Levine and Leonard (2005) for evidence against gender differences.

As for gender differences in the time it takes to get a promotion, McCue (1996) examines data from 1976 to 1988 of the Michigan Panel Study of Income Dynamics. The findings are quite interesting in that the time to promotion for single women is comparable to men's, whereas married women usually take more time to get a promotion. In contrast, time to promotion for male employees does not depend on their civil state. Pekkarinen and Vartiainen (2006) analyze gender differences in the metallurgical industry in Finland. They evince that women usually take more time to get a promotion than men with similar jobs, even though women are consistently more productive than men once one controls for promotion outcomes. They thus conclude that women must exceed a much higher level of productivity to obtain a promotion than men.

The remainder of this paper ensues as follows. Section 2 describes the main features of our database, whereas Section 3 discusses the econometric methodology that we employ to assess whether there is gender differences in promotions. Section 4 then reports the findings of our empirical analysis, while Section 5 collects the results of a series of robustness checks. Section 6 offers some concluding remarks.

2 Data description

The IPEA data set we employ gathers information from several databases. In particular, it combines data from the Annual Report of Social Information (RAIS), covering the period running from 1996 to 2005, as well as data from the 1996 Annual Industrial Survey (PIA) in 1996 and from the 1995 Census of Foreign Capital (CEB).

RAIS is an administrative register of the Ministry of Labor (MTE) that provides socioeconomic information regarding the employees of every firm in the Brazilian formal sector. It reports the employees' identifying security number, age, gender, schooling level, job tenure, monthly stipend, occupation, number of hours at work, type of labor contract, nationality, and month of admission. In addition, it also

[1] They separate the two periods so as to verify whether the class-action lawsuit over gender discrimination that the firm faced in the early 1980s had any effect on the relative status of female employees.

documents the firm's identifying fiscal number, sector of activity, and location. PIA is a survey from the Brazilian Institute of Geography and Statistics (IBGE) that focus only on firms with 30 or more employees. It not only covers a very large sample of small and medium firms, but also the complete universe of firms with 500 or more employees. We make use of the 1996 PIA data set to check the RAIS data for misreports as well as to obtain a more precise classification of the firm's sector of activity.

The Central Bank of Brazil publishes the CEB every five years, collecting information on the origin of the shareholders' capital for every firm in Brazil. We employ the CEB to classify firms into multinational or not. We define as multinational a firm in which more than 50% of the shareholders' capital is foreign, though we also control later for the proportion of foreign capital. Matching data from RAIS and CEB reveals that women amount to 21% of the employees in multinationals of the Brazilian transformation industry, occupying 13% of their managerial positions. The figures are similar for firms with less than 50% of foreign capital, namely, 25% and 15%, respectively.

To form a homogeneous RAIS sample, we focus on individuals meeting the following criteria on January 1996. First, the individual must work in a profit-seeking private firm with 500 or more employees in the Brazilian transformation industry. Second, the individual must work full time (i.e., at least 40 hours per week) and hold a university degree. Third, the individual must have joined the firm between January 1989 and November 1995, with an age between 20 and 26. Fourth, the individual must receive a monthly stipend above 5 minimum wages either as an accountant, administrator, director, economist, engineer, intermediate manager, lawyer, manager, or purchases/sales supervisor. Fifth, the individual must also have a labor contract with no expiration date.

The resulting sample includes 636 firms, of which 145 are multinationals, that altogether employ 3,854 male and 1,213 female workers. As for occupations, engineers are the mode with 48.4% of the observations. This is not surprising given that all firms belong to the transformation industry. The average individual in our sample is 27 years old, works about 43 hours per week, and has been working for three years in the firm. There is a fraction of 12.5% of women occupying managerial positions, whereas the analogous figure drops to 11.7% for men. Table 1 stratifies the sample according to occupation and gender, whereas Table 2 reports the sample averages of the individuals' main characteristics.

3 Duration model for time to promotion

In this section, we describe the duration model that we estimate to address gender differences in promotions. We first define time to promotion as the time it takes to the individual to get a promotion to a managerial position either in the same or in another firm. Although we also consider a semiparametric duration model later, we start with a simple linear regression specification for the log of the time to promotion:

$$\ln T^* = \boldsymbol{X}_i \boldsymbol{\beta} + \epsilon_i, \tag{1}$$

where T_i^* gauges how much time it takes to the individual i to obtain a promotion, $\boldsymbol{X}_i$ is a vector of control variates, and ϵ_i is an error term with scale and shape parameters σ and ς, respectively. In the context of duration models, (1) corresponds to an accelerated failure time specification.

We construct the duration variable by following every individual that appears in the 1996 RAIS up to 2004. As some individuals do not obtain a promotion to managerial positions before 2004, we do not observe the time they take to get a promotion. The same occurs to individuals who already are in managerial positions (i.e., either managers or directors) in the beginning of our sample. All we know is for how long he has been working in the firm, which could at best bound from above the time to promotion if they have not changed jobs. Altogether, this means that promotion durations may exhibit both left and right censoring, though the former is not very likely given the criteria we have used to construct the sample.

