

Arbache, Jorge Saba

Working Paper

The Impact of Unions on Wages in Brazilian Manufacturing

Department of Economics Discussion Paper, No. 9805

Provided in Cooperation with:

University of Kent, School of Economics

Suggested Citation: Arbache, Jorge Saba (1998) : The Impact of Unions on Wages in Brazilian Manufacturing, Department of Economics Discussion Paper, No. 9805, University of Kent, Department of Economics, Canterbury

This Version is available at:

<https://hdl.handle.net/10419/105511>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

THE IMPACT OF UNIONS ON WAGES IN BRAZILIAN MANUFACTURING

Jorge Saba Arbache*

January 1998

Abstract

The empirical literature on the impact of unions on wages has stressed two major conclusions. Firstly, unionised workers earn a wage premium when compared to comparable nonunionised workers. Secondly, the dispersion of wages within the union sector is lower than in the nonunion sector. We examine the validity of these findings in the context of a developing country labour market. Our results show that unionism does create a positive wage differential for male, semi-skilled workers with formal labour contracts in Brazilian manufacturing, and that, contrary to the common finding in the existing literature, wage dispersion is greater in the union sector. We show that these findings can be explained by the greater variance in the characteristics of unionised workers, the vulnerability of nonunionised workers to market conditions, and the structure of wage bargaining.

JEL Classification: J31, J51

Keywords: Union power, union wage differential, wage dispersion, Brazil

Acknowledgements: I would like to thank Andrew Dickerson, Owen O'Donnell, Francisco Carneiro and João Ricardo Faria for their useful comments and suggestions. The usual disclaimer applies.

Correspondence address: Department of Economics, Keynes College, University of Kent at Canterbury, Kent, CT2 7NP, England, Tel: 01227 827449; Fax: 01227 827850; E-mail: jsa1@ukc.ac.uk

* University of Kent at Canterbury, England and University of Brasília, Brazil

THE IMPACT OF UNIONS ON WAGES IN BRAZILIAN MANUFACTURING

1. Introduction

There is a well established empirical literature on the effects of unions on wage determination and on the effects of union policies on the structure of pay in developed countries¹. Two basic results prevail in this literature. First, unions increase the rate of pay by bargaining, thus creating a union wage differential between otherwise comparable workers. Second, unions reduce the dispersion of wage rates within and across establishments for labour of the same type of grade as compared to unorganised workers. Many theories support this finding. Institutionalist economists argue that the standardisation of wage rates is the goal of trade unions (Reynolds and Taft, 1956; Slichter *et al.*, 1960). The application of the median voter model to union objectives (Farber, 1978; Booth, 1984) predicts such an outcome as long as mean earnings are greater than median earnings. Layard *et al.* (1991) argue that unions follow standardisation policies in order to avoid the incentives the firm has to replace existing workers by entrants earning lower wages. Hirsch (1982) points out that wage standardisation policies provide measurable objectives for unions to bargain over.

For developing countries, there exist several studies measuring the impact of unions on wage determination. Teal (1997), for example, estimates wage equations for Ghana and finds a significant union membership dummy of 0.21 using individual data. Arbache (1997), also estimating wage equations with individual data, finds significant union coefficients ranging from 0.094 to 0.152 in the Brazilian manufacturing sector. Thomas and Vallée (1996), using establishment data for a study of segmentation in the labour market in Cameroon, find a

¹ For a survey of the theoretical and empirical literature, see Freeman and Medoff (1984), Lewis (1986), and Booth (1995). For a cross-country evaluation on the issue for developed countries, see Blanchflower and Freeman (1992).

negative but insignificant union coefficient of -0.121. Little attempt, however, has yet been made to assess the impact of unions on pay structure in developing countries.

In this paper we estimate the magnitude of the union-nonunion wage differential and the impact of unions on wage dispersion in the context of a developing country labour market. Our results show that unionism creates a wage gap for semi-skilled, male workers with formal labour contracts in the Brazilian manufacturing sector, and, contrary to the common finding in the literature, wage dispersion is greater in the unionised sector. We argue that these findings can be explained by the greater variance in the characteristics of unionised workers, the vulnerability of nonunionised workers to market conditions, and the structure of wage bargaining.

The paper is organised as follows. In the next section we measure the union-nonunion wage differential. In section 3 we explore the influence of several features of unions on the structure of pay. Section 4 summarises the findings and concludes.

