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WAGE DIFFERENTIALS BY FIRM SIZE: THE EFFICIENCY WAGE TEST IN A DEVELOPING COUNTRY

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1. Introduction

Empirical evidences demonstrate that different size enterprises pay different wages (Esteves, 2008, Ahn, 2006; Fox, 2004; Winter-Ebmer and Zweimüller, 1999; Romanguera, 1991; Brown and Medoff, 1989; Haber and Lamas, 1988; Barth et al, 1987). Most of them provide two sources of explanations. From one side, wage differentials by firm size arise because of firm's and worker's heterogeneity, and from the other side, companies with high monitoring costs pay higher salaries than the market clearing level (the efficiency wage theory).

Different sizes enterprises behave differently because they differ on the organization of production and consequently hire workers accordingly to their productive needs. This, in turn, has a direct impact on the labor remuneration. Oi (1983) argues that it is the level of entrepreneurial ability that gives origin to firms with different sizes, where the ones with greater managerial skills will be able to develop large size firms because they can coordinate a higher volume of standardized goods and employ a large amount of workers.

On the other hand, big companies will face high monitoring costs since they have more employees to supervise and also because the opportunity cost of monitoring is greater for more skilled entrepreneurs. As a consequence, firms with different sizes will bare different monitoring costs which, in turn, affect their demand of labor. The result of this dynamics is that large firms in order to minimize surveillance costs have incentives to hire more productive workers and to design a more capital intensive production, while the small companies tend to be more labor intensive and to admit less skilled individuals (Barth et al 1987apud Haber and Lamas, 1988).

On the same line of reasoning, Fox (2004) shows evidences of a positive correlation between firm size and wages for the private sector in the United States and Sweden. He argues that workers attributes, such as talent or non-wage preferences for the firm, affect the

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firm's decision of wages. Some workers judge that large enterprises have a poor work environment because it has more rules, requests more intensive work or is more impersonal, thus, on the margin the employees have lower preferences for the big firms and the large employers need to pay a compensating wage to attract labor (Fox, 2004; Oi, 1983).

From the arguments above, we see that the wage differentials are caused either by worker's ability and non-wage preferences, which are unobservable variables, or by differences in enterprises monitoring costs. Under competitive assumptions, marginal productivity of labor equals salaries and full-employment condition must hold, therefore no wage differentials should persist for similar workers. As a result, there are only two reasons consistent with competitive models for the wage gap existence: the need to compensate for non-pecuniary workers preferences and individual's ability. Note that both of them are unobservable variables, which implies that the main reason for such differential in competitive models would be due to measurement problems (Romanguera, 1991).

The efficiency wage (EW) models also demonstrate how wage distribution (for similar workers) can arise in equilibrium, however, for quite different mechanisms than the ones predicted by the competitive models. The EW theory incorporates the idea that enterprises would get better economic results if they remunerate their employees with a higher wage than the market clearing level and there are various reasons why the firms would behave in such a way. The shirking version proposed by Shapiro and Stiglitz (1984) demonstrates that firms that face high monitoring costs find shirking so costly that the payment of high wages is a proper incentive to extract labor effort. There are large empirical evidences that support the existence of efficiency wage (Krueger and Summers, 1987 and 1988; Dickens and Katz 1987a and 1987b, and Groshen, 1986). However, in less developed countries (LDCs) the investigation of wage differentials due to efficiency wages has not been widely explored, most of these studies focus on competitive models, as discussed before.

In this paper we are particularly interested in verifying if the prediction of the EW theory, on its shirking version, can explain the wage growth in development countries. The idea that monitoring costs differs by firm size suggests that the amount of effort a worker whishes to devote to his/her job tasks, might vary as well. Motivated by this issue, we seek to test the following hypothesis: large size firms pay higher wages because they tend to remunerate better the effort in order to minimize monitoring costs, which are greater when compared to smaller enterprises. We adopt a Switching Regression Model (Maddala, 1983) to estimate the increase of wage for small and large enterprises, between the years of 2006 and 2007.