Under censoring, instead of observing the time to promotion T_i^* for each individual in our sample, we have information only on the duration promotion

$$T_i = \begin{cases} T_i^* & \text{in the absence of censorship} \\ L_i & \text{under left censoring} \\ R_i & \text{under right censoring} \end{cases} \tag{2}$$

where L_i and R_i correspond to how much time the individual i has on the job on January 1996 and on December 2004, respectively. If the individual i exits the firm before December 2004, then the right-censoring variable R_i denotes tenure on the job, without receiving a promotion, up to the exit date.

The control variables are either from the RAIS database of January 1996 or from the 1995 CEB. In particular, we construct the binary variables MALE and JANUARY1993 to control for the individual's gender and tenure in the firm. The latter equals one for individuals who joined the firm after January 1993, zero otherwise. We also include the dummy variables MULTINATIONAL and SOUTHEAST that respectively take value one for firms with more than 50% of foreign capital and for firms located in the (relative much richer) Southeast of Brazil. Finally, we also consider the interaction dummy MALE×MULTINATIONAL and the continuous variable SIZE corresponding to the natural logarithm of the number of employees in the firm that the individual works for.

Let F denote the cumulative distribution function of the error term in (1), with density function f and survival function $S = 1 - F$, and $\boldsymbol{\theta} = (\boldsymbol{\beta}, \sigma, \varsigma)$ denote the parameter vector. The log-likelihood function then reads

$$\mathcal{L}_N(\boldsymbol{\theta}) = \sum_{i=1}^{N}(1-r_i)(1-\ell_i)\,\ln\Big[f(\epsilon_i)/\sigma\Big] + \sum_{i=1}^{N} r_i\,\ln S(\epsilon_i) + \sum_{i=1}^{N} \ell_i\,\ln F(\epsilon_i) \tag{3}$$

where r_i and ℓ_i are indicator functions relating to whether observations are under censoring either to the right or to the left.

Although we relax such an assumption in Section 5, for the sake of exposition, we initially suppose that both r_i and ℓ_i are independent of the regressors. This assumption is indeed strong in that it rules out the situation in which women are more likely to quit their jobs than men, as in Lazear and Rosen's (1990) model.[2] Table 3 documents that 10.8% of the durations relating to male workers exhibit no censoring, whereas 77.8% display right censoring and 11.4% left censoring. These figures are respectively 4.5%, 83%, and 12.4% for female women.

The next section discusses the estimation results. We maximize the log-likelihood using the Newton-Raphson algorithm in SAS 8.2 and compute standard errors using the inverse of the estimated information matrix.

4 Promotions in the Brazilian transformation industry

The duration model we estimate assumes a generalized gamma distribution for promotion durations. There are two distributional parameters, namely, the scale and shape parameters σ and ς. We employ the generalized gamma distribution because it encompasses most of the distributions that appear in the duration literature. In particular, the generalized gamma coincides with the lognormal distribution if $\varsigma = 0$ and with the Weibull distribution if $\varsigma = 1/\sigma$. We thus examine using log-likelihood ratio tests whether the distributional parameter estimates are consistent with the lognormal and Weibull distributions. Table 4 reports the estimation results according to the distribution assumption.

The estimates of the regression coefficients are very similar regardless of the distribution assumption. They indicate that, within firms of domestic capital, there are significant gender differences in promotions. In particular, male employees wait significantly less than female employees to get a promotion. The time to promotion for men is, on average, from 31% to 35% shorter than that for women depending on the distribution. In contrast, there is no evidence supporting gender difference within multinationals. Table 5 indeed documents that the sum of the regression coefficients relating to the dummy variables MALE and MALE×MULTINATIONAL does not statistically differ from zero. In addition, time to promotion is relatively shorter in firms of foreign rather than domestic capital, indicating that, on average, women in multinationals obtain their promotions faster than men in firms with domestic capital.

Our results also evince a negative size effect. If one increases by 1% the number of employees in the firm, the employees will have to wait, on average, 6.7% more to obtain a promotion. This is not surprising due to

[2] The empirical evidence is conflicting at best. Pekkarinen and Vartiainen's (2006) results confirm that women quit more often than men, whereas Ransom and Oaxaca (2005) and Blau and Kahn (1981) find no evidence supporting such gender differences.

the competition effect. The number of managerial positions indeed increases much less than proportionally with the number of employees. Finally, there is some mixing evidence as for the location of the firm. Under the generalized gamma assumption, the estimated regression coefficient suggests that promotion takes a significantly longer spell in the Southeast of Brazil as opposed to the insignificant estimates based on the lognormal and Weibull distributions. The log-likelihood ratio test results in Table 6 however reject the latter distributions, suggesting that the generalized gamma estimates are more reliable.

4.1 Wage growth and promotion likelihood

Booth et al.'s (2003) model predicts that gender does not affect promotion likelihood, though female employees receive lower wage gains. We thus turn to investigating gender differences in promotion likelihoods and in wage growths. In particular, we compute the percentage variation in the number of minimum wages from January 1996 to December 2004, viz.

$$\frac{\text{wage in December 2004} - \text{wage in January 1996}}{\text{wage in January 1996}},$$

for a sample that includes only individuals who worked for the same firm in the period ranging from January 1996 to December 2004. We then perform a linear regression so as to control for the gender, age, and job tenure of the individual as well as for the size, origin of capital, and location of the firm.

