TRADE LIBERALISATION AND INSIDER POWER: THE CASE OF BRAZIL

Jorge Saba Arbache*

January 1999

Abstract

This paper investigates the impact of market-oriented economic reforms on union behaviour in Brazil. Previous work shows that openness, deregulation and similar measures constrain union power. In contrast, our results show that insider power has increased in the more competitive environment since the implementation of the reforms in Brazil in the early 1990s. We argue that this is associated with the structure of wage bargaining, and with the low quality of the labour force. Unions take advantage of the higher demand for qualified workers in a more competitive economy by increasing wage pressure.

JEL Classification: F16**,** J31, J51

Keywords: Trade liberalisation, insider power, wage structure, wage dispersion, Brazil1

Acknowledgments: I would like to thank Andy Dickerson for his comments and suggestions. This paper has benefited from helpful discussions with Francis Green, Owen O'Donnell, Sarquis B. Sarquis, and Bill Collier.

Correspondence address: Department of Economics, Keynes College, University of Kent at Canterbury, Kent, CT2 7NP, England, Tel: +44 1227 827449; Fax: +44 1227 827850; email: jsa1@ukc.ac.uk.

* University of Kent at Canterbury and University of Brasília

TRADE LIBERALISATION AND INSIDER POWER: THE CASE OF BRAZIL

1. Introduction

The movement towards trade liberalisation, deregulation and privatisation of state-owned companies in industrialising countries in the 1980s and early 1990s, has possibly been the most important and significant change in the labour markets of these countries in recent decades. One way to measure the impact of such reforms is through the analysis of unions' effects on the wage structure. Unfortunately, there has yet to be a comprehensive investigation of this issue tracking unions *before* and *after* the implementation of economic reforms for any of these industrialising countries. Filling this gap in knowledge may provide valuable information on how unions react to economic changes, and will help to improve the understanding of labour market adjustment in countries experiencing radical economic reforms.

There is a vast literature on the impact of trade, deregulation, and institutional changes on union wages in developed countries. Gosling and Machin (1995) and Fortin and Lemieux (1997), for example, find that institutional changes in the UK and US have decreased the union power and increased earnings inequality due to the unions' objective of wage rate standardisation. Peoples (1998) shows for the US that union bargaining power declined in three out of four industries following deregulation. Stewart (1991) found that economic and industrial relations legislation changes in the UK had little impact on union-nonunion wage differentials. Freeman and Katz (1991) identify that union wages are more responsive than nonunion wages to international import competition. MacPherson and Stewart (1990) show that the union-nonunion wage gap is lower among industries facing greater import competition. MacPherson and Stewart, and Blumenfeld and Partridge (1996) argue that international competition is an important factor explaining the union decline in the US. These

last two papers also show a differential response of wages to imports according to industry union density. This literature, however, normally examines the impact on unions of economic and other changes that take place over a long time span. This does not enable a proper evaluation of how the collective bargaining process reacts and adapts to short-term, radical economic changes.

In this paper we investigate the influence of unions on the wage structure in Brazil, a country which experienced major economic reforms in the first half of the 1990s. The case of Brazil is particularly interesting because of a number of reasons. First, the neo-liberal nature of the reforms and the pace of the changes. In just a few years, Brazil turned from a protected, regulated, and predominantly stated-owned economy to a liberal trade regime, deregulated and privatised. This makes the Brazilian case an interesting 'natural experiment'. Second, the 'intermediate' structure of wage bargaining (in the Calmfors and Driffill, 1988, classification), which allowed the growth of unions' rent-seeking behaviour (Carneiro and Henley, 1998). Union power was increasing over the 1980s and was suddenly confronted with dramatic changes in the economic environment. Third, the low quality of the labour force in terms of education and skills. This may constitute a critical issue in the labour market of a country experiencing significant trade liberalisation.[1]

We employ comparable micro data sets from selected years from 1988 to 1996 – which cover the pre- and post-reform period – to investigate the impact of unions on wage dispersion, relative wages, and the union-nonunion wage differential. Given the nature of the reforms and the pace of the changes, we could expect a sizeable response from unions. We show, however, that such a result applies only to the beginning of the 1990s, when the

[1] The mean years of education in Brazil is one of the lowest in Latin America, and is far behind many 'potential' competitor NICs (Nehru and Dareshwar, 1993).

combined effects of economic reforms and economic recession significantly reduced unions' strength. By 1996, however, unions had increased their relative influence on the wage structure. These results can be explained by the structure of collective bargaining, and by the ability of unions to take advantage of the increasing demand for a qualified workforce in a country facing the challenge of rapid technological advancement and increasing productive efficiency.

The main contribution of this paper is the pioneering investigation of the impact of collective bargaining on wages in a country experiencing widespread market-oriented economic reforms. Our results provide information that may enhance the understanding of the effects of economic liberalisation on the labour market adjustments of industrialising countries embarking on similar reforms. We also highlight a neglected issue in the literature on unions and trade, namely wage dispersion.

The paper is organised as follows. Section 2 presents the basic theoretical background on unions and trade. Section 3 presents the structure of wage bargaining in Brazil. Section 4 shows the evolution of some of the key labour market variables over the period under analysis. Section 5 describes the data. Section 6 investigates the relationship between trade, unions and wage dispersion. Sections 7 and 8 examine the impact of trade on relative wages. Section 9 estimates the union wage mark-up. Section 10 presents an interpretation of the findings and finally, section 11 concludes and provides some policy implications.

2. Trade and Unions: The Basic Theory

The literature on unions and international trade shows that increasing imports and the removal of trade barriers have a negative impact on union wages (Driffill and van der Poeg, 1995; Freeman and Katz, 1991; MacPherson and Stewart, 1990; Gaston and Tefler, 1995). Cournot and Dixit-Stiglitz type models can be used to show that imports and exports influence

union wages through the industry's product market. Greater imports (exports) increase (decrease) the product demand elasticity and reduce (increase) profits, and lead to wage concessions by unions. Freeman and Katz (1991), for example, use a monopoly union model framework to show that a larger price elasticity due to trade (and other factors) implies an inferior union wage-employment trade-off. Huizinga (1993) shows that in imperfectly competitive product markets, an increase in international competition is likely to increase the product demand elasticity and lead to wage concessions by unions. If trade leaves the elasticity unchanged, but shifts the demand curve downward, the union is also likely to lower wage demands. So, if international competition or other changes reduce the rents appropriated by the firm, it is also likely to reduce the rents enjoyed by workers. The greater the union-nonunion wage differential, the higher tends to be the response of union wages to changes in market conditions. In this approach, import liberalisation is likely to affect union wages more than those of their nonunion counterparts.