The rest of the paper is organized as followed. The next section introduces a literature review about the EW models emphasizing on the developments of the shirking version. The following one presents the data used for the estimations and briefly describes some characteristics of the Brazilian Labor Monthly Survey (PME/ IBGE). The fourth section brings the estimation strategies based on the Switching Model described in Cameron and Trivedi (2005). The results obtained are presented in the fifth and the last section concludes the paper.

2. Literature Review on Efficiency Wage Models

There are various versions of the EW models that explain why it is profitable for an employer to fix the wage above the market clearing level and each of them exploit different mechanisms on the relation among worker, employer and the market forces. Romanguera (1991) lists seven distinct approaches for the EW models, which will be briefly described below:

- Nutritional Model: the earliest of these models. It was developed by Leibenstein (1957) and established that the positive correlation between effort and wage would be motivated by the worker's health and nutrition that could be achieved by highest consumption supported by higher salaries.
- Adverse Selection Model: predicts that better workers have better alternative offers and that the high wage firms have greater probability of attracting a better pool of applicants (Weiss, 1980, apud Romanguera, 1991).
- Recruiting Model: emphasizes that firms find costly to have a job offer turned down because of recruitment costs and forgone production, therefore the entrepreneur has an incentive to catch the applicant by offering an elevated salary (Lang, 1988 and Montgomery, 1988, apud Romanguera, 1991).
- Sociological or Normative Model: relies on the idea that agents are not completely individualistic in their choices, but also value social conventions that are not totally individualistic. As a consequence, the worker perceives his or her higher remuneration as a "gift" to be rewarded (Solow, 1979 and 1980; Akerlof, 1982 and 1984; and Akerlof and Yellen, 1988, apud Romanguera, 1991).

- Union Threat Model: argues that collective action enables workers with bargaining power that allows them to appropriate part of the firm's rents, which in turn leads to higher wages (Dickens, 1986 apud Romanguera, 1991).
- Turnover Model: it is very similar to the shirking version that will be presented next. This model assumes that labor turnover is costly for the firm because they lose the investments made on the job training and because workers have lower productivity in the adjustment process. As a result, firms in order to minimize such costs have incentive to prevent turnover by paying higher salaries (Salop, 1979 and Stiglitz, 1974, 1986 apud Romanguera, 1991).
- The shirking version: it was proposed by Shapiro and Stiglitz (1984) and bases its structure on the following intuition: if unemployment represents a penalty for those who were caught shirking, then workers will choose not do so. The employers, on their side, in order to avoid shirking have incentive to pay more than the "going wage", thus if all firms act similarly the labor demand will reduce and, therefore, unemployment arises. Note that the employers cannot monitor the activities of their employees costlessly and perfectly and that is why high wage represents savings for the firm both in monitoring costs and in the increased output due to higher effort. Therefore, there is an informational problem between employers and workers in the structure of this model that explains how involuntary unemployment can persist as an equilibrium phenomenon.

The Basic Model of the Shirking Version (Shapiro and Stiglitz, 1984)

The model starts assuming that there are a fixed number of N identical workers who dislikes exerting labor effort and enjoy consumption, with utility represented by $U(w,e)$, where w is the wage earned and e is the level of effort put on the job activities. When an individual is unemployed, he or she receives a benefit of w^b and $e=0$. There is a probability b, taken as exogenous, that a worker can be dismissed from the job due to relocation, for example, but not because he or she was caught shirking. However, if the employee shirks, there is some probability q that he or she will be caught and fired. The worker utility is maximized at a discount rate of $r>0$[3].

[3] When r is higher, the relatively more weight is attached to the short-run gains from shirking, until one is caught, compared to the losses incurred when one is eventually caught.