Table 7 confirms by a long chalk our previous results. In particular, wage increases seem significantly higher in multinationals than in domestic firms. In addition we find no evidence supporting gender differences in wage variations within multinational firms, whereas domestic firms seem to favor their male employees. To control for heterogeneity, we also compute heteroskedasticity-consistent standard errors. They are very similar to the standard errors that we compute under homoskedasticity. This means not only that there is no evidence of residual heteroskedasticity, but also that there are no qualitative changes in the results.[3]

To verify whether the probability of promotion depends on gender, we run a logit regression in which the dependent variable takes value one if the individual obtains a promotion to a managerial position in the period ranging from January 1996 to December 2004 within the firm, or else it equals zero. We control once more for the gender, age, and job tenure of the individual as well as for the size, origin of capital, and location of the firm. The results in Table 8 evince that domestic firms seems to display gender differences in promotions not only in terms of how much time it takes to get a promotion, but also in terms of promotion likelihood. Female employees are less likely to get promoted in domestic firms, whereas the same does not happen to male employees who have the same odds as workers in multinationals.

Altogether, these results contradict to some extent the evidence and theory put forth by Booth et al. (2003) in that multinationals feature no gender differences in promotions, either in terms of duration or of likelihood, as well as in wage variation. In contrast, there are severe gender differences in promotions within domestic firms, especially in terms of the probability of getting a promotion.

5 Robustness checks

In this section, we run a battery of robustness checks to verify whether our findings indeed hold water. First, we consider different samples so as to cope with potential bias due either to omitted variables or to sample selection. In particular, we aim to check whether individuals' former occupation affects their time to promotion. Second, we extend our definition of promotion so as to include individuals who obtain their promotion by moving from one firm to another. Third, we examine whether there is any qualitative change in the results if we consider a sample that confines attention to individuals in their first job and in certain occupations.

[3] We also perform some specification tests, e.g., Ramsey's RESET, to check whether the linear regression model for wage variation is congruent. All testing results are positive in that they cannot reject our linear specification.

5.1 Former occupation

The duration models in Section 4 do not account for the occupation of the individuals prior to their promotion to a managerial position in view that it is unobservable under left censoring. This may contaminate our results for two reasons. First, Table 1 documents that there exists substantial occupational segmentation, and hence it may result in spurious gender differences. Second, the career path in the transformation industry presumably depends on the occupation the individual has. It seems reasonable to expect lawyers to wait more, on average, for a promotion than engineers in the transformation industry. We then estimate a duration model that includes former occupation dummies as controls for a sample that excludes all left-censored observations. These dummy variables assume value one if the individual's occupation before promotion was either engineer, intermediate manager, or (purchase and sales) supervisor.

Table 9 reports the resulting estimates, which single out a quite different story. First, there is no significant firm size effect. Second, gender differences within domestic firms are much lower than before in that time to promotion for men is, on average, only 23% shorter than for women within firms of domestic capital. Third, gender differences within multinationals are significant at the 5% level. As for occupational differences, engineers take on average 29% less time to get a promotion than accountants, administrators, economists, and lawyers. The differences are even higher for supervisors and, especially, for intermediate managers. Table 10 also shows that the parameter estimates do not change much if one assumes either a lognormal or a Weibull distribution.

Although it avoids the omitted variable bias, this sample entails a substantial selection bias. In particular, by excluding the individuals with presumably shorter time to promotion (i.e., managers and directors), it may distort the evidence relating to gender differences in promotions. The estimation results in Table 4 indicate that women are, on average, promoted in less time than male employees within multinationals, whereas the converse is true within domestic firms. We thus expect the sample selection bias to downplay the female advantage within multinationals as well as the gender differences within domestic firms.

To have a more precise idea of the magnitude of the sample selection bias, we estimate the original duration model, i.e., without former occupation dummies as controls, for the sample without left-censored observations. Table 9 documents that, as expected, gender difference in domestic firms, as measured by the magnitude of the estimated regression coefficient of the gender dummy MALE, decreases from 0.442 to 0.317 if one excludes the left-censored observations and to 0.260 if one additionally includes the former occupation dummies as controls. As for the female advantage within multinationals, the magnitude of the estimated regression coefficient of the firm dummy MULTINATIONAL decreases from 0.448 to 0.175 if one excludes the left-censored observations and to 0.136 if one additionally includes the former occupation dummies as controls. Finally, male advantage within multinationals, as measured by the sum of the estimated coefficients of the dummy variables MALE, MULTINATIONAL, and MALE×MULTINATIONAL, remains stable across the specifications in Tables 4 and 9 (with a magnitude between 0.35 and 0.40).

Altogether, controlling for former occupation does not suffice to disrupt our main result in that we still find no strong evidence of gender differences in promotions within multinationals once we account for the sample selection bias. As before, the same does not apply for domestic firms, where women have to wait significantly more time to be promoted than male employees.