2. Do unions raise wages?

The micro data we use to assess the impact of union power on wage determination are from the National Household Surveys (PNAD), conducted yearly by the Brazilian Institute of Statistics (IBGE). Each survey contains data of randomly selected households from all parts of the country whose individuals are interviewed once a year. A huge number of individual characteristics of interest for labour market analyses are recorded. In order to avoid any bias from occupational, demographic or segmentation issues, our sample data is restricted to semi-skilled, male workers aged between 18 to 65 years, who are in full-time employment, have a

formal labour contract and are employed in the manufacturing sector. To produce a reasonably large sample, we pool the data from 1992, 1993 and 1995.²

Table A1 in the Appendix summarises the means and standard deviations of a number of variables separately for union and nonunion workers. In general, unionised workers are more educated, more experienced, have longer tenure, work less extra-hours, have a higher probability of being married and to be white, earn more non-wage benefits, and are concentrated in the South and Southeast, the two most developed and industrialised regions.

The figures in Table A1 suggest that, since union and nonunion workers have different characteristics on average, then they may receive different average wages. The data reveal that the mean union log real hourly wage is about 13.5 percent higher than the nonunion mean wage. This wage differential may reflect, at least in part, the higher productivity of unionised workers, since, as noted by Abowd and Farber (1982), a positive union wage differential reduces the marginal cost of hiring more productive workers, thus biasing the firm's demand for labour towards more skilled workers.

To gauge the impact of unions on wage determination, we estimate the average union-nonunion wage differential as:

$$D = \sum_k \bar{X}_k (\hat{\beta}_k^U - \hat{\beta}_k^N), \quad (1)$$

where D is the average log wage differential, \bar{X} is the vector of means of the k independent variables in the wage equation, and $\hat{\beta}s$ are the estimated coefficients from the union (U) and nonunion (N) wage equations. Note that the $\bar{X}s$ can be taken from the sub-sample of union or nonunion workers, or from the whole sample.

² Data on wages were deflated to 1995 levels.

Table 1 shows the average union-nonunion wage differentials computed with each of the three \bar{X} vectors. Depending on which \bar{X} is used and on whether or not industry dummies are included in the wage equations, the union wage differential ranges from 4.8 to 7.2 percent. When we change the vector \bar{X} from the union means to the nonunion means, the estimated union-nonunion wage gap decreases by 34 percent (column 1) and 37 percent (column 2) according to whether industry dummies are included in the wage equations. This demonstrates that the differences in the vectors of characteristics between the union and the nonunion sector have an important influence on the determination of the union-nonunion wage gap³.

The figures in Table 1 are not dissimilar to previous estimates of the union wage gap for manual and semi-skilled workers, as summarised in Booth (1995) and Lewis (1986). However, they are perhaps rather lower than might have been expected given that union density in Brazilian manufacturing is as high as 39 percent (Table A2). Unions in Brazil bargain over working conditions and safety, provide medical and odontological services, legal advice, loan co-operatives, social facilities etc, as well as other fringe benefits. Unfortunately, only limited information is recorded on the scope and provision of unions' non-wage benefits, although as can be seen from the statistics in Table A1, unionised workers clearly receive greater non-pecuniary benefits than non-unionised workers. Thus, to the extent that these non-wage benefits are being under-recorded, then the total benefits accruing to unionisation are under-estimated by the magnitude of the estimated union wage effects presented in Table 1.

3. Unions and wage dispersion

Since the empirical literature stresses that union wages tend to be less market-related than nonunion wages due to the standard rate wage policy, union wages tend to have a lower

³ If both groups had the same \bar{X} , then the wage gap would be entirely due to the differences in the β s, or in other words, to the union effects on wage determination.

dispersion than nonunion wages. However, in the case of semi-skilled workers in Brazilian manufacturing, this does not appear to be the case. Table 2 presents the standard deviation of log hourly wages and shows that in 14 out of 22 industries, the wage dispersion of unionised workers is greater than that for nonunionised workers. The (weighted) dispersion of union wages is about 11 percent larger than for nonunion wages, indicating that, contrary to most of the previous evidence, union sector wages are more highly dispersed than nonunion wages.⁴ Further evidence is provided by the 90th-10th percentile gaps of log hourly wages which are 1.834 for the union sector and only 1.799 for the nonunion sector. Similarly the 95th-5th percentile gaps are 2.147 for unionised workers wages and 2.096 for nonunionised workers wages.

One could argue that the wider wage dispersion within the union sector is due to efficiency wages reasons. Unobserved industry characteristics would be responsible for such dispersion. However, there is no reason to believe that such effects would be greater for union than for nonunion workers. Alternatively, Stewart (1990) finds for the UK that firms with market power pay more for semi-skilled labour than competitive firms even in the nonunion sector, suggesting that market conditions have a strong influence on wage determination, even in the absence of unions.