The nonunion sector is also potentially affected by increasing openness through rent-sharing and union threat effects. However, because the nonunion labour market is more competitive, it is unlikely that trade liberalisation impacts upon nonunion workers more than on union workers. Thus, international trade works as a discipline device, and faced with negative shocks, unions are likely, *ceteris paribus*, to focus more on employment and less on wages. However, the wage responses to changes in product demand are likely to depend on the bargaining framework, and on the structure of labour demand and supply. Differences in these fundamental aspects among countries may lead to differences in the responses of unions to trade liberalisation.

The empirical literature also finds that wages may increase rather than decrease with imports (Partridge, 1993; Blumenfeld and Partridge, 1996). It is argued that it may be due to unions' strategic behaviour. There are at least two models that explain this outcome.

Lawrence and Lawrence (1985) examine the hypothesis of ‘endgame bargaining’. An industry facing increasing import competition indicates that it is in decline, with reduced opportunities to invest in new capital and equipment. Therefore, it is unlikely that this industry can substitute capital for labour, and the union exploits this fact by trying to extract capital’s quasi-rents. Conversely, an industry facing increasing exports may be encouraged to invest in equipment and new plant. In these circumstances, fearing that the industry can adopt more capital-intensive technologies, unions act strategically by moderating their wage demands. Therefore, there is a positive relationship between imports and wages, and a negative relationship between exports and wages.

Grossman (1984) examines the union wage response to increased international competition in a partial equilibrium model of a monopoly union. Unions determine wage demands in a median voter member framework. He assumes that union members are subject to seniority layoff, which has two offsetting impacts on union wages caused by an increase in import competition. On the one hand, higher import competition reduces the probability of employment, which leads unions to focus on lower wages, since some of their members will have a higher probability of being laid off. On the other hand, increased import competition reduces unions employment and forces the least senior employee to be laid off. The ‘new’ median voter will have a higher preference for wages than the ‘old’ median voter. The weight of these two factors depends on the elasticity of labour demand, which depends only on the industry technology and factor substitution possibilities. The outcome of these two forces will determine the response of unions to import competition. The net effect is ambiguous in general, but the model shows that in the case of a constant elasticity of labour demand, union wages are unresponsive to international competition.

3. The Structure of Wage Bargaining in Brazil

After decades of very strong state tutelage, in which unions were closely controlled by the state and regulated by draconian laws (Alexander, 1981; Amadeo and Camargo, 1993), there was an emergence of a new labour union movement in the late 1970s. In part, this was a reaction to the extensive use of compulsory wage policies. Wages were adjusted once a year according to the occupational category of the worker by a rate announced by the government. But the systematic under-indexation of the rate of adjustment to the increasing inflation rate raised wide dissatisfaction, and fuelled the organisation of independent unionism, especially in the manufacturing sector of the most industrialised regions.

With the slow re-emergence of political democracy in the late 1970s and early 1980s, unions gained not only political power, but also an increasing role in the wage determination process (Cook, 1998). This development gradually broke the link between the state wage policy and wage adjustment. The rate of adjustment determined by the government became increasingly a floor for the wage adjustments obtained by unions in collective bargaining. The outcome of the bargaining process was increasingly determined by the characteristics of the industry affiliation and the power of the union. In some sectors there were national agreements which defined the floor of adjustment, leaving room for further improvements at the firm level.

With the rapid acceleration of the inflation rate over the 1980s and the successive (ineffective) stabilisation plans based on freezing wages and prices, unions started to act strategically trying to over-index wages keen to protect real wages from the combination of the expected acceleration of inflation and frozen wages (Amadeo, 1994a). This process intensified an already very unsynchronised wage bargaining process, which had a definite contribution to the breakdown in the co-ordination of wage determination. Carneiro and Henley (1998) argue that a strong intermediate level of collective bargaining centralisation

emerged from this process. According to the classification of Calmfors and Driffill (1988), this is the least favourable wage bargaining structure as far as macroeconomic performance is concerned.

The different levels of monopolistic product market power, the highly protected and regulated economy, the dominance of state-owned companies in a variety of sectors – which are more tolerant to labour demands – and the huge informal labour market which buffers the costs of displacement, provided few incentives for unions to discipline and moderate wage demands. Amadeo (1994a,b) and Carneiro and Henley (1998) argue that this environment was conducive to the growth of considerable insider power in wage determination, allowing powerful groups of industrial, formal sector workers to secure a share of product market rents through the wage bargaining process. Accordingly, Amadeo (1993, 1994a), and Carneiro (1998) have identified strong rent-sharing effects in the manufacturing sector in the 1980s.

The government in office during the transition from the dictatorship era to democracy (President José Sarney - 1985-1990) was unable to impose fiscal equilibrium due to its weak political position, and to the huge demands coming from all branches of society – which is an expected response after a long period under authoritarianism (1964-1985). This economic and political environment gave scope for strong, self-interested pressure groups acting in a free-rider manner demanding wages, prices, public subsidies etc. in an uncoordinated way according to their relative powers. This process would quickly generate a steady acceleration of the inflation rate (Arbache and Faria, 1996). By 1990 the annual inflation rate was about 2,700%!

Amadeo (1994a,b) and Carneiro and Henley (1998) argue that measures aimed at reducing the protection against external competition and deregulation of the markets are fundamental conditions needed to break and restrain the insider power of unions in wage determination.

4. The Labour Market: 1988-1996

The introduction of market-oriented economic reforms in Brazil seems to have caused sizeable impacts on the labour market. In this section we briefly investigate the evolution of three key variables reflecting labour market development, namely unemployment, productivity and real wages.[2]

Figure 1 shows a remarkable change in the unemployment rate from 1990-91 onwards. In 1985-89, the average unemployment rate was 3.9%. By 1990-95, it had increased to 5%. In a labour market like that in Brazil, where the informal sector plays an important role absorbing a large share of the labour force and acts as a buffer for the displaced workers from the formal sector, the unemployment rate tends to be lower than in developed countries. While workers queue for a formal job, they engage in informal activities. This phenomenon can be partially explained by the restricted unemployment insurance system, and by the limited job creation in the formal sector. An increase in the unemployment rate from, say, 4% to 5%, may be socially more costly for a country like Brazil than for a developed country, since it suggests a faster unemployment increase than in an otherwise developed country.

Figure 2 shows the one-step-ahead Chow test for structural breaks on a vector auto-regression (VAR) of the unemployment rate series. It seems that there is at least one change in regime in the 1990s, and the most conspicuous is the one at the beginning of 1991. To the extent that union strength depends on labour market conditions, one could expect that a tighter labour market would tend to make unions change preferences from wages to employment,

[2] All the (monthly) data we use here are from the Brazilian Institute of Geography and Statistics.

reducing their impact on wage determination. An expected outcome is a lower union-nonunion wage gap.[3]

Figure 3 shows the real wages in the manufacturing sector.[4] Wages were relatively stable until 1990. Thereafter, wages fell until 1992. This can be partially explained by the introduction of economic reforms and by the deep recession caused by the unsuccessful stabilisation plans Collor I and II.[5] The manufacturing annual GNP growth rate fell by -8.2% in 1990, stagnated in 1991, and fell by -4.2% in 1992. Accordingly, the unemployment rate rose from 3.4% in 1989 to 5.8% by the end of 1992, with obvious effects on wages. However, from 1992 onwards, real wages started to increase steadily. This figure clearly suggests a changing regime in real wages with a critical point in 1990-91.