5.2 Broader definition of promotion

We consider so far only promotion within a firm, without accounting for the possibility that individuals may move up to a managerial position through interfirm (rather than intra-firm) promotions. This seems particularly relevant in that the turnover in the Brazilian labor market is extremely high. It turns out that 74% of men and 69% of women get their promotion by moving from one firm to another. We thus create another sample in which promotion may occur in a different firm than the one that employs the individual in January 1996. Table 11 reports the main descriptive statistics.

The results in Table 12 reveal that, if starting at a multinational firm, it takes more time for female employees to be promoted than male employees who, in turn, take slightly less time to be promoted than individuals (regardless of the gender) starting at a domestic firm. One possible explanation rests on the sociology literature that emphasizes the better networking skills that men presumably exhibit (Fernandez and Weinberg, 1997; Fernandez, Castilla and Moore, 2000; Fernandez and Sosa, 2005), which contribute to their advantage in terms of interfirm promotions. Moreover, given that domestic firms pay on average less than multinationals, networking skills would affect more male employees in domestic firms than in multinationals just as we observe.

5.3 Shorter job tenure

The sample so far includes individuals that have joined the firm between January 1989 and November 1995, with an age between 20 and 26. This pretty much ensures that most individuals in our sample are in their first job. We may however miss individuals who has joined the firm after January 1989, but left before January 1996. This could well entail some sort of sample selection bias, and hence we change the sampling procedure to consider only individuals with tenure between 3 and 6 months. This ensures not only that we are dealing with individuals in their first jobs, but also that we are not missing any individual who has already left the firm before January 1996. In this section, we mainly adopt the broader notion of promotion (i.e., both intra- and interfirm promotions) in order to avoid dealing with a very small sample size. Table 13 reports the main descriptive statistics for this alternative sample.

Table 14 displays the estimation results for the sample corresponding to the broader definition of promotion and to individuals in their first jobs. Although the main results remain valid in that there are gender differences only within domestic firms, ranking time to promotion by gender and origin of capital portray a slightly different picture. It seems that male employees in their first jobs take much less time to get promoted than female employees within a domestic firm. The latter take the same time, on average, as workers of both sexes within multinationals.

We next restrict attention to engineers and intermediate managers in their first job so as to improve on homogeneity. Table 15 reports the results for both the original and broader notions of promotion. Although the differences are palpable, both results evince gender differences only within domestic firms. In particular, female engineers and intermediate managers take more time to get a intra-firm promotion within domestic firms, whereas accounting for interfirm promotions is especially relevant for male engineers and intermediate managers within domestic firms.

6 Conclusion

This paper examines whether there exists a glass ceiling to women's ascension in the largest firms of the Brazilian transformation industry. Our main goal is to check whether gender matters in the time it takes to get a promotion to a managerial position, even though we also assess gender differences in wage growths. The motivation lies not only on the natural interest in assessing gender differences in a developing country, but also on the particular features of the Brazilian data set. As it also conveys information on wage growths, we may to some extent control for promotion quality apart from the usual set of controls for worker and firm characteristics. Moreover, we observe multiple workers per establishment at different occupations and hierarchical levels as well as their career paths in terms of occupation, promotions, and wage increases even if they move from one firm to another within the Brazilian transformation industry. This allows us to draw a larger picture by addressing both intra-firm and interfirm promotions.

We find that, although there are significative gender differences in promotions within domestic firms, the same does not seem to apply for foreign-owned firms. The results are very robust in that there are no qualitative changes if one employs different samples and model specifications. Finally, although our main focus in on gender differences in times to promotion, we evince similar gender differences within domestic firms in terms of promotion likelihoods and of wage gains. Our results thus complement well the recent evidence that the nature of the firm may entail substantial differences in managerial practices and in the role of promotions (Doms and Jensen, 2006; deVaro and Samuelson, 2005; Greene et al., 2006). The main limitation of our empirical analysis is that our data set lacks a direct measure of on-the-job productivity. Although we attempt to control for that by considering different samples, it would be enlightening to employ better measures, even if indirect, of productivity or job performance.

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Table 1
Sample size according to gender and occupation

Our sample results from matching data from the 1996 PIA and RAIS databases. The label 'absolute' refers to the number of observations in that cell, whereas 'relative' corresponds to the relative sample size as a percentage of the total number of observations in that column. We group under 'AAEL' all individuals that work as accountants, administrators, economists, and lawyers.

occupation	female		male		total	
	absolute	relative	absolute	relative	absolute	relative
engineers	333	27.5%	2,120	55.0%	2,453	48.4%
AAEL group	385	31.7%	384	10.0%	769	15.2%
intermediate managers	175	14.4%	527	13.7%	702	13.9%
supervisors	169	13.9%	382	9.9%	551	10.9%
managers	149	12.3%	435	11.3%	584	11.5%
directors	2	0.2%	6	0.2%	8	0.2%
total	1,213	100%	3,854	100%	5,067	100%

Table 2
Sample statistics according to gender

Our sample results from matching data from the 1996 PIA and RAIS databases. The columns 'mean' refer to sample averages, whereas the columns 'st.dev.' correspond to the sample standard deviations. We gauge 'age' and 'tenure' (time in the job) in years, whereas 'monthly stipend' is in number of minimum wages.