Freeman (1980, p.11) notes that, according to the standardisation hypothesis, the magnitude of the regression coefficients on the principal wage-determining variables should be lower in the union sector than in the nonunion sector. The empirical evidence for developed countries supports this proposition (Freeman, 1980; Blanchflower and Freeman, 1992; Bratsberg and Ragan, 1997, *inter alia*). Table 3 presents the regression coefficients

⁴ Since unions seem to increase rather than decrease wage dispersion, we might expect that, contrary to what Kahn and Curme (1987) have found for the US, union spillovers would amplify wage dispersion in the nonunion sector.

from the estimated union and nonunion wage equations (with and without industry dummies). In general, the coefficients in the union wage equations are greater than those in the corresponding nonunion wage equations, indicating that unions amplify rather than reduce the impact of workers' characteristics on wages. This result is exactly the opposite of the conventional wisdom, and contradicts the notion that unions are a source of greater equalisation in wages. Overall, unions are seen to boost the returns to human capital, marriage, tenure etc, thus increasing wage dispersion⁵. However, unionism may not be the only cause of the higher wage dispersion in the unionised sector. Other factors can also affect the distribution of wages. These are discussed in the following sub-sections.

3.1 Wage dispersion and dispersion of characteristics

The dispersion of workers' characteristics can account for the degree of wage dispersion to the extent that wages are determined by productivity differences. The higher the variance of workers' characteristics within a particular sector, the greater should be the variance of wages in this sector, *ceteris paribus*. Thus, given the higher union wage dispersion, we might expect that the data reveal a greater variance of characteristics of union workers as compared to nonunion workers.

To test this proposition, we first decompose the variance of union wages into its explained component:

$$V(\hat{W}^U) = \sum_i (\hat{\beta}_i^U)^2 V(X_i^U) + \sum_i \sum_j \hat{\beta}_i^U \hat{\beta}_j^U Cov(X_i^U X_j^U), \quad (2)$$

⁵ The standard errors of the union equations are larger than of the nonunion equations, which accords with the greater unexplained dispersion of union wages.

where $V(\hat{W}^U)$ is the variance of union sector wages, $V(.)$ and $Cov(.,.)$ are the variances and covariances of characteristics, $\hat{\beta}^U$ s are the estimated coefficients from the wage equation, and X^U s the vector of characteristics of union workers. Similarly, we can decompose the variance of union wages into an explained component but conditional on the variances of characteristics of the nonunion workers (X^N):

$$V(\hat{W}^U / V(X_i^N)) = \sum_i (\hat{\beta}_i^U)^2 V(X_i^N) + \sum_i \sum_j \hat{\beta}_i^U \hat{\beta}_j^U Cov(X_i^N X_j^N). \quad (3)$$

Of course, equations (2) and (3) do not provide the complete decomposition, since they do not account for the residuals. We can write the total variance of union wages as

$$V(W^U) = V(\hat{W}^U) + e^U \quad (4)$$

for equation (2), and

$$V(W^U / V(X^N)) = V(\hat{W}^U / V(X^N)) + e^{U/X^N} \quad (5)$$

for equation (3), where e^U and e^{U/X^N} are the respective residual terms. If $V(X_i^U) \neq V(X_i^N)$, then $e^U \neq e^{U/X^N}$. Now suppose that $V(X_i^U) > V(X_i^N)$, then $e^U < e^{U/X^N}$. Equating (4) and (5) and re-arranging, we obtain:

$$\frac{e^{U/X^N}}{e^U} = 1 + \frac{V(\hat{W}^U)}{e^U} - \frac{V(\hat{W}^U / V(X^N))}{e^U}, \quad (6)$$

which gives the degree to which the variance (dispersion) in union wages is due to differences in characteristics between union and non-union workers. Substituting the computed values into expression (6), we find that 36.84 percent of the difference in wage dispersion can be accounted for by the difference in variances of union and nonunion characteristics. We can perform a similar exercise for nonunion wages, conditioning on the variances in union characteristics. This reveals that 16.12 percent of the difference in dispersion between union

and nonunion wages is due to the greater variance of union characteristics. These figures indicate that the differences in variance of characteristics among the union and nonunion sectors can explain between 16 and 37 percent of the total difference in wage dispersion between union and non-union wages. Of course, this is not a result of unions exercising power, but simply a consequence of the characteristics of their members. Clearly, the differences in the dispersion of characteristics has an important effect on wage dispersion.