Figure 4 shows at least one structural break in real wages, and the most significant is in the first half of 1990, when the Collor Plan I was introduced. We will show later that the pattern of increasing real wages in this more competitive economy is associated with changes in both the demand and supply of labour.

Figure 5 shows labour productivity in the manufacturing sector.[6] Productivity remained relatively stagnant during the 1980s, but started to experience a remarkable change from 1991 onwards. Around 20% of manufacturing jobs were lost in 1990-95, which suggests that part of the increasing productivity can be explained by employment factors such as outsourcing. However, investigations using different methodologies has identified unequivocal rapid increases in productivity in the post-reform period (Hay, 1998; Salm *et al*., 1997). They argue

---

[3] The union gap, however, may be counter-cyclical, since unions buffer the impact of market conditions on wages. Whether the gap increases or decreases is therefore an empirical issue.
[4] The data are indexed at 1985=100.
[5] The Collor Plan I, 1990, imposed a temporary squeeze of assets causing a huge and sudden decrease economic activity. The Collor Plan II, 1991, froze prices and wages and substituted the currency unit. Both, however, were ineffective in keeping inflation rates down.
[6] Productivity is measured as the index of physical output over the employment index.

that such an increase was a reaction of the firms in order to increase efficiency to cope with openness to international trade.

Figure 6 suggests a strong structural break in the productivity series in 1990. Arbache (1996) applies the Granger causality procedure to test the temporal causality between unemployment, real wages and productivity in the manufacturing sector from 1985 to 1994. Due to structural breaks, the study was divided into 'before' and 'after' the reforms. Interestingly, in the 1980s no cointegrating vector was found, meaning that no temporal relationship exists between these variables. In the 1990s, however, it was found that productivity seems to temporally precede both unemployment and real wages. This suggests that productivity is the central variable driving the relations in the labour market in the 1990s.

5. Data Description

We use cross-sectional micro data from the National Household Surveys (PNAD), published by the Brazilian Institute of Geography and Statistics (IBGE), for 1988, 1992, and 1996. The three samples consist of a total of 42,691 individuals, of which 11,697 are unionised. The concept of unionisation is union membership. The PNAD survey asks the individual whether he/she is a member of a union. Thus, union membership is represented by a dummy variable. The samples we analyse are the result of the following filter: active individuals, non-employers, between the ages of 18 and 65, main job, full-time, and affiliated to the manufacturing sector (similar to the 2-digit ISIC). Hourly wages are deflated by and indexed to the CPI of December 1995. We focus on the manufacturing sector because of data limitations regarding international trade for other sectors. However, manufacturing accounts for the biggest share of the Brazilian international trade (on average, more than 60 percent of total exports, and an even higher proportion of total imports, excluding crude oil).

Table 1 shows the means and standard deviations of a number of variables for union and nonunion workers. Union workers are older, have more accumulated human capital – measured by education, tenure and experience – and have higher probability of being male, married and white. There is a noticeable increase in the human capital variables from 1988 to 1996, although it is more evident for the unionised workers.

The raw average union-nonunion wage differential is about 48%. The differential is roughly the same magnitude even after the economic reforms, thus suggesting some union power to keep the premium. Whether this union wage gap is a result of union power or the composition of the unionised workforce is a matter for investigation in a subsequent section. Consistent with the findings of Arbache (1998a), the standard deviation of union wages is higher than that of nonunion wages, which contrasts with the empirical evidence supporting the policy of the standardisation of wage rates (Freeman, 1980). It seems that even the market-oriented economic reforms have not changed the pattern of the structure of wage bargaining in Brazil. Although the standard deviation of wages decreases from 1988 to 1996 for both groups, the nonunion workers experience a relatively higher wage compression. Since the standard deviation of log wages is a fairly reasonable measure of inequality, it implies less inequality in pay within groups. Actually, the same finding is evident in aggregate (i.e. union plus nonunion workers combined), thus suggesting that pay inequality fell in general. The respective standard deviations for 1988, 1992, and 1996 are 0.803, 0.757, and 0.732.

Unionisation seems to strongly affect the provision of non-wage benefits, as suggested by Freeman and Medoff (1984). Union workers enjoy as much as 5 times more education and training, more than 2 times health insurance, almost 2 times more meals, and more than 1.5 times more transportation than their nonunionised counterparts. Only housing is more common among nonunion workers. This suggests that union workers accrue higher salaries overall, and estimates of the union-nonunion wage gap without considering the non-wage

benefits are likely to underestimate the benefits of unionisation. In our case, the data on indirect wages are recorded in dummies rather than in value terms.

Union workers are concentrated in the richest regions (South and Southeast), and in metropolitan areas which is consistent with the location of manufacturing activity. Among manual workers, the more skilled are over-represented in the union sector, while the less skilled are concentrated in the nonunion sector. Almost 95% of the union workers have formal labour contracts, compared to an average of 64.5 percent of the nonunion workers. The turnover ratio and overtime worked are consistently higher in the nonunion sector. These characteristics reflect the differences in labour quality, and suggest that unions have regard to the working conditions of their members and ensure compliance with labour law.

Regarding industry characteristics, union workers are concentrated in larger firms, which conforms with the results of Dickens and Katz (1987) in their explanation of the main factors affecting the determination of inter-industry wage differentials. With reference to trade variables, union workers enjoy a slightly higher level of effective protection than nonunion workers. Interestingly, import penetration in the union sector is higher than that in the nonunion sector, thus suggesting that unionism seems stronger in the tradable industries.[7] Despite the fact that the manufacturing sector has undergone large changes in import penetration as a whole, not all industries might have been equally affected. Some industries are concentrated in the production of non-tradables, while others are more exposed to international competition.

---

[7] The measure of industry international competition is import penetration, $[M_i / (Y_i - X_i + M_i)] \times 100$, where M is imports, Y is production, and X is exports of industry i. The export ratio is given by X/Y. Data on industrial production are from Haguenauer *et al*. (1998).