The only choice the worker makes is the selection of the effort level, by comparing the utility of shirking (V_E^S) and not shirking (V_E^N). The utility equations of a shirker and nonshirker are given by:

$$rV_E^S = w + (b+q)(V_u - V_E^S) \quad (1)$$

$$rV_E^N = w - e + b(V_u - V_E^N) \quad (2)$$

where V_u is the utility of being unemployed that will be presented latter. Working with both equations yields the following solutions:

$$V_E^S = \frac{w + (b+q)V_u}{r+b+q} \quad (3)$$

$$V_E^N = \frac{(w-e) + bV_u}{r+b} \quad (4)$$

The worker will not shirk if and only if $V_E^N \geq V_E^S$, which produces the no-shirking condition (NSC):

$$w \geq rV_u + (r+b+q)\,e \Big/ q \equiv \hat{w} \quad (5)$$

Note that the critical wage $\hat{w}$ is positively related with the effort level (e), the utility of being unemployed (V_u), the interest rate (r) and with the quit rate (b), but it is inversely related with the probability of being caught (q).

From the employers side, there are M identical firms with a production function $Qi = f(L_i)$ generating an aggregate production of $Q = F(L)$. An enterprise pays w for its employees and must pay some level w^b of unemployment benefits, which will be set at the minimum level as possible. Thus, the firm's labor demand $f'(L_i)$ is found by equating the marginal product of labor to the cost of hiring an additional employee, which is given by $\hat{w} + w^b$.

In the simplest version of this model, the monitoring technology (q) is taken as exogenous. When the firms endogenize q, they can trade off monitoring by higher wages as a method of labor discipline and firms who have high costs of monitoring will choose to pay higher salaries. It implies that firms are no longer identical since they differ on their monitoring technologies and, therefore, might choose different levels of wages for workers alike.

The market equilibrium is determined when each firm, taking as given the wages and employment levels, finds it optimal to offer the going wage rather than a different wage[4]. In order to find the no-shirking condition after incorporating the firm's behavior, lets first present the utility of a worker being unemployed:

$$rV_u = w^b + a(V_E - V_u) \tag{6}$$

where a is the job acquisition rate and V_E is utility of an employed worker, which equals to V_E^N, in equilibrium. Solving for **(4)** and **(6)**, we have:

$$rV_E = \frac{(w-e)(a+r)+w^b b}{a+b+r} \tag{7}$$

$$rV_u = \frac{(w-e)a+w^b(b+r)}{a+b+r} \tag{8}$$

Replacing **(8)** into the NSC **(5)** yields the aggregate NSC:

$$w \geq w^b + e + e(a+b+r)/q \tag{9}$$

Observe that the critical wage is greater, the highest w^b and the flows out of unemployment a. Since a is the probability of obtaining a job per unit of time, $1/a$ is the expected duration of unemployment, so the longer this duration, the smaller the wage necessary to induce nonshirking. In steady-state the flow into unemployment, bL, equals the flow out, $a(N-L)$, which gives:

$$a = bL/(N-L) \tag{10}$$

Substituting for a into **(9)**, the aggregate NSC becomes:

$$w \geq w^b + e + \frac{e}{q}\left(\frac{bN}{(N-L)} + r\right) \tag{11}$$

$$= w^b + e + (e/q)(b/u + r) \equiv \hat{w}$$

where $u = (N-L)/N$, is the unemployment rate. Market equilibrium occurs where the aggregate NSC intersects the aggregate demand for labor.

[4] Note, however, that when the firms face different monitoring costs, some will have incentive to pay more than the going wage.

Equation **(11)** shows the mechanisms that induce companies to pay high salaries. From the worker's point of view, he or she wishes to keep a high remuneration because entering into unemployment represents a penalty given the lost of the high wages themselves and because with high salaries the labor demand will be low, which implies long spells of unemployment. As result to keep that level of labor income, workers will choose to devote the highest amount of effort necessary to reach the critical wage at NSC. From the firm's side, when they have control on their monitoring technologies, two outcomes are possible, firms that face high monitoring costs will have incentive to pay $\hat{w}$ as a worker discipline, and also because they want to keep a high level of output due to increased effort. But if the monitoring costs aren't high enough, the firms do not need to pay an elevated salary because they can easily observe workers effort and this is a sufficient mechanism for no-shirking.