variable	female		male		total	
	mean	st.dev.	mean	st.dev.	mean	st.dev.
age	27.10	2.15	27.46	2.28	27.38	2.26
tenure	2.97	1.98	3.12	2.08	3.08	2.06
hours at work per week	42.99	1.55	43.01	1.62	43.01	1.61
monthly stipend	18.81	9.62	23.13	11.12	22.09	10.93
number of observations		1,213		3,854		5,067

Table 3

Sample statistics according to censoring and gender

Our sample results from matching data from the 1996 PIA and RAIS databases. The columns 'mean' and 'st.dev.' correspond to the sample averages and standard deviations. We gauge 'promotion duration' in months. As for the variables relating to the firm at which the individual works, 'exp(SIZE)' denotes its number of employees, 'FEMALE WORKERS' documents the number of female employees, 'exp(EXPORTS)' conveys how much the firm exports in USD millions, and 'FOREIGN PARTICIPATION'reports the share of foreign capital within the firm. All other rows refer to binary variables that assume value either one or zero. In particular, 'JANUARY1993' relates to whether the individual has joined the firm after January 1993 and 'EXPORTER' reports whether 'EXPORTS' takes a positive value for the firm at which the individual works.

	left censoring				no censoring				right censoring			
variable	female		male		female		male		female		male	
	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.
promotion duration	36.83	23.32	49.44	25.39	90.23	40.40	90.42	41.62	153.94	40.75	153.85	24.41
JANUARY1993	0.49	0.50	0.33	0.47	0.45	0.50	0.44	0.50	0.52	0.50	0.60	0.49
ENGINEER	0	0	0	0	0.41	0.50	0.58	0.49	0.31	0.46	0.63	0.48
AAEL group	0	0	0	0	0.17	0.38	0.09	0.28	0.38	0.48	0.12	0.32
INTERMEDIATE MANAGER	0	0	0	0	0.32	0.47	0.22	0.41	0.15	0.36	0.14	0.35
SUPERVISOR	0	0	0	0	0.10	0.30	0.11	0.31	0.16	0.37	0.11	0.32
MANAGER	0.99	0.11	0.99	0.12	0	0	0	0	0	0	0	0
DIRECTOR	0.01	0.11	0.01	0.12	0	0	0	0	0	0	0	0
MULTINATIONAL	0.40	0.49	0.34	0.47	0.44	0.50	0.48	0.50	0.29	0.46	0.39	0.49
SOUTHEAST	0.85	0.35	0.72	0.45	0.77	0.42	0.71	0.45	0.82	0.38	0.72	0.45
exp(SIZE)	3,836	4,090	3,293	3,688	3,523	4,974	4,183	5,382	3,546	5,262	4,481	5,848
FEMALE WORKERS	967	1,151	852	1,571	773	1,510	654	917	634	1,038	674	1,030
exp(EXPORTS)	45.59	98.84	44.75	99.27	59.63	128.37	81.80	155.50	65.31	135.04	80.52	149.33
EXPORTER	0.91	0.29	0.85	0.36	0.87	0.33	0.92	0.28	0.88	0.33	0.91	0.29
FOREIGN PARTICIPATION	0.40	0.48	0.33	0.46	0.39	0.46	0.43	0.45	0.27	0.42	0.34	0.44
number of observations		151		441		71		607		991		2,806

Table 4
Maximum likelihood estimates of the duration model

Our sample results from matching data from the 1996 PIA and RAIS databases. The dependent variable is the natural logarithm of the promotion duration. The columns 'coefficient' and 'st.error' report maximum likelihood estimates of the regression coefficients and their standard errors, respectively. 'FEMALE RATIO' denotes the proportion of female employees in the firm at which the individual works. In the bottom panel, we report the overall number of observations as well as the number of uncensored, left censored, and right censored observations.

	generalized gamma		lognormal		Weibull	
	coefficient	st.error	coefficient	st.error	coefficient	st.error
CONSTANT	7.5929	0.4865	7.3612	0.5192	7.5980	0.4790
JANUARY1993	0.8551	0.1088	0.8020	0.1210	0.8669	0.1114
MALE	-1.6331	0.2460	-1.4846	0.2610	-1.6569	0.2558
MALE×MULTINATIONAL	0.8187	0.2625	1.0270	0.2905	0.9177	0.2730
MULTINATIONAL	-1.0292	0.2441	-1.1045	0.2633	-1.0830	0.2519
MALE×FEMALE RATIO	2.3908	0.7051	2.6774	0.9382	2.6098	0.7961
FEMALE RATIO	-2.9293	0.6167	-3.9500	0.8171	-3.3790	0.6979
SOUTHEAST	0.1415	0.1119	0.1097	0.1335	0.1367	0.1193
SIZE	0.0783	0.0549	0.0328	0.0638	0.0617	0.0574
EXPORTS	0.0204	0.0098	0.0395	0.0120	0.0254	0.0106
scale parameter σ	0.8436	0.5306	2.9963	0.1043	1.7886	0.0666
shape parameter ς	2.3744	1.4969	0		0.5591	0.0208
sample size		5,067		5,067		5,067
uncensored		678		678		678
left-censored		592		592		592
right-censored		3,797		3,797		3,797