6. Union and Nonunion Wage Dispersion

Table 2 shows the unconditional and conditional standard deviation of log hourly real wages of union and nonunion workers for before and after the implementation of the economic reforms. Two features are apparent. First, in general, wage dispersion in the union sector is higher than in the nonunion sector, even after the introduction of the economic reforms. This result – identified by Arbache (1998a) and Arbache and Carneiro (1998) as caused essentially by the strong rent-seeking effect allowed by the structure of wage bargaining in Brazil – stresses that even in a more competitive environment, collective bargaining is still a pervasive phenomenon influencing the wage level. Considering that union power would tend to be weakened by the tighter labour market, as suggested by Cournot type models, and supported by the empirical literature (Freeman and Katz, 1991; MacPherson and Stewart, 1990; Blumenfeld and Partridge, 1996), one could predict that the degree of wage dispersion in the union sector would converge towards that the nonunion wage sector.

The second feature is that the conditional standard deviation of wages is significantly smaller than the unconditional standard deviation. This implies that the control variables in the wage equations play an important role in the explanation of wage dispersion. It should be stressed, however, that union workers are relatively *less* affected by the inclusion of control variables. This can be seen by calculating the ratio of the unconditional to the conditional standard deviation for each of the groups. Consider, for example, the ratios for, respectively, union and nonunion workers in 1988. Since the ratio for nonunion workers is greater than that for union workers ($0.914/0.730 < 0.903/0.673$), it implies that nonunion workers are more affected by the inclusion of the control variables. This seems to be an outcome of unions on the wage determination process, and suggests that a proper measure of union and nonunion wage dispersion should be taken from the conditional rather than the unconditional standard deviation.

In order to assess how the economic reforms have affected wage dispersion in the union sector vis-à-vis the nonunion sector over time, we calculate the ratio of standard deviations – the SD ratio – as follows:

$$SDratio = \frac{SD^U}{SD^N},$$

where SD^U is the standard deviation of union wages, and SD^N is the standard deviation of nonunion wages. This ratio provides an assessment of the *relative* standard deviation. It could be expected that this ratio is less than unity due to the standardisation of wage rates hypothesis. One would also expect that the market-oriented economic reforms would cause this ratio to converge towards 1 due to the more competitive labour market. However, this explanation applies only for the period when the reforms were being introduced, which also coincided with a deep recession. Consider the conditional SD ratio in Panel 2 of Table 2. In 1988, it was 1.085; in 1992 it dropped to 1.060. By 1996, the SD ratio had increased to 1.16, a level higher than that prevailing before the economic reforms! This result is remarkable and possibly unexpected, since it suggests that unions can amplify the *relative* wage dispersion in a more competitive environment.

Note that the *absolute* standard deviation of both union and nonunion wages in 1996 are lower than those in 1988. Therefore, the higher SD ratio in 1996 is due to the relatively *larger* reduction of the standard deviation of nonunion as compared to union wages. A possible explanation for the larger reduction of the nonunion wage dispersion is that while the economy was highly regulated, protected and dominated by state-owned companies, union *and* nonunion workers could enjoy rent-sharing.[8] Under these circumstances, nonunion workers are relatively more responsive than union workers to changes in market conditions

[8] An additional argument in favour of distributing rents to nonunion workers is the threat of unionisation (Dickens, 1986).

due to the unions' ability to protect their members from the impact of economic changes, and secure part of the monopoly rents.

6.1 Trade and Wage Dispersion

A problem with the above results is the likely aggregation-effect. Unions in industries facing different levels of international competition may behave rather differently. Therefore, we present a disaggregated investigation of the SD ratio by industry to investigate the impact of changing international competition, and increasing imports. We proceed in two stages. In step 1, we classify the 2-digit industries in thirds according to the magnitude of the change in *level* of import penetration from 1988 to 1996 (i.e. level of import penetration in 1996 minus level of import penetration in 1988). In step 2 we calculate the SD ratio for each of the three groups of industries. Since unions in industries facing higher international competition tend to have seen reductions in their bargaining power, we expect to find the SD ratio of high import penetration industries to fluctuate around 1, and the SD ratio of low import penetration industries to be somewhat higher than 1.

The industry classification in each of the three industrial groups is reported in Table 3. This classification reflects:

(i) The nature of the industry goods (tradable and non-tradable);

(ii) The heterogeneity of the trade liberalisation policies for each industry regarding tariffs and non-tariffs barriers;[9]

(iii) International competitiveness of each industry.

---

[9] For studies on trade policies and effective protection by industry level, see, respectively, Kume (1996) and Pinheiro and Almeida (1994).

The weighted mean from the high import penetration industry group is 2.6 times and 5 times bigger than that from medium and low import penetration groups, respectively, thus suggesting a quite different impact of trade liberalisation across industries. As a consequence, we may expect different responses from unions in each group to the economic reforms.

Table 4 reports the SD ratio for each of the three industry groups over time and shows distinct responses according to the change in import penetration level. The high import penetration industries had a SD ratio of 1 in 1988 and 1992, but experience a modest increase by 1996. The SD ratio of the medium import penetration group – which was already high in 1988 (1.18) – is hit by the economic reforms and recession, dropping to 1.07 in 1992. By 1996, however, the SD ratio increased to 1.21, suggesting an increasing union rent-seeking in these industries. The SD ratio of the low import penetration industries increases steadily. This suggests a strong union ability to take advantage of the *relatively* more comfortable situation of these industries vis-à-vis manufacturing as a whole. Obviously, this is also a result of the relatively higher ability of these industries to acquiesce to wage demands, which allows unions to enhance their *relative* power as compared to unions in industries more affected by international competition.

Our results highlight an important feature in the analysis of the effects of economic reforms on wages, namely the different impact such reforms may cause in each industry and the effect on union behaviour. Unions in the least affected industries are likely to weigh wage gains highly relative to employment gains, producing an increase in their relative wages. Unions in industries facing threats of plant shutdowns, however, are willing to offer large wage concessions to save jobs. Industries facing modest negative shocks are less likely to sacrifice rents to save jobs, which may produce some wage inertia. As a result, there may have a change in the *structure of wages* according to the changes in the *relative power* of unions. The aggregate effect on wages will depend on these different forces. Whether unions will have

decreased or increased their *overall* impact on wages is an empirical issue that we will address shortly.

7. Trade, Unions, and Relative Wages

In order to assess the predictions of the above section on relative wages and wage structure, we adopt a two-step strategy. In part 1 we estimate the inter-industry wage differentials. In part 2 we calculate the change of wage premium by degree of import penetration change from 1988 to 1996. To estimate the inter-industry wage differentials, we adopt the methodology proposed by Haisken-DeNew and Schmidt (1997).