As argued on the first section of this article, large size firms employ a larger number of workers and face relatively greater monitoring costs, since they hire more skilled managers whose opportunity cost of monitoring is more expensive. Small firms, by contrast, can manage to monitor workers activities in a cheaper way. As a result of this process, we expect the find the following outcome: large companies pay a higher wage premium for dispended labor effort, as compared to smaller enterprises.

3. The Data Description

The paper uses data from the Brazilian Labor Monthly Survey (PME/ IBGE) for the years of 2006 and 2007. It is a longitudinal survey that is based on a rotating panel, where a group of households is selected in every sample sector and each of these households are interviewed for four consecutive months, after that they exit the survey to come back again eight months later and be followed for four additional months. The survey covers six metropolitan regions of Brazil: Recife, Salvador, Belo Horizonte, São Paulo, Rio de Janeiro and Porto Alegre.

The target variable to be studied here is the wage growth between 2006 and 2007 for workers employed in small and large size firms. There are two group of explaining variables included in the model, one capturing the usual worker's socioeconomic features, such as gender, age, head of family and education, and the other covering the characteristics of the job, such as sector of activity, type of contract (if temporary or not), legal contribution for social security, time working for the firm, and two proxies variables designed to capture the

effort level of the worker: sub-occupation and sub-remuneration. The individuals considered sub-occupied were those who worked less than 40 hours a week, but wished to work more, while sub-remuneration addressed to those employees who received a wage that was inferior to the average salary the category of similar workers used to earn. This last proxy corresponds to unpaid overtime work because when the employee is sub-remunerated he or she is receives less per hour worked, being equivalent to working unpaid hours.

The choice of these proxies followed the spirit of the studies of Bradley et al (2007), Engellandt and Riphahn (2003), Booth et al (2000) and Jimeno and Cortes (1996), whose works chose as effort level proxies, unpaid overtime work or absenteeism. This last variable, however, is not trustable to be used in the present paper because the PME is answered by the employee and he or she would rather not reveal job absenteeism, a problem that doesn't exist when the employer, instead, is interviewed.

The selection of our database used workers employed in small firms to medium, with less than 10 employees, and those employed in large firms, with eleven or more workers. After the removal of missing observations, we ended up with 37,024 observations, being 6,196 workers in the small to medium firms and 30,828 in the large ones.

The data used for the estimations is presented in **Table 1**, which brings individual attributes of the worker and the job characteristics according to the firm size.

Table 1
Sample characteristic according to the firm size

CHARACTERISTICS	FIRM SIZE	
	SMALL AND MEDIUM	LARGE
Individuals		
Man	59.64%	62.47%
16 to 25 years old	30.94%	23.29%
26 to 40 years old	40.90%	44.84%
41 to 70 years old	28.16%	31.87%
Head of family	43.35%	48.93%
Years of school	3.07	3.40
From the job		
Average wage	R$ 602.66	R$1,593.62
Temporary contract	3.94%	4.65%
Social security contribution	52.94%	84.64%
Working for 1 month	1.63%	0.80%
1 month to 1 year of work	22.11%	17.25%
1 to 2 years of work	15.74%	13.88%
Working for more than 2 years	60.52%	68.07%
Sub-occupied	3.31%	2.13%
Sub-remunerated	26.74%	8.62%
Industry	12.41%	25.20%
Construction	8.04%	4.47%
Sales	32.12%	16.60%
Financial	20.56%	20.21%
Public administration	7.26%	15.44%
N° of observations	6,196	30,828

Source: Labor Monthly Survey (Pesquisa Mensal de Emprego, PME/IBGE, 2006 and 2007).

Table 1 tells us that there exists some worker's heterogeneity from individual and, especially, from the job aspects. Large size firms employ in average a higher percentage of man, head of family and hire employees slightly more educated. The greatest difference arise in terms of wage paid: the average salary of large firms is almost three times as greater as the one paid in small and medium enterprises.

Another striking discrepancy is the social security contribution and sub-remuneration. The highest percentage of workers under sub-remuneration explains why the average wage of small to medium firms is so much lower than the one paid in larger ones. The social security contribution, on its turn, is also expected to be inferior in small and medium companies, since this segment of the Brazilian labor market concentrates the highest amount of the so-called "informal" business that do not pay taxes and usual labor legal costs.