3.2 Minimum wage and wages dispersion

The minimum wage can also affect the wage distribution if one group is relatively more exposed to this institutional feature than the other. This has been noted in the context of gender wage determination (Shannon, 1996; Fortin and Lemieux, 1997). In order to investigate the relevance of this proposition to the explanation of the greater union wage dispersion, Figures 1 and 2 show the distribution of hourly wages in real Reais (R\$) (1995 prices) for union and nonunion workers respectively with pooled data from 1992, 1993, and 1995. The nonunion wage distribution seems to be much more affected by the national minimum wage rate than the union wage distribution, since it is more concentrated around the hourly minimum wage rate, given by the vertical line at R\$0.56.⁶ The statistics in Table 4 provide additional evidence. The median and mode of the nonunion group are closer to the minimum wage rate than for the union group, and this places more of the nonunion workers in the left tail of the distribution. Accordingly, the nonunion wage distribution is more skewed. The percentiles of the distribution reinforce this point; while 29 percent of the nonunion workers earn less than R\$1.00, only 15 percent of union workers earn less than this amount.

⁶ Real hourly minimum wage rate of 1995.

Together, these features of the wage distributions explain the higher kurtosis of nonunion wages as compared to union wages.

Hence, the positive wage differential enjoyed by unionised workers insulates more of them from the impact of the minimum wage, and thereby the distribution of union wages is not as truncated at the left hand tail by as much as is the distribution of nonunion wages. Thus, we see that part of the higher wage dispersion of union workers is due to the effects of the minimum wage on the distribution of nonunion wages. This can be understood as an outcome of unionism on (the level of) wage determination.

3.3 Bargaining structure and wage dispersion

In a more centralised structure of wage bargaining, one could expect that unions would promote a more egalitarian pay structure as suggested in the literature (Freeman, 1988; Rowthorn, 1992). In this case, establishments and industry characteristics would have less importance for union wages than for nonunion wages. Thus, one would expect that union wages are less dispersed than nonunion wages. On the other hand, if a very decentralised system of wage bargain prevails, then one could expect union and nonunion workers to have a more similar distribution of wages. In the intermediate situation between these two extremes, where the constraints of neither a corporatist structure nor competitive market forces operate, union power tends to be stronger, thus creating distinctive patterns in wage dispersion according to industry characteristics and the availability of rents to be shared. In this case, union wage dispersion could be even greater than nonunion.

In order to evaluate the effects of the bargaining structure on wage dispersion, we estimate the inter-industry wage differentials to obtain the standard deviation of the wage premium for union and nonunion workers, once wage equations are controlled for individual characteristics, region, non-wage benefits etc. To estimate the inter-industry wage

differentials, we adopt the methodology proposed by Haisken-DeNew and Schmidt (1997), which improves the standard procedure popularised by Krueger and Summers (1988)⁷. According to the above argument, we could expect to find the larger standard deviation of wage differentials in the union sector equation. The results reported in Table 5 are striking. The standard deviation of wage differentials in the union sector is twice as large as that in the nonunion sector, and it can be seen that the industry wage premia vary between unionised and nonunionised workers. These results suggest that:

- (i) unions are powerful enough to bargain over rents that otherwise would not be shared and, accordingly, in most of the industries, the wage premium in the union sector is higher than in the nonunion sector;⁸
- (ii) industry characteristics are important for these results; in particular, capital-intensive industries appear to have a higher union wage premium;⁹
- (iii) the unions act as rent-seekers, amplifying rather than reducing the effects of industry characteristics on wage determination. This result harmonises with the previous finding that unions boost the returns to individual workers' characteristics, and suggests that the manufacturing sector in Brazil faces an intermediate structure of wage bargaining.¹⁰

⁷ Haisken-DeNew and Schmidt show that the Krueger and Summers procedure overstates substantially the standard error of coefficients, and, depending on the choice of industry chosen as reference, the problem can be even more apparent. As a consequence, it can lead to spurious inferences regarding individual elements of the wage differential vector. Also, the estimated variance of the renormalised coefficients is overestimated in their procedure, which affects the estimation of summary measures like the standard deviation of coefficients.

⁸ The Pearson correlation coefficient between the union and nonunion wage differentials is 0.7035 ($p=.0000$), revealing that both groups have a similar wage structure.

⁹ In an assessment of the relevance of many theories of wage determination for Brazilian manufacturing, Arbache (1997) finds that efficiency wages are an important determinant of wages.

¹⁰ Amadeo (1994) and Carneiro (1996) have identified an intermediate structure of wage bargaining in Brazil using the Calmfors and Driffill (1988) classification.

5. Summary and conclusions

Summarising what we have found on the union-nonunion wage gap in Brazilian manufacturing:

- (i) Unions have a positive impact on the determination of wages for male, semi-skilled workers. There is a union-nonunion wage gap which ranges from 4.8 to 7.2 percentage points;
- (ii) About 36 percent of the union-nonunion wage gap is due to the differences of means of characteristics between the union and nonunion workers.