The results are reported in Table 5. Before proceeding to the second step, we report and analyse the weighted and adjusted standard deviation of the inter-industry wage premium in the bottom of the table. The standard deviation of union wages is always larger than that of nonunion wages, thus reinforcing our previous findings on the pervasive rent-seeking effect on wage bargaining in Brazil. After the introduction of the economic reforms, the inter-industry wage dispersion beings to converge towards zero in both groups, but at a much higher rate in the nonunion sector, suggesting that this group is more exposed to the impact of the economic changes. In 1996, the nonunion wage dispersion is only 2%, which is probably one of the smallest figures in the literature of inter-industry wage differentials. As far as we are aware, the only comparable result is that of 2.6% for Sweden in 1981 (Arai, 1994), observed in an era when the structure of wage bargaining was very centralised which tends to enable this sort of result.[10] Of course, the environment and the structure of wage bargaining in Brazil are completely different, as are the reasons behind these figures. While the standard

[10] It should be noted, however, that the methodology we adopt is different from that used in previous studies, and hence direct comparisons should be made with caution.

deviation of the wages of nonunion workers in 1996 is one sixth the size of that for 1988, the union wage dispersion in 1996 is only about half of that prevailing in 1988. These results suggest that:

(i) Unions can act as a buffer, protecting their members from economic changes;

(ii) The nonunion sector seems to be a *key group* for the understanding of the huge adjustment experienced by the Brazilian labour market since the introduction of economic reforms.

Having estimated the inter-industry wage differentials, we now assess unions' behaviour according to the degree of import penetration in the industry. Given the different shocks in product demand across manufacturing, we expect to find that unions in industries least affected by import competition have a more aggressive strategy in favour of wages, while unions in the most affected industries may be forced to accept wage concessions. As a consequence, there would have a change in *relative* wages in favour of the workers in least affected industries.

Table 6 reports the estimates. The results show that workers in the high import penetration industries experience an average *decrease* of industry wage premia from 1988 to 1996. Workers in medium and low import penetration industries, however, enjoy an average *increase* of industry wage premia from 1988 to 1996. Thus, there is a change in *relative* wages in favour of workers in medium and low import penetration industries.[11] The increase of industry wage premia in these industry groups, however, may be due to efficiency wages and other effects, and not to union bargaining power. In order to test this possible effect, Table 6 provides the increase in industry wage premia by union status. While union workers in the low

[11] To the extent that the average wage premium in the high import penetration group is the biggest among the three groups, while the average wage premium in the low import penetration is the lowest, it reduces the overall wage dispersion in the manufacturing sector.

import penetration industries have an average industry wage premia improvement of 12%, nonunion workers have an average increase of only 7%. A similar picture is apparent in the medium import penetration group; while the union workers enjoyed a 3% increase in industry wage premia, nonunion workers obtained only a 2% gain. The difference in the percentage points difference for union and nonunion workers (i.e. 12%-7%, and 3%-2%) can be unambiguously considered as being due to the bargaining power of unions to force firms to share their monopoly rents.

Union workers in the high import penetration industries, however, are more severely affected by import competition than their nonunion counterparts. While they experience a 4.5% decrease in industry wage premia, nonunion workers experience a fall of only 3%. Union worker wages tend to be more responsive to high external competition due to the union mark-up attached to their wages. This result is in line with the empirical evidence for the US (Freeman and Katz, 1991; MacPherson and Stewart, 1990).

The changes in the industry wage premium over time according to import penetration and union status are likely to have affected the structure of wages. To test this proposition, we calculate the Spearman rank correlation coefficients of the inter-industry wage differentials of union and nonunion workers using the estimated industry premia as shown in Table 5. The last row of Table 5 shows the correlation results. While the correlation coefficient of 1988 is 0.78, it is only 0.54 in 1996, thus suggesting a significant change in the wage structure of union as compared to nonunion workers after the increase in the degree of openness to international trade and other reforms. These results suggest an unambiguous change in unions' bargaining power over time. The coefficient of 0.84 for 1992 might be related to the impact of recession and the introduction of reforms on unions' power. Indeed, the changes in the wage structure seem to be associated with the different impacts of economic reforms across the manufacturing sector and their respective effects on union bargaining power.

8. Trade, Unions and Wages: A Further Assessment

In this section we investigate union wage responses to international trade, examining the effects of *changes* in product demand on *changes* in the inter-industry wage premium by union status from 1988 to 1996. Our strategy is to decompose the product demand into its three components: internal demand, exports and imports. This procedure will enable us to assess the responses of unions to each of the demand components, thus providing a more complete examination on the responses of unions to economic changes. We closely follow the methodology of Freeman and Katz (1991) carried out for the US.

The change in product demand (PD) is decomposed as:[12]

(i) Domestic demand (DD) = output - exports + imports;

(ii) Exports (X);

(iii) Imports share of domestic market demand, or import penetration (IP) = imports/DD.

In order to appropriately take account of the relative magnitudes of the product demand components, Freeman and Katz adopt the following respective weights:

(i) DD weight = (PD - X)/PD;

(ii) X weight = X/PD;

(iii) IP weight = DD/PD.[13]

The weighting adjusts the relevant changes for the difference in absolute magnitude of product demand generated by domestic demand and trade.[14]

---

[12] We use industry output as a proxy for product demand. It implies that everything produced is sold. The data on industry output is from Haguenauer *et al*. (1998, Table A1.2.3).

[13] For further details on the derivation of this decomposition, see Freeman and Katz (1991).

[14] Since the weights proposed by Freeman and Katz are more accurate for small changes, our results may suffer from some inaccuracy due to the large changes in import demand in some industries over the period under analysis.

The estimation methodology is carried out in two-steps. In step 1 we estimate the inter-industry wage differentials for 1988 and 1996 (as in Table 5). In step 2 we regress the change in industry dummy coefficients on changes in the weighted log product demand components. Table 7 reports the coefficients of such procedure for union and nonunion workers. The results show that changes in inter-industry wage differentials in both union and nonunion sectors are primarily affected by domestic demand. This may be associated with at least three factors: (i) larger variation in the wage premia of industries in the low import penetration group as compared to the variation of the wage premia in the high import penetration group; (ii) non-tradable nature of products from most of the low import penetration industries, which make them less sensitive to trade liberalisation; and (iii) the large share of domestic demand in overall product demand (an average of 96%).

Note that the coefficient for the union sector response to domestic demand is about twice as large as the nonunion coefficient. This suggests a strong degree of union power to capture rents during expansionary business cycles. While a 10% increase in domestic demand pushes average union inter-industry wage differentials up by 1.8%, it pushes nonunion wages up by only 0.8%. The coefficient for union wages found for Brazil is about twice as large as that found by Freeman and Katz (1991, Table 8.6) in a similar estimation procedure for the US in a period of a rapid increase in the international trade imbalance. These results reinforce the view of the strong role of unions on wage determination in Brazil.

While the coefficients on exports are positive as expected, they are not statistically significant. Nevertheless, the union sector coefficient is larger than that of the nonunion sector, which is in accordance with the above findings. The coefficients for import penetration are statistically significant and positive. This result can be interpreted in light of the increasing relative wages in medium and low import penetration industries vis-à-vis the decreasing relative wages in high import penetration industries.