Other differences important to mention, but not as remarkable as the ones just cited, refers to the fact that small and medium firms employ in average more temporary workers who work for the firm for a inferior period of time when compared to the labor duration in

bigger enterprises, while the percentage of sub-occupied workers is higher in smaller firms. The distribution among economic sector is also heterogeneous by firm size: large firms concentrate labor demand on the industry segment, while small to medium companies employ more on the sales sector

4. Empirical Strategy

In this section we present the empirical strategy used to investigate the inter-dependence of wage increase and firm size given worker's and firm's attributes. The hypothesis to be tested is that large firms remunerate better the worker effort. In order to test it, the paper follows the empirical strategy proposed by Jappelli et al (1997) and Gross and Souleles (2001), whose developments is based on Roy's model also denominated as *Switching Model* by Maddala (1983).

According to Cameron and Trivedi (2005), the origin of the Roy's model departure from a Roy's article (1951), which considered that the existence of individual heterogeneous skills and self-selection into job occupations could create occupational differentials of earnings. The application of such model is very suitable for the problem studied in the present paper, since it might be the case that the wage differentials by firm size could arise as a consequence of heterogeneous skills and levels of effort. The model adopted here comes from Cameron and Trivedi (2005) and is described as follows.

There is a latent variable c_1^* indicating if the observed result is c_2^* or c_3^*, such as:

$$c = \begin{matrix} c_2^* & if\, c_1^* > 0 \\ c_3^* & if\, c_1^* \leq 0 \end{matrix} \qquad (12)$$

where $c_1^* > 0$ if the individual works for small firm and $c_1^* \leq 0$ if he or she works for medium or large companies. Based in **(12)** it can be defined a linear system with additive errors for the latent variable:

$$\begin{aligned} c_{1t}^* &= Z_{it}^{'}\beta_1 + \varepsilon_{1it} \\ c_{2t}^* &= x_{2it}^{'}\beta_2 + \gamma_2 y_{2it} + \varepsilon_{2it} \\ c_{3t}^* &= x_{3it}^{'}\beta_3 + \gamma_3 y_{3it} + \varepsilon_{3it} \end{aligned} \qquad (13)$$

The first equation indicates if the person works or not in a small firm. The second and third equations have as dependent variable the wage growth, between 2006 and 2007, for the individuals who work and do not work in small firms. The matrix X_{it} is composed of exogenous variables that represent the preferences and characteristics of individuals and market. The Y_{it} vector consists of apparently endogenous variables, such as years of school, while Z_{it} is a vector of instruments. The idea behind the system present in **(13)** is that $x_{3it}^{'}\beta_3 + \gamma_3 y_{3it} = x_{2it}^{'}\beta_2 + \gamma_2 y_{2it} + \alpha$, where α is the extra-wage paid by larger enterprises for workers alike. Assuming that the correlated errors have a joint normal distribution, the simplest parametric model is given by:

$$\begin{bmatrix} \varepsilon_{1it} \\ \varepsilon_{2it} \\ \varepsilon_{3it} \end{bmatrix} \sim \left[\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \sigma_{12} & \sigma_{13} \\ \sigma_{21} & \sigma_2^2 & \sigma_{23} \\ \sigma_{13} & \sigma_{23} & \sigma_3^2 \end{bmatrix} \right] \tag{14}$$