On the effects of unions on pay structure, we find that the wage dispersion of unionised workers is higher than of nonunionised workers, contrary to the empirical evidence for developed countries. There are a number of possible explanations of this finding:

- (i) unions amplify the returns of industry and workers characteristics, thus increasing union wage dispersion. This outcome of unionism contrasts with the standard rate wage policy hypothesis;
- (ii) differences in the variance of characteristics between the union and nonunion workers, which explains from 16 to 37 percentage points of the greater union wage dispersion;
- (iii) the higher exposure of non-organised workers to the minimum wage causes a compression of the nonunion wage distribution *vis-à-vis* the union wage distribution;
- (iv) the structure of wage bargaining seems to affect the dispersion of wages at the inter-industry level.

The evidence suggests that unions in manufacturing industry in Brazil have sufficient power to achieve a small wage premium for their members. However, unions in Brazil do not appear to pursue a standard rate wage policy, and this appears to be related to the structure of

wage bargaining. The differences in variances of characteristics of workers are important in explaining the higher union wage dispersion. This effect seems to be related to the Abowd and Farber (1982) proposition that firms have incentives to hire better quality workers due to the union wage premium. As a result, there would appear to be a positive relationship between union power (or unionisation) and the distribution of wages.

REFERENCES

- Abowd, J. and Farber, H.S. (1982), 'Job Queues and the Union Status of Workers' *Industrial and Labor Relations Review*, 35: 354-367.
- Amadeo, E.J. (1994), '*Institutions, Inflation and Unemployment*', Aldershot: Edward Elgar Publishing Co.
- Arbache, J.S. (1997), '*Wage Differentials in Brazilian Manufacturing*', Studies in Economics No. 97/5, Department of Economics, University of Kent at Canterbury.
- Blanchflower, D.G. and Freeman, R.B. (1992), 'Unionism in the United States and Other Advanced OECD Countries', *Industrial Relations*, 31: 56-79.
- Booth, A.L. (1984), 'A Public Choice Model of Trade Union Behaviour and Membership', *Economic Journal*, 94: 883-898.
- Booth, A. L. (1995), '*The Economics of the Trade Unions*', Cambridge: Cambridge University Press.
- Bratsberg, B. and Ragan Jr., J.F. (1997), 'Have Unions Impeded Growing Wage Dispersion Among Young Workers?', *Journal of Labor Research*, 18: 593-612.
- Calmfors, L. and J. Driffill (1988), "Bargaining Structure, Corporatism and Macroeconomic Performance", *Economic Policy*, 6, 13-61.
- Carneiro, F.G (1996), '*Labour Market Institutions, Insider Power and Informal Employment in Brazilian Wage Determination: 1980-1993*', Unpublished thesis, Department of Economics, University of Kent at Canterbury.
- Farber, H.S. (1978), 'Individual Preferences and Union Wage Determination: The Case of the United Mine Workers', *Journal of Political Economy*, 86: 932-942.
- Fortin, N.M. and Lemieux, T. (1997), 'Institutional Changes and Rising Wage Inequality: Is There a Linkage?', *Journal of Economics Perspectives*, 11: 75-96.
- Freeman, R. (1980), 'Unionism and the Dispersion of Wages', *Industrial and Labor Relations Review*, 34: 3-23.
- Freeman, R. (1988), 'Labour Market Institutions and Economic Performance', *Economic Policy*, 6: 64-80.
- Freeman, R. and Medoff, J. (1984), '*What Do Unions Do?*', New York: Basic Books.
- Haisken-DeNew, J.P. and Schmidt, C.M. (1997), 'Inter-Industry and Inter-Region Differentials: Mechanics and Interpretation', *Review of Economics and Statistics*, 79: 516-521.
- Hirsch, B. (1982), 'The Interindustry Structure of Unionism, Earnings, and Wage Dispersion', *Industrial and Labor Relations Review*, 36: 22-39.

- Kahn, L.M. and Curme, M. (1987), 'Unions and Nonunion Wage Dispersion', *Review of Economics and Statistics*, 69: 600-607.
- Krueger, A.B. and Summers, L.H. (1988), 'Efficiency Wages and the Inter-Industry Wage Structure', *Econometrica*, 56: 259-293.
- Layard, R.; Nickell, S. and Jackman, R. (1991), *'Unemployment, Macroeconomic Performance and the Labour Market'*, Oxford: Oxford University Press.
- Lewis, H.G. (1986), *'Union Relative Wage Effects: A Survey'*, Chicago: University of Chicago Press.
- Reynolds, L. and Taft, C. (1956), *'The Evolution of Wage Structure'*, New Haven: Yale University Press.
- Rowthorn, R.E. (1992), 'Centralisation, Employment and Wage Dispersion', *Economic Journal*, 102: 506-523.
- Shannon, M. (1996), 'Minimum Wages and Gender Wage Gap', *Applied Economics*, 28: 1567-1576.
- Slichter, S.; Healy, J. and Livernash, R. (1960), *'The Impact of Collective Bargaining on Management'*, Washington DC: The Brookings Institution.
- Stewart, M.B. (1990), 'Union Wages Differentials, Product Market Influences and the Division of Rents', *Economic Journal*, 100: 1122-1137.
- Teal, F. (1997), 'The Size and Sources of Economic Rents in a Developing Country Manufacturing Labour Market', *Economic Journal*, 106: 963-976.
- Thomas, M. and Vallée, L. (1996), 'Labour Market Segmentation in Cameroonian Manufacturing', *Journal of Development Studies*, 32: 876-898.