9. The Union Wage Mark-up

An obvious indicator of whether market-oriented economic reforms affect union power is through the size of the union wage mark-up before and after the introduction of reforms. Given the nature and the pace of the changes introduced in Brazil, one could expect a smaller union wage mark-up after the reforms due to the tighter labour market. In order to investigate this prediction, we decompose the raw union-nonunion wage differential. This procedure provides further information on the evolution of the share of rewards and endowments on the union-nonunion wage differential. If unions lose importance, the share associated with differences in individual characteristics should increase, while the share derived from differences in rewards should decrease.

We decompose the union-nonunion wage differential applying the Blinder-Oaxaca procedure as follows:

$$\overline{w}^{U} - \overline{w}^{N} = (c^{U} - c^{N}) + \overline{X}^{U}(\mu^{U} - \mu^{N}) + \mu^{N}(\overline{X}^{U} - \overline{X}^{N}),$$

where $\overline{w}s$ are the natural logarithm of mean hourly real wages on union and nonunion workers, given by the superscripts *U* and *N*; *c* are the constant terms; $\overline{X}$s are the mean vectors of exogenous variables; and μs the vectors of coefficients. We follow Murphy *et al*. (1991) and report the results from estimates when the mean union characteristics are applied to obtain union mark-up (the second term in the right hand side). It assumes that in the absence of union effects on wage determination, the structure of wages would be that of prevailing for nonunion workers (the third term in the right hand side). The union mark-up we report is the one derived from this decomposition procedure.

Table 8 reports the decomposition results and the estimated union-nonunion wage differential. The last row shows that the wage differential falls dramatically from 1988 to 1992, possibly due to the mixed effects of economic reforms and recession on union power.

However, by 1996 the union mark-up increases to a level greater than that prevailing in 1988. This result can be interpreted as an outcome of the increasing *relative* power of unions in medium and low import penetration industries, which were able to increase their *relative* wages forcing firms to share rents at the expense of their nonunion counterparts. Thus, the effect coming from the unions in industries least affected by international competition dominates the effect from high import penetration industries. Note that the endowments share in the raw wage differential increases significantly from 1992 to 1996, suggesting the increasing importance of individual traits to the explanation of the union wage gap.

10. Discussion

How can we reconcile, in a microeconomic framework, increasing insider power in an economy experiencing market-oriented economic reforms? A central factor in understanding this issue seems to be *economic efficiency*. Hay (1998) shows that Brazilian manufacturing firms responded to trade liberalisation with an impressive growth in productivity, indicating a key role for improvements in X-efficiency and technological catch up. Salm *et al*. (1997) show a rapid and widespread adoption of new, modern managerial methods in Brazilian firms aimed at improving competitiveness. Of course, these technologies impact on labour demand in a such a way that it becomes more selective, benefiting the most qualified workers. Accordingly, human capital variables became increasingly more important in explaining wage determination in the 1990s (see Arbache, 1998a,b).

A modified version of Grossman's (1984) model seems suitable to explain the increasing insider power in Brazil. In the Brazilian case, due to the adoption of new technologies, there is not a seniority layoff rule, but a *skill layoff rule*. The greater the introduction of modern technologies to catch up technologically, the higher the demand for better quality workers. As a consequence, the least skilled workers tend to be displaced,

raising the skill level of the average union member. This can be shown by the higher average education and by the dramatic reduction of the turnover ratio in 1996 as compared to 1988.[15] The *'new' median voter* is likely to weigh wage gains highly in comparison with the *'old' median voter*, which can produce sizeable increases in wages in a period of higher competition.

The poor average labour force quality in Brazil gives skilled workers a disproportionate influence in wage setting. Considering the decentralised structure of wage bargaining prevailing in Brazil, insider power can be used to appropriate part of the increased productivity at the expense of the rest of society, which would otherwise have benefited through reduced prices. In these circumstances, unions have high incentives to boost the returns of individual productive traits. This would create a positive relationship between increased insider power and trade liberalisation.

This 'adapted' model helps to explain the increasing real wages over the 1990s, and the rationality behind the greater union strength in a more competitive environment. Two factors seem crucial in understanding the increasing union power: (i) the poor quality of the labour force; and (ii) the characteristics of collective bargaining.

Empirical evidence supporting the prediction that unions boost the returns of *individual productive traits* can be given by the size of regression coefficients on the principal wage-determining variables. Freeman (1980) argues that, according to the standardisation of wage rates policy, we should find lower returns for such variables in the union sector compared to

---

[15] The average years of education in manufacturing increased by about 10% in the period, while the turnover ratio decreased by 1/3, thus suggesting that firms are more keen to retain workers. This is in accordance with the prediction of the efficiency wage turnover model. Arbache (1998b) shows that this model is one of the main explanations of wage determination in Brazil in the 1990s.

the nonunion sector.[16] However, Table 9 shows that the coefficients of selected variables for the union workers are greater than that from their nonunion counterparts, implying that unions amplify rather reduce the returns of productivity-related characteristics on wages.[17]

11. Conclusions and Policy Implications

This paper tracked the impact of unions on wages before and after the implementation of market-oriented economic reforms in Brazil. Recent work shows that unions had an important influence in wage setting in the 1980s. They suggest that this was a result of the protected, highly regulated economy, and the intermediate degree of centralisation in bargaining. However, we find that after the implementation of market-oriented economic reforms, unions' power was increased rather than diminished.

Indeed, the structure of collective bargaining seems to be a fundamental aspect in the understanding of the strong insider power even in a more competitive environment. Unions in industries least affected by import penetration take advantage of their better relative position weighing wage gains more than employment. In contrast, unions in highly affected industries experience wage concessions. As a consequence, there is a change in relative wages and thus in the wage structure.

One way to reconcile the increasing insider power in a more competitive environment is through the change in the characteristics of labour demand. As a response to trade liberalisation, Brazilian firms have had to catch up technologically, which seems to have changed the elasticity of labour demand for better workers. Using the framework of a median

---

[16] The empirical evidence for developed countries supports this proposition (Freeman, 1980; Blanchflower and Freeman, 1992; Bratesberg and Ragan, 1997).

[17] The fall in coefficients in 1992 seems to be an outcome of the negative shocks of recession and the introduction of economic reforms on wages.

voter model, we argued that unions will have a higher preference for wage gains than employment gains, thus explaining the increasing insider power in a more competitive environment. This rent-seeking behaviour is facilitated by the decentralised structure of wage bargaining, and by the poor quality of the labour force, which gives skilled workers a disproportionate influence on wages.

Our results suggest two important policy implications. First, a change of the structure of collective bargaining in Brazil is necessary in order to reduce the pervasive free-rider effect in wage negotiations. One suggestion is the adoption of a framework that encourages more centralisation or more fragmentation of bargaining, which would impose more discipline in wage demands, reducing the strong rent-seeking effect. Second, and more importantly, it seems crucial to improve average labour quality. It would not only restrain insider power, but would also tackle the side effects on the already very unequal Brazilian income distribution.