Table 5
Likelihood ratio tests for gender difference in multinationals

Our sample results from matching data from the 1996 PIA and RAIS databases. The restricted log-likelihood value refers to constraining the maximum likelihood estimator such that the sum of the regression coefficients relating to the dummy variables MALE and MALE×MULTINATIONAL equals zero. The asymptotic distribution of the likelihood ratio statistic is a chi-squared distribution with one degree of freedom and hence the asymptotic critical values are 6.63, 3.84, and 2.71 at the 1%, 5%, and 10% levels of significance, respectively.

distribution	log-likelihood		LR statistic
	unrestricted	restricted	
generalized gamma	-3,893.26	-3,898.99	11.46
lognormal	-3,931.94	-3,933.18	2.48
Weibull	-3,901.04	-3,905.22	8.36

Table 6
Likelihood ratio tests for the error distribution

Our sample results from matching data from the 1996 PIA and RAIS databases. The unrestricted log-likelihood value refers to the maximum likelihood estimation under the generalized gamma distribution, whereas the restricted log-likelihood value corresponds to constraining the shape parameter ς either to zero or to one, so that the generalized gamma distribution reduces to the lognormal or Weibull distributions, respectively. The asymptotic distribution of the likelihood ratio statistic is a chi-squared distribution with one degree of freedom and hence the asymptotic critical values are 6.63, 3.84, and 2.71 at the 1%, 5%, and 10% levels of significance, respectively.

distribution	log-likelihood		LR statistic
	unrestricted	restricted	
lognormal ($\varsigma = 0$)	-3,893.26	-3,931.94	77.36
Weibull ($\varsigma = 1$)	-3,893.26	-3,901.04	15.56

Table 7

Linear regression analysis for wage growth

Our sample results from matching data from the 1996 PIA and RAIS databases, including only individuals who have been working on the same firm between January 1996 and December 2004. The dependent variable is the percentage variation in wage from January 1996 to December 2004:

$$\frac{\text{wage in December 2004} - \text{wage in January 1996}}{\text{wage in January 1996}}.$$

The columns 'coefficient' 'standard error' and 'robust standard error' report least-squares estimates of the regression coefficients and their standard errors under homoskedasticity and heteroskedasticity, respectively. The bottom panel reports the number of cross-sectional observations.

	coefficient	standard error	robust standard error
CONSTANT	1.4182	0.3249	0.3247
AGE	-0.0292	0.0126	0.0132
SIZE	-0.0383	0.0138	0.0128
TENURE	-0.0191	0.0140	0.0144
MALE	0.1122	0.0522	0.0506
MULTINATIONAL	0.1939	0.0743	0.0701
MALE×MULTINATIONAL	-0.1111	0.0812	0.0784
SOUTHEAST	-0.0706	0.0378	0.0410
sample size			980

Table 8
Logit regression for the probability of promotion

Our sample results from matching data from the 1996 PIA and RAIS databases. The dependent variable takes value one if the individual obtains a promotion to a managerial position in the period ranging from January 1996 to December 2005, or else it equals zero. The columns 'coefficient' and 'standard error' report logistic estimates of the regression coefficients and their standard errors, respectively. The bottom panel reports the overall number of observations as well as the number of observations relating to promoted and not promoted individuals.

	coefficient	standard error
CONSTANT	-1.5310	0.6458
TENURE	0.7957	0.1649
SQUARED TENURE	-0.0915	0.0214
MALE	0.6813	0.3583
MALE×MULTINATIONAL	-0.2632	0.3857
MULTINATIONAL	0.4063	0.3596
MALE×FEMALE RATIO	1.8270	1.2262
FEMALE RATIO	1.9647	1.0078
SOUTHEAST	-0.8115	0.1716
SIZE	-0.0964	0.0717
EXPORTS	0.0129	0.0164
sample size		979
promoted		434
not promoted		545

Table 9
Maximum likelihood estimates of the duration model with no left censoring

Our sample results from matching data from the 1996 PIA and RAIS databases. The dependent variable is the natural logarithm of the promotion duration. The columns 'coefficient' and 'standard error' report maximum likelihood estimates and their standard errors under the log-generalized gamma distribution. In MODEL I, we estimate the original duration model for a sample that excludes all left-censored observations, whereas MODEL II controls for former occupation using dummy variables that assume value one if the individual's occupation before promotion was either engineer, intermediate manager, or (purchase and sales) supervisor. The row 'LR statistic, sum zero' refers to the null hypothesis that the sum of the coefficients relating to MALE and MALE×MULTINATIONAL equals zero. The asymptotic critical values are 6.63, 3.84, and 2.71 at the 1%, 5%, and 10% levels of significance, respectively. In the bottom panel, we report the overall number of observations as well as the number of uncensored, left censored, and right censored observations.