Table 1: Union-nonunion wage differentials - in percentages

Vector of means		
Union	6.53	7.25
Nonunion	4.86	5.27
Union plus nonunion	5.82	6.04
Industry dummies included	yes	no

Variables in regressions: education, experience, experience squared, tenure, five non-wage benefits dummies, five region dummies, married, metropolitan residence, race, overtime dummy, three year dummies and twenty two industry dummies.

Table 2: Standard deviation of log wage

Industry	Union	Nonunion
Apparel	0.55	0.51
Beverages	0.59	0.60
Chemical	0.74	0.68
Electronic	0.55	0.59
Food	0.65	0.57
Furniture	0.52	0.54
Leather	0.48	0.43
Mechanic	0.59	0.64
Metallurgic	0.64	0.64
Mineral	0.78	0.62
Nonmetallic	0.64	0.56
Other	0.60	0.52
Paper	0.61	0.58
Perfumes	0.78	0.67
Pharmaceutical	0.59	0.45
Plastic	0.58	0.50
Publishing	0.66	0.58
Rubber	0.65	0.52
Textiles	0.55	0.56
Tobacco	0.67	0.60
Transportation	0.59	0.62
Wood	0.47	0.50
<i>Weighted SD</i>	0.6852	0.6145

Table 3: Regression estimates of union and nonunion semi-skilled workers

Variables	Unions		Nonunions		Unions		Nonunions	
	Coef.	SE	Coef	SE	Coef	SE	Coef	SE
Education	0.0805	(.0030)	0.0680	(.0024)	0.0696	(.0030)	0.0623	(.0024)
Experience square	-0.0005	(.0001)	-0.0006	(.0000)	-0.0005	(.0001)	-0.0006	(.0000)
Experience	0.0357	(.0030)	0.0376	(.0021)	0.0332	(.0029)	0.0353	(.0021)
Tenure	0.0204	(.0014)	0.0176	(.0012)	0.0184	(.0014)	0.0178	(.0012)
Married	0.1440	(.0218)	0.1194	(.0147)	0.1253	(.0210)	0.1205	(.0145)
Race	0.1075	(.0179)	0.1156	(.0130)	0.1056	(.0172)	0.1158	(.0127)
Metropolitan	0.1137	(.0178)	0.1114	(.0135)	0.0761	(.0175)	0.0905	(.0135)
Overtime	-0.1970	(.0178)	-0.1585	(.0126)	-0.1830	(.0174)	-0.1452	(.0126)
Health	0.1976	(.0167)	0.1810	(.0143)	0.1722	(.0163)	0.1725	(.0143)
Housing	-0.1285	(.0458)	-0.0239	(.0258)	-0.1103	(.0444)	-0.0054	(.0256)
Transportation	0.0304	(.0170)	0.0576	(.0128)	0.0005	(.0164)	0.0444	(.0126)
Meals	0.1357	(.0170)	0.1588	(.0133)	0.1117	(.0165)	0.1298	(.0133)
Education/Training	0.1849	(.0336)	0.1435	(.0434)	0.1648	(.0325)	0.1249	(.0427)
Centrewest	0.1727	(.0575)	0.1952	(.0302)	0.1897	(.0556)	0.1942	(.0298)
North	0.1329	(.0528)	0.1345	(.0337)	0.1354	(.0523)	0.1584	(.0339)
South	0.1871	(.0276)	0.1892	(.0206)	0.2260	(.0275)	0.1944	(.0208)
Southeast	0.3877	(.0247)	0.3396	(.0179)	0.3608	(.0247)	0.3019	(.0178)
Industry dummies	no		no		yes		yes	
<i>R</i> ²	0.4339		0.3793		0.4833		0.4038	
<i>F</i>	180.62		225.02		104.18		118.12	
<i>S.E.E.</i>	0.5166		0.4847		0.4947		0.4758	
<i>n</i>	4,496		7,016		4,496		7,016	

Other variables in regression: five non-wage benefits, three year dummies and twenty two industry dummies.