REFERENCES

Alexander, R.J (1981), 'Brazil', in A.A. Blun (ed.), *International Handbook of Industrial Relations - Contemporary Developments and Research*, London: Aldwych Press.

Amadeo, E.J. (1993), 'Do Relative Wages Move Together with Relative Prices?', *Revista Brasileira de Economia*, 47: 33-52.

Amadeo, E.J. (1994a), 'Bargaining Power, Mark-up, and Wage Differentials in Brazil', *Cambridge Journal of Economics*, 18: 313-322.

Amadeo, E.J. (1994b), *Institutions, Inflation and Unemployment*, Aldershot: Edward Elgar Publishing Co., London.

Amadeo, E.J. and Camargo, J.M. (1993), 'Labour Legislation and Institutional Aspects of the Brazilian Labour Market', *Labour*, 7: 175-180.

Arai, M. (1994), 'An Empirical Analysis of Wage Dispersion and Efficiency Wages', *Scandinavian Journal of Economics*, 96: 31-50.

Arbache, J.S. (1996), 'Wages, Unemployment and Productivity in Brazil – 1985-1994', Águas de Lindoia: Proceedings of the XXIV Brazilian Economic Meeting.

Arbache, J.S. (1998a), 'Do Unions Always Decrease Wage Dispersion? The Case of Brazilian Manufacturing', *Journal of Labor Research*, forthcoming.

Arbache, J.S. (1998b), 'Inter-industry Wage Differentials: Evidence from Brazilian Manufacturing Data in the 1990s', Blankenberge: Proceedings of Tenth Annual Conference of the European Association of Labour Economists.

Arbache, J.S. and Carneiro, F.G. (1998), 'Bargaining Structure and Union Wage Differentials: Evidence from Brazilian Data', Blankenberge: Proceedings of Tenth Annual Conference of the European Association of Labour Economists.

Arbache, J.S. and Faria, J.R. (1996), 'Pressure Groups and Inflation: A Dynamic Model', *Revista de Economia Política*, 16: 256-266.

Blanchflower, D.G. and Freeman, R.B. (1992), 'Unionism in the United States and Other Advanced OECD Countries', *Industrial Relations*, 31: 56-79.

Blumenfeld, S.B. and Partridge, M.D. (1996), 'The Long-Run and Short-Run Impacts of Global Competition on U.S. Union Wages', *Journal of Labor Research*, 17: 149-171.

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 Driffill, J. (1988), 'Bargaining Structure, Corporatism and Macroeconomic Performance', *Economic Policy*, 6:13-61.

Carneiro, F.G. (1998), 'Productivity Effects in Brazilian Wage Determination', *World Development*, 26: 139-154.

Carneiro, F.G. and Henley, A. (1998), 'Wage Determination in Brazil: The Growth of Union Bargaining Power and Informal Employment, *Journal of Development Studies*, 34: 117-138.

Cook, M.H. (1998), 'Toward Flexible Industrial Relations? Neo-Liberalism, Democracy, and Labor Reform in Latin America', *Industrial Relations*, 37: 311-336.

Dickens, W.T. (1986), 'Wages, Employment and the Threat of Collective Action by Workers'. Working Paper No. 1856, Cambridge, MA: National Bureau of Economic Research.

Dickens, W.T. and Katz, L.F. (1987). 'Inter-industry Wage Differences and Industry Characteristics', in K. Lang, and J. Leonard (eds.), *Unemployment and the Structure of Labor Markets*. Oxford: Basil Blackwell.

Driffill, J. and van der Poeg, F. (1995), 'Trade Liberalisation with Imperfect Competition in Goods and Labour Markets', *Scandinavian Journal of Economics*, 97: 223-243.

Fortin, N.M. and Lemieux T. (1997), 'Institutional Changes and Rising Wage Inequality: Is There a Linkage?', *Journal of Economic Perspectives*, 11: 75-96.

Freeman, R. (1980), 'Unionism and the Dispersion of Wages', *Industrial and Labor Relations Review*, 34: 3-23.

Freeman, R.B. and Katz, L.F. (1991), 'Industrial Wage and Employment Determination in an Open Economy', in J.M. Abowd and R.B. Freeman (eds.), *Immigration, Trade, and the Labor Market*, Chicago: University of Chicago Press.

Freeman, R. and Medoff, J.L. (1984), *What Do Unions Do?*, New York: Basic Books.

Gaston, N. and Tefler, D. (1995), 'Union Wage Sensitivity to Trade and Protection: Theory and Evidence', *Journal of International Economics*, 39: 1-25.

Gosling, A. and Machin, S. (1995), 'Trade Unions and the Dispersion of Earnings in British Establishments, 1980-90', *Oxford Bulletin of Economics and Statistics*, 57: 167-184.

Grossman, G.M. (1984), 'International Competition and the Unionized Sector', Canadian *Journal of Economics*, 17: 541-556.

Haguenauer, L., Markwald, R. and Pourchet, H. (1998), 'Estimativas do Valor da Produção Industrial e Elaboração de Coeficientes de Exportação e Importação da Indústria Brasileira', Texto para Discussão No. 563, Rio de Janeiro: Instituto de Pesquisa Econômica Aplicada.

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.

Hay, D.A. (1998), 'The Post 1990 Brazilian Trade Liberalization and the Performance of Large Manufacturing Firms: Productivity, Market Share and Profits', Applied Economics Discussion Paper Series No. 196, Institute of Economics and Statistics, University of Oxford.

Huizinga, H. (1993), 'International Market Integration and Union Wage Bargain', *Scandinavian Journal of Economics*, 95: 249-255.

Kume, H. (1996), A Política de Importação no Plano Real e a Estrutura de Proteção Efetiva', Águas de Lindoia: Proceedings of XXIV Brazilian Economic Meeting.

Lawrence, C. and Lawrence, R.Z. (1985), 'Manufacturing Wage Dispersion: an Endgame Interpretation', *Brooking Papers on Economic Activity*, 1: 47-106.

MacPherson, D.A. and Stewart, J.B. (1990), 'The Effect of International Competition on Union and Nonunion Wages', *Industrial and Labor Relations Review*, 43: 435-446.

Murphy, P.D.; Sloane, P.J. and Blackaby, D.H. (1991), 'The Effects of Trade Unions on the Distribution of Earnings: A Sample Selectivity Approach', *Oxford Bulletin of Economics and Statistics*, 52: 517-542.

Nehru, V. and Dareshwar, A. (1993), 'A New Database on Human Capital Stock in Developing Country and Industrial Countries: Sources, Methodologies and Results', *Revista de Analises Economico*, 8: 37-59. The statistics are also available at <http://www.worldbank.org/htlm/promg/grthweb/ddnehdha.htm>.