As usual **(14)** is normalized for $\sigma_1^2 = 1$, only when c_1^* is observed. The most common estimation strategy is the Heckman's two-step method applied to the truncated means:

$$\begin{aligned} E\left[\Delta \ln w \mid x, c_1^* > 0\right] &= x_{2it}^{'}\beta_2 + \gamma_2 y_{2it} + \sigma_{12}\lambda(x_{1it}^{'}\beta_1) \\ E\left[\Delta \ln w \mid x, c_1^* \le 0\right] &= x_{3it}^{'}\beta_3 + \gamma_3 y_{3it} - \sigma_{13}\lambda(-x_{1it}^{'}\beta_1) \end{aligned} \tag{15}$$

where $\lambda(Z) = \phi(Z)/\Phi(Z)$ is the inverse-Mills ratio. At the first stage, it is estimated a probit model, which binary dependent variable (c_1^*) is whether the individual works or not in a small/ medium enterprise. This first-stage estimation is, thus, the selection equation and yields estimates of β_1 and $\lambda(x_{1it}^{'}\beta_1)$. At the second stage, two separated OLS regressions give the estimates for (β_2, σ_{12}) and (β_3, σ_{13}).

5. The Results for the Wage Growth Estimation in Brazil using Switching Regression Model

In this section, the key hypothesis of this paper is tested. The switching endogenous regression model is used to investigate if the predictions of the efficiency wage theory holds for a development country, such as Brazil. The idea is to test if large firms because of higher monitoring costs do pay a higher wage in order to extract more labor effort.

As discussed in the first section, individuals might have non-wage preferences for the firm and heterogeneous abilities, which make the decision of working or not in a small firm conditioned to some endogeneity problem. The assumption is that this choice is associated to some demographic and occupational characteristics, such as the variable presented in the selection equation in **Table 2**. Some of these variables are used as instruments (vector Z_{it}: education, being head of family and having temporary contract) and the estimates of all of them were significant and presented the expected sign, as discussed next.

The results in **Table 2** indicate that the probability of working in a small to medium size enterprise decreases with age, years of school, growth of schooling and within workers who are head of family. These results are consistent with empirical evidences provided by Fox (2004), in which he argues that it is efficient to match high-ability workers together with large employers because the marginal product of a manager supervising a large firm is greater. Additionally, older workers or heads of family represent individuals carrying more familiar responsibilities, so they tend to be more experienced, value more the employment and, as consequence, are rather desired by more structured and larger firms.

On the other hand, the chances of working on a small to medium size enterprise increase within workers under temporary contract and who contributes for social security. For the first case, Booth et al (2000) find evidences that temporary employees present greater probability of wishing to separate (either to change occupation or geographical location) or a higher cost (or lower benefit) to acquiring specific human capital. Considering that large size firms tend to invest more on firm-specific training in order to produce large standardized volumes of output, labor turnover can represent substantial cost for the large employer, therefore, they do not wish a worker who presents high probability of quitting. As for the positive relation between the chances of working in a small to medium company and social security contribution, we have an unexpected result, which is possibly associated with the recent "formalization" process in the Brazilian labor market that might be increasing the chances of a worker who benefits from social security to be employed in a small firm. In fact between 2006 and 2007, the proportion of employees who contributed to social security in small firms increased 10%, while the growth observed in large firms was only of 3% (PME/ IBGE, 2006 and 2007).

The geographic dummies indicate that the probability of working in a small firm decreases in the metropolitan regions of Belo Horizonte, São Paulo and Porto Alegre relatively to the reference dummy of Salvador. This is an expected result since these three

cities are located in the most developed regions of Brazil, which concentrate larger and more structured companies, while Salvador is located in a poorer region.

Table 2
Selection equation for working or not in small/ medium firms in 2006 - First stage probit estimation

VARIABLES	COEFFICIENT	STANDARD ERRORS
Age	**-0.0022***	0.0012
Man	0.0325	0.0247
School variation	**-0.2316*****	0.0106
Years of school	**-0.2488*****	0.0150
Head of family	**-0.0923*****	0.0213
Temporary contract	**0.0870***	0.0449
Sub-occupied	-0.0193	0.0713
Sub-remunerated	0.0273	0.0360
Social security contribution	**0.0762***	0.0291
Working for 1 month	-0.0412	0.0983
1 month to 1 year of work	-0.0004	0.0291
1 to 2 years of work	0.0030	0.0341
Industry	-0.0352	0.0347
Construction	0.0467	0.0546
Sales	0.0091	0.0357
Financial	-0.0334	0.0358
Public administration	-0.0285	0.0403
Belo Horizonte	**-0.1113****	0.0439
Rio de Janeiro	-0.0370	0.0417
São Paulo	**-0.2179*****	0.0424
Porto Alegre	**-0.1551*****	0.0453
Recife	0.0206	0.0517
Constant	-0.0215	0.0886

Bold coefficients for p-value: ***p<0.01, **p<0.05, *p<0.1.