Table 4: Distribution of union and nonunion wages

	Union	Nonunion
Mean	2.674	1.826
Median	2.070	1.401
Mode	2.091	1.307
SD	2.108	1.652
Skewness	1.993 (.037)	3.195 (.029)
Kurtosis	5.293 (.073)	17.072 (.058)

Standard errors in parenthesis. Wages in reais of 1995.

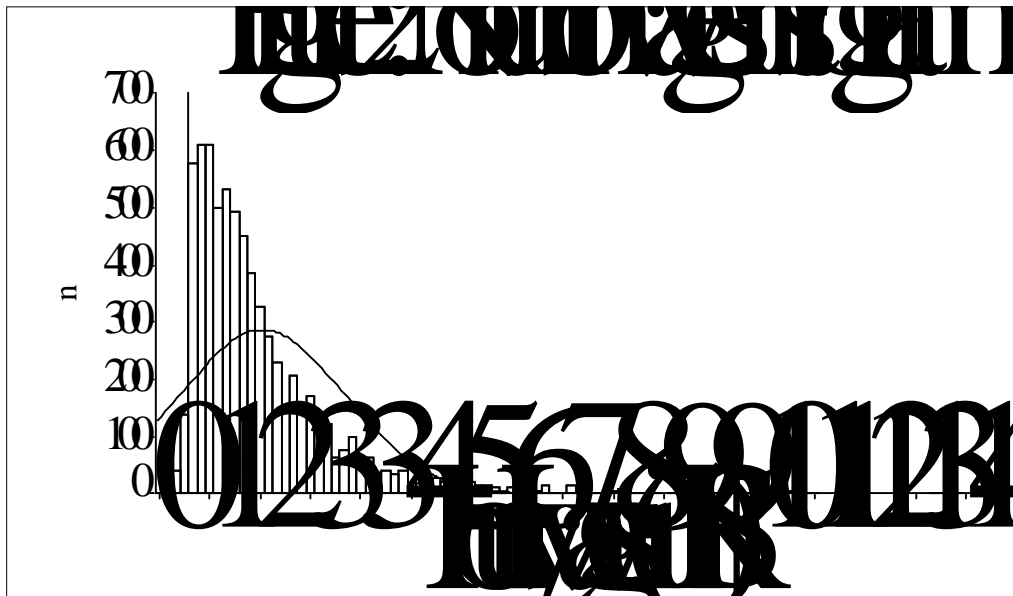
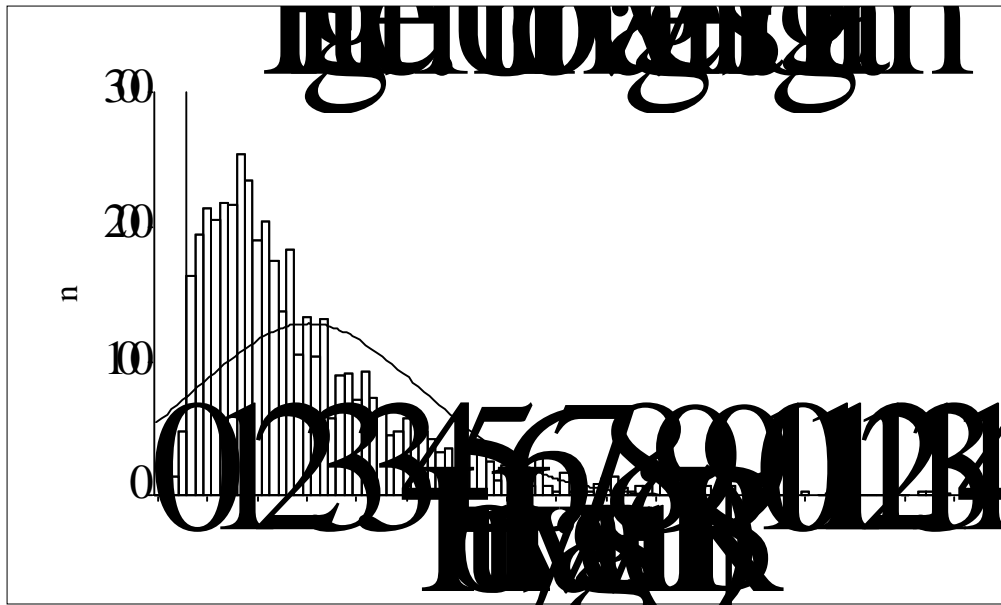