Partridge, M. (1993), 'Technology, International Competitiveness, and Union Behaviour', *Journal of Labor Research*, 14: 131-149.

Peoples, J. (1998), 'Deregulation and the Labor Market', *Journal of Economic Perspectives*, 12: 111-130.

Pinheiro, A.C. and Almeida, G.B. (1994), *Padrões Setoriais da Proteção na Economia Brasileira*, Texto para Discussão No. 355, Rio de Janeiro: Instituto de Planejamento Econômico.

Salm, C.; Saboia, J. and Carvalho, P.G.M. (1997), 'Produtividade na Indústria Brasileira: Questões Metodológicas e Novas Evidências Empíricas', *Pesquisa e Planejamento Econômico*, 27: 377-396.

Stewart, M.B. (1991), 'Union Wage Differentials in the Face of Changes in the Economic and Legal Environment', *Economica*, 58: 155-172.

Figure 1

Unemployment rate

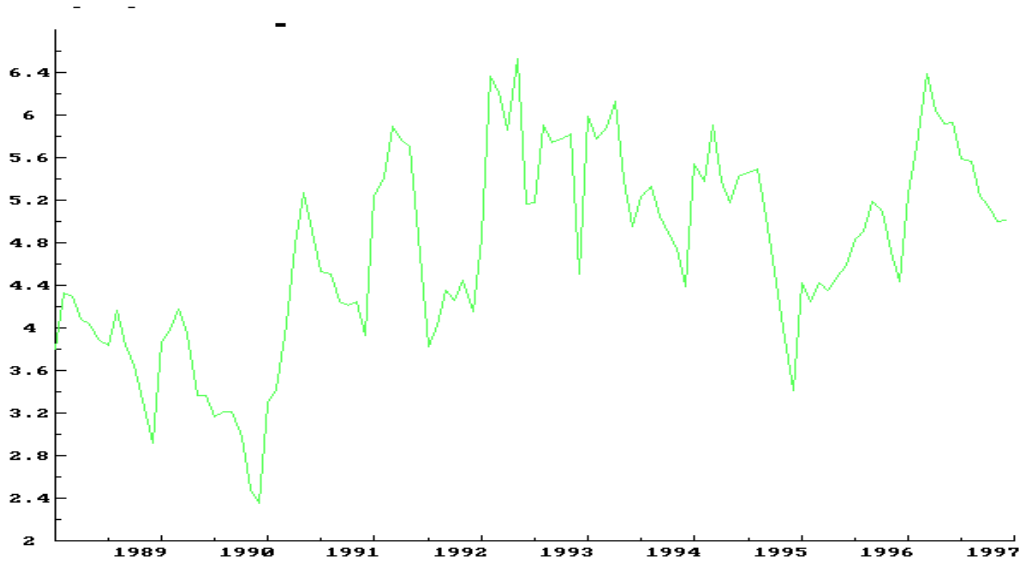

Figure 2

One-step-ahead Chow test of structural stability on VAR of unemployment

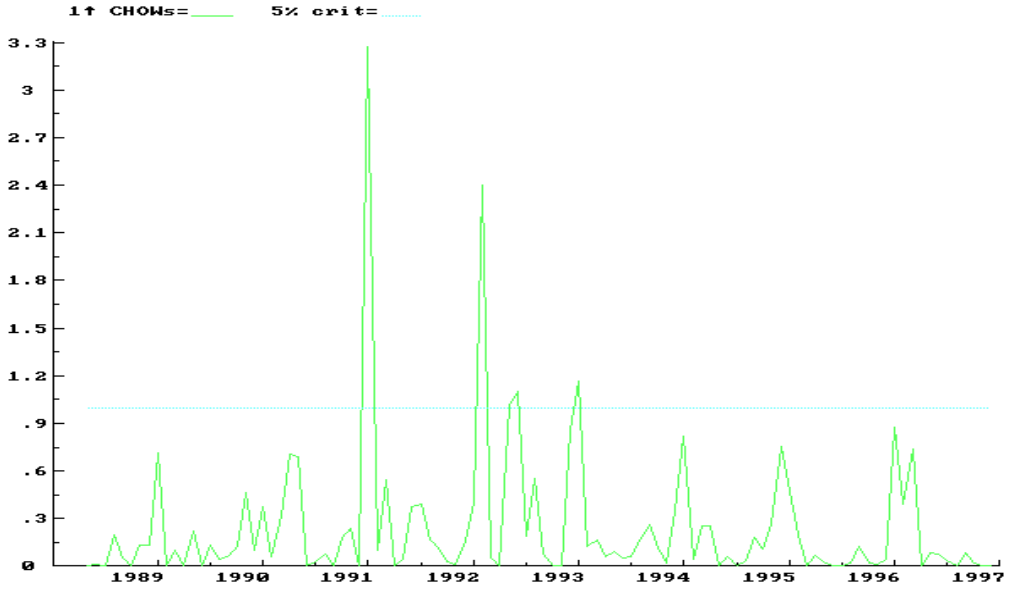

Figure 3

Real wages in manufacturing sector

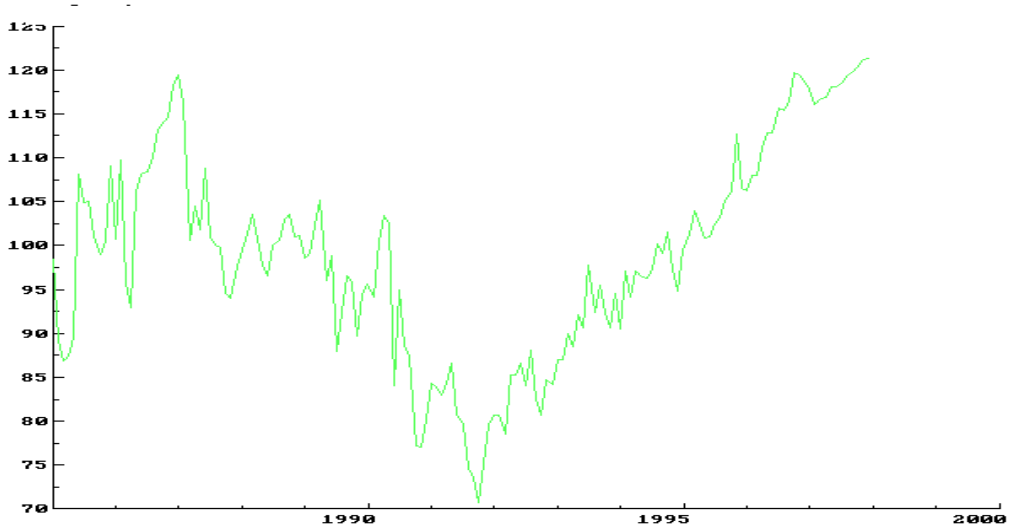

Figure 4

One-step-ahead Chow test of structural stability on VAR of real wages in manufacturing