	MODEL I		MODEL II	
	coefficient	standard error	coefficient	standard error
CONSTANT	6.7865	0.2751	6.9416	0.2968
January1993	-0.0182	0.0660	-0.0812	0.0704
ENGINEER			-0.1765	0.0921
SUPERVISOR			-0.2324	0.1162
INTERMEDIATE MANAGER			-0.5441	0.1080
MALE	-1.0040	0.1499	-0.9361	0.1521
MALE×MULTINATIONAL	0.1787	0.1640	0.1336	0.1643
MULTINATIONAL	-0.3753	0.1542	-0.3038	0.1547
MALE×FEMALE RATIO	1.6047	0.5372	1.4923	0.5461
FEMALE RATIO	-1.0977	0.4726	-0.8590	0.4797
Southeast	0.2180	0.0695	0.1728	0.0701
SIZE	0.0320	0.0326	0.0417	0.0331
EXPORTS	0.0004	0.0064	-0.0044	0.0065
scale parameter σ	1.3799	0.1570	1.4651	0.1563
shape parameter ς	-0.2200	0.2714	-0.4058	0.3021
LR statistic, sum zero				5.03
sample size		4,475		4,475
uncensored		678		678
left-censored		0		0
right-censored		3,797		3,797

Table 10

Maximum likelihood estimates of the duration model with no left censoring under alternative distributions

Our sample results from matching data from the 1996 PIA and RAIS databases. The dependent variable is the natural logarithm of the promotion duration. The columns 'coefficient' and 'standard error' report maximum likelihood estimates and their standard errors under the log-generalized gamma distribution. The former occupational dummy variables assume value one if the individual's occupation before promotion was either engineer, intermediate manager, or (purchase and sales) supervisor. The row 'LR statistic, distribution' reports the statistic for the null hypothesis that the error distribution is either lognormal or Weibull rather than a generalized gamma distribution. The row 'LR statistic, sum zero' refers to the null hypothesis that the sum of the coefficients relating to MALE and MALE×MULTINATIONAL equals zero. The asymptotic critical values for both LR tests are 6.63, 3.84, and 2.71 at the 1%, 5%, and 10% levels of significance, respectively. In the bottom panel, we report the overall number of observations as well as the number of uncensored, left censored, and right censored observations.

	lognormal		Weibull	
	coefficient	standard error	coefficient	standard error
CONSTANT	7.0336	0.2809	7.0090	0.2741
JANUARY1993	-0.0344	0.0588	0.0395	0.0542
ENGINEER	-0.1850	0.0923	-0.2130	0.0920
SUPERVISOR	-0.2224	0.1158	-0.1889	0.1139
INTERMEDIATE MANAGER	-0.5231	0.1062	-0.4674	0.1025
MALE	-0.9662	0.1538	-0.9736	0.1647
MALE×MULTINATIONAL	0.1660	0.1644	0.2204	0.1686
MULTINATIONAL	-0.3449	0.1544	-0.4075	0.1615
MALE×FEMALE RATIO	1.5231	0.5409	1.4855	0.5264
FEMALE RATIO	-0.8932	0.4795	-0.9073	0.4773
SOUTHEAST	0.1550	0.0669	0.0985	0.0602
SIZE	0.0379	0.0320	0.0355	0.0290
EXPORTS	-0.0039	0.0064	-0.0033	0.0061
scale parameter σ	1.2456	0.0410	0.6608	0.0245
shape parameter ς			1.5134	0.0561
LR statistic, distribution		24.76		0.12
LR statistic, sum zero		6.38		4.92
sample size		4,475		4,475
uncensored		678		678
left-censored		0		0
right-censored		3,797		3,797

Table 11

Sample statistics according to censoring and gender for the broader definition of promotion

Our sample results from matching data from the 1996 PIA and RAIS databases. We extend the definition of promotion so as to include individuals that get a promotion either in the firm they work for in January 1996 or in another firm. The columns 'mean' refer to sample averages, whereas the columns 'st.dev.' correspond to the sample standard deviations. We gauge 'promotion duration' in months, whereas 'exp(SIZE)' denotes the number of employees in the firm. All other rows refer to binary variables that assume value either one or zero, including 'JANUARY1983' that relates to whether the individual has joined the firm after January 1983.

variable	left censoring				no censoring				right censoring			
	female		male		female		male		female		male	
	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.
promotion duration	36.83	23.32	49.43	25.39	79.53	31.11	92.13	37.01	142.97	26.23	143.40	25.23
JANUARY1993	0.490	0.500	0.330	0.470	0.388	0.488	0.556	0.496	0.591	0.491	0.586	0.492
ENGINEER	0	0	0	0	0.199	0.400	0.572	0.494	0.381	0.486	0.659	0.473
SUPERVISOR	0	0	0	0	0.108	0.311	0.124	0.329	0.189	0.391	0.102	0.300
INTERMEDIATE MANAGER	0	0	0	0	0.176	0.381	0.198	0.398	0.157	0.364	0.120	0.325
MULTINATIONAL	0.397	0.490	0.340	0.474	0.227	0.419	0.442	0.496	0.346	0.476	0.378	0.485
SOUTHEAST	0.854	0.354	0.720	0.450	0.845	0.361	0.690	0.462	0.803	0.397	0.734	0.440
exp(SIZE)	3,836	4,090	3,293	3,688	2,841	4,542	4,026	5,161	3,963	5,578	4,743	6,186
number of observations		151		441		396		1,500		666		1,913

Table 12

Maximum likelihood estimates of the duration model for the broader definition of promotion