Table 5: Inter-industry wage differentials

Industry	Unions		Nonunions	
	Coef.	SD	Coef.	SD
Apparel	-0.2654	(.0280)	-0.0993	(.0199)
Beverage	-0.0721	(.0523)	-0.0078	(.0383)
Chemical	0.3836	(.0336)	0.0813	(.0276)
Electronics	0.1249	(.0449)	0.1155	(.0412)
Food	-0.1802	(.0228)	-0.0810	(.0145)
Furniture	-0.1620	(.0412)	-0.0487	(.0198)
Leather	-0.2867	(.0544)	-0.1298	(.0416)
Mechanic	0.0724	(.0266)	0.1420	(.0243)
Metallurgic	0.0387	(.0164)	0.0963	(.0147)
Mineral	0.1656	(.0412)	0.0678	(.0330)
Nonmetallic	-0.0035	(.0380)	-0.0720	(.0211)
Others	-0.0745	(.0706)	-0.0402	(.0452)
Paper	0.0472	(.0396)	0.0367	(.0418)
Perfume	0.0348	(.1136)	-0.0565	(.0652)
Pharmaceutical	0.3412	(.1375)	0.0751	(.1040)
Plastics	-0.1011	(.0463)	-0.0200	(.0327)
Publishing	0.0562	(.0384)	0.0333	(.0262)
Rubber	0.0668	(.0547)	-0.0210	(.0486)
Textil	-0.1304	(.0251)	-0.0176	(.0268)
Tobacco	0.1602	(.0905)	0.3531	(.1320)
Transport	0.2067	(.0223)	0.2300	(.0232)
Wood	-0.1609	(.0431)	-0.1572	(.0220)
R^2	0.4831		0.4043	
F	104.22		118.24	
SD	0.1444		0.0698	
n	4,496		7,016	

Variables in regression: education, experience, experience square, tenure, five non-wage benefits dummies, twenty two industry dummies, five region dummies, married, metropolitan residence, race, overtime dummy, three year dummies.

APPENDIX

Table A1: Means and standard deviations

	Unions		Nonunions	
	Mean	SD	Mean	SD
Ln hourly wage	3.05	0.685	2.69	0.614
<i>Individual characteristics</i>				
Education (years)	6.95	3.161	6.34	3.010
Experience (years)	21.09	10.991	19.36	11.400
Experience ²	565.67	540.78	504.73	559.38
Tenure (years)	6.41	6.425	4.11	5.385
Married (=1)	0.78	0.417	0.66	0.472
Metropolitan residence (=1)	0.29	0.452	0.29	0.452
Overtime worked (=1)	0.27	0.445	0.34	0.472
Race (white=1)	0.64	0.480	0.58	0.494
<i>Non-wage benefits</i>				
Transportation	0.58	0.494	0.46	0.498
Meals	0.57	0.496	0.37	0.483
Education and Training	0.05	0.238	0.04	0.137
Health	0.46	0.498	0.25	0.434
Housing	0.03	0.171	0.06	0.230
<i>Region</i>				
Centrewest	0.02	0.143	0.05	0.218
Northeast	0.14	0.350	0.15	0.360
North	0.03	0.158	0.04	0.189
South	0.33	0.471	0.28	0.449
Southeast	0.48	0.501	0.48	0.501
<i>Industry</i>				
Apparel	0.07	0.258	0.08	0.273
Beverage	0.02	0.139	0.02	0.146
Chemical	0.06	0.215	0.02	0.199
Electronics	0.03	0.161	0.02	0.136
Furniture	0.03	0.176	0.08	0.268
Leather	0.02	0.135	0.02	0.137
Mechanic	0.07	0.261	0.05	0.224
Metallic	0.17	0.380	0.13	0.340
Mineral	0.03	0.177	0.03	0.169
Nonmetallic	0.04	0.188	0.07	0.256
Other	0.01	0.104	0.02	0.124
Paper	0.03	0.182	0.02	0.134
Perfume	0.008	0.065	0.01	0.087
Phamaceutical	0.007	0.054	0	0.055
Plastics	0.03	0.157	0.03	0.170
Publishing	0.04	0.190	0.05	0.211
Rubber	0.02	0.133	0.01	0.116
Textiles	0.08	0.277	0.04	0.206
Tobacco	0.01	0.081	0.004	0.043
Transport	0.11	0.310	0.06	0.238
Wood	0.03	0.176	0.07	0.255
<i>n</i>	4,496		7,016	

Table A2: Union density

Apparel	36.0
Beverages	36.8
Chemical	42.9
Electronic	47.4
Food	31.6
Furniture	20.8
Leather	38.5
Mechanic	46.9
Metallurgic	45.6
Mineral	41.2
Nonmetallic	25.1
Other	30.8
Paper	54.8
Perfumes	26.4
Pharmaceutical	38.2
Plastic	35.2
Publishing	34.1
Rubber	46.0
Textiles	54.7
Tobacco	69.8
Transportation	53.5
Wood	22.5
<i>Weighted mean</i>	39.1