Table 3 brings the estimations of the second and third equations in **(13)**, which corresponds to the wage growth equation by firm size. The solution for the system of equations in **(13)**, which includes the selection equation **(Table 2)**, is simultaneously obtained by maximum likelihood estimation. **Table 3** shows us how the behavior of the wage growth varies with the size of the firm.

The wage growth between 2006 and 2007 was greater amongst men and younger workers when compared to women and older individuals. It was also positively related with the increase in the years of school and with all the metropolitan regions located in the south of Brazil compared with the reference dummy, the city of Salvador. Only when compared to Recife, a city from the same region as Salvador, this last city exhibit greater wage growth in the case of large companies. The positive impact of the school variation was greater for larger

firms, a similar result for the selection equation. On the other hand, the magnitude of the salary increase was larger for small to medium firms located in the South of the country, probably revealing these enterprises were experiencing more dynamism when compared to the bigger ones that already achieved a more structured status.

The wage increase was also directly associated with the period of time working for the firm, but at decreasing rates, which was expected, provided that firm cannot augment the salary at increasing rates as the worker lasts in the company. This tendency was especially clear after the first year of contract, for both groups of firm sizes. For large enterprises, the wage growth increased at a faster rate after the first month to slow down after one year of contract, indicating that the first month was faced as probation for the worker and after succeeding it, he or she would earn a wage increase.

The wage growth by economic sector revealed that the salaries in the industry increased less than other segments, in both size firms. For big companies this was also true for the financial sector, but not for the sales one. Social security contribution was inversed related with the labor income growth in the two groups of enterprises. This might be explained by the fact that it represents an indirect salary for the worker and a protection in the case he or she gets fired. Besides, when the firm decides to incur in such labor cost, it becomes more expensive to provide salary increase. Being this burden even more substantial for small to medium firms, as figures from the greater coefficient found for this group of firms compared to the large ones.

Finally we get to analyze the key variables to test the EW theory, the proxies for labor effort: **sub-occupied** and **sub-remunerated**. The hypothesis is that large size firms pay higher wages because they tend to remunerate better the effort in order to minimize monitoring costs, which are greater when compared to smaller enterprises.

The results from **Table 3** show that the effort variables were statically significant and positively related with the wage growth, in the two groups of firms. However, the magnitude of the coefficients was larger for big firms than for smaller ones, an indication that workers who would like to work more hours than they actually do (sub-occupied) and who are receiving, in average, less than others employees from the same category (sub-remunerated) are better rewarded in large size firms. This happens because, as predicted by the shirking version of the EW theory, when the firms have control on their monitoring technologies, two outcomes are possible: firms that face high monitoring costs will have incentive to pay more than the prevalent wage as a worker discipline, and also because they want to keep a high level of output due to increased effort. But if the monitoring costs aren't high enough, the

firms do not need to pay an elevated salary because they can easily observe workers effort and this is a sufficient mechanism for no-shirking. Big companies will face higher monitoring costs than smaller ones, provided that they have more employees to supervise and also because they hire more skilled supervisors, whose opportunity cost of monitoring is greater (Oi, 1983 and Barth at al, 1987 apud Haber and Lamas, 1988).

It is important to mention that, besides the association between labor effort and the wage differential by firm size, the investments in education, as well as the permanence on the job for longer periods, can also explain the differences in the wage variation for the two groups of firms. In fact this can also be seen as an implication from the predications of the EW theory, provided that, from one side, employers have incentive to pay more than the market-clearing wage in order to attract more productive and skilled labor, expecting to minimize the monitoring costs, and from the other side, the greater is the employee's fidelity to the firms, the less expenses the enterprise will face with labor turnover. We already argued that the relatively higher monitoring costs and labor turnover that large size firms face as compared to smaller ones represent proper incentives to attract more qualified labor and individuals who would rather not shrink because the penalty for losing their jobs would be long spells of unemployment and the lost of the elevated salary. In fact, the results from **Table 3** show that the effects of school variation and greater tenure to the job were specifically higher for large size firm, as compared to small ones.