Our sample results from matching data from the 1996 PIA and RAIS databases. The dependent variable is the natural logarithm of the promotion duration. We extend the definition of promotion so as to include individuals that get a promotion either in the firm they work for in January 1996 or in another firm. The columns 'coefficient' and 'standard error' report maximum likelihood estimates of the regression coefficients under the generalized gamma distribution and their standard errors, respectively. In the bottom panel, we report the overall number of observations as well as the number of uncensored, left censored, and right censored observations.

	generalized gamma	
	coefficient	standard error
CONSTANT	4.8220	0.1434
JANUARY1993	-0.0822	0.0325
MALE	-0.0273	0.0460
MALE×MULTINATIONAL	-0.2458	0.0839
MULTINATIONAL	0.1640	0.0778
MALE×FEMALE RATIO		
FEMALE RATIO	1.7256	0.2142
SOUTHEAST	0.0659	0.0349
SIZE	0.0829	0.0158
EXPORTS		
scale parameter σ	0.5383	0.1161
shape parameter ς		
sample size		5,067
uncensored		1,896
left-censored		592
right-censored		2,579

Table 13

Sample statistics according to censoring and gender for the broader definition of promotion and only individuals with 3 to 6 months of tenure in January 1996

Our sample results from matching data from the 1996 PIA and RAIS databases, including only individuals that have joined the firm between July and September 1995. We extend the definition of promotion so as to include individuals that get a promotion either in the firm they work for in January 1996 or in another firm. The columns 'mean' refer to sample averages, whereas the columns 'st.dev.' correspond to the sample standard deviations. We gauge 'promotion duration' in months, whereas 'exp(SIZE)' denotes the number of employees in the firm. All other rows refer to binary variables that assume value either one or zero, including 'JANUARY1983' that relates to whether the individual has joined the firm after January 1983.

variable	no censoring				right censoring			
	female		male		female		male	
	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.
promotion duration	49.587	27.520	56.760	25.100	112.66	0.806	112.98	0.833
ENGINEER	0.500	0.516	0.375	0.486	0.425	0.499	0.808	0.395
SUPERVISOR	0.187	0.403	0.230	0.423	0.148	0.358	0.060	0.240
INTERMEDIATE MANAGER	0.125	0.341	0.153	0.362	0.185	0.392	0.043	0.205
MULTINATIONAL	0.250	0.447	0.154	0.362	0.351	0.482	0.391	0.490
SOUTHEAST	0.812	0.403	0.596	0.493	0.740	0.442	0.643	0.481
exp(SIZE)	4,587	5,955	3,752	3,906	3,750	4,128	3,295	3,681
number of observations		16		104		54		115

Table 14

Maximum likelihood estimates of the duration model for the broader definition of promotion and only individuals with shorter tenure

Our sample results from matching data from the 1996 PIA and RAIS databases, including only individuals that have joined the firm between July and September 1995. The dependent variable is the natural logarithm of the promotion duration. We extend the definition of promotion so as to include individuals that get a promotion either in the firm they work for in January 1996 or in another firm. The columns 'coefficient' and 'standard error' report maximum likelihood estimates of the regression coefficients under the generalized gamma distribution and their standard errors, respectively. In the bottom panel, we report the overall number of observations as well as the number of uncensored, left censored, and right censored observations.

	generalized gamma	
	coefficient	standard error
CONSTANT	6.4654	0.7556
MALE	-0.6310	0.2270
MALE×MULTINATIONAL	0.3913	0.4091
MULTINATIONAL	0.4314	0.3626
SOUTHEAST	-0.0269	0.1643
SIZE	-0.1567	0.0829
scale parameter σ	1.0384	0.1483
shape parameter ς	0.0125	0.4293
sample size		289
uncensored		120
left-censored		0
right-censored		169

Table 15

Maximum likelihood estimates of the duration model for the sample including only engineers and intermediate managers with shorter tenure

Our sample results from matching data from the 1996 PIA and RAIS databases, including only engineers and intermediate managers that have joined the firm between July and September 1995. The dependent variable is the natural logarithm of the promotion duration. We consider two definitions of promotion. The first restricts attention to promotion within the firm the individual works for in January 1996, whereas the second definition is broader in that it considers both intra- and interfirm promotion. The columns 'coefficient' and 'standard error' report maximum likelihood estimates of the regression coefficients under the lognormal distribution and their standard errors, respectively. In the bottom panel, we report the overall number of observations as well as the number of uncensored, left censored, and right censored observations.

	intra-firm		any firm	
	coefficient	standard error	coefficient	standard error
CONSTANT	8.0489	1.1992	7.4376	1.5419
MALE	-0.2410	0.2067	-0.5374	0.3925
MALE×MULTINATIONAL	0.6516	0.3248	1.0178	0.6018
MULTINATIONAL	-0.2653	0.2341	-0.0811	0.5048
SOUTHEAST	-0.5295	0.1890	0.0722	0.3370
SIZE	-0.5944	0.1374	-0.3390	0.1714
scale parameter σ	0.6459	0.2347	1.5215	0.1464
shape parameter ς	-17.4338	5.6566	-1.3710	0.8727
sample size		196		196
uncensored		27		65
left-censored		0		0
right-censored		169		131