Table 3
Estimation for the wage growth between 2006 and 2007 by firm size

	SMALL AND MEDIUM		LARGE	
VARIABLES	**COEF.**	**STAND. ERR**	**COEF.**	**STAND. ERR**
School variation	**0.2568*** **	0.0133	**0.2868*** **	0.0062
Age	**-0.0174*** **	0.0016	**-0.0184*** **	0.0008
Man	**-0.2582*** **	0.0352	**-0.2215*** **	0.0167
Sub-occupied	**0.3209*** **	0.1054	**0.3424*** **	0.0497
Sub-remunerated	**0.5566*** **	0.0529	**0.6122*** **	0.0251
Social security contribution	**-0.2400*** **	0.0416	**-0.1284*** **	0.0197
Working for 1 month	**0.2829***	0.1455	**0.1742** **	0.0676
1 month to 1 year of work	**0.2087*** **	0.0423	**0.2115*** **	0.0203
1 to 2 years of work	**0.1405*** **	0.0499	**0.1828*** **	0.0240
Industry	**-0.1263** **	0.0507	**-0.1055*** **	0.0243
Construction	-0.0407	0.0805	-0.0525	0.0389
Sales	0.0439	0.0521	**0.0733** **	0.0253
Financial	-0.0731	0.0521	**-0.0557** **	0.0250
Public administration	0.0538	0.0588	0.0443	0.0280
Recife	-0.0431	0.0741	**-0.1203** **	0.0378
Belo Horizonte	**0.3193*** **	0.0636	**0.2293*** **	0.0316
Rio de Janeiro	**0.3123*** **	0.0596	**0.1994*** **	0.0304
São Paulo	**0.6418*** **	0.0629	**0.4911*** **	0.0302
Porto Alegre	**0.5149*** **	0.0662	**0.3106*** **	0.0324
Constant	**1.5439*** **	0.1299	**0.4355*** **	0.0469

Bold coefficients for p-value: ***p<0.01, **p<0.05, *p<0.1.

6. Conclusions

Although there is a large body of empirical evidences supporting the existence of wage differentials by firm size due to the EW theory in developed countries, this subject has not been widely explored in less developed countries, such as Brazil. Motivated by this gap in the Brazilian literature, the goal of this paper was to study if the wage differential between small/medium and large size firms in Brazil could be explained by the predictions of the EW theory, emphasizing the role of labor dispended effort and the wage premium. Using data from the Labor Monthly Survey (PME/ IBGE) for the years of 2006 and 2007, the following hypothesis was tested: large size firms pay higher wages because they tend to remunerate better the effort in order to minimize monitoring costs, which are greater when compared to smaller enterprises.

On such investigation we adopted empirical strategies based on a Switching Endogenous Regression Model. On the first stage, probit estimations characterized the chances of working or not in a small to medium size firm. Given the possible role of

endogeneity involved in such decision of working or not in small/medium firms, simultaneous equations models were estimated in order to incorporate the mentioned choice. These models were used to estimate the wage growth between 2006 and 2007 for the two groups of firms studied: small/medium and large.

The obtained estimates corroborated the idea that the dedication to labor effort had a positive impact on the wage growth and this impact was even greater for large size firms, when compared to small ones. At the same time, the growth of schooling and the longer permanence of the worker on the firm were also directly related with the increase of wage, being its effect even higher within large enterprises. These results were largely favorable to the predictions of the EW theory on its shirking version, because, as already argued, large size firms have incentive to pay more than prevalent wage in order to extract more labor effort and to capture more skilled and productive individuals. This, in turn, may reduce the elevated monitoring costs such firms face relatively to smaller ones.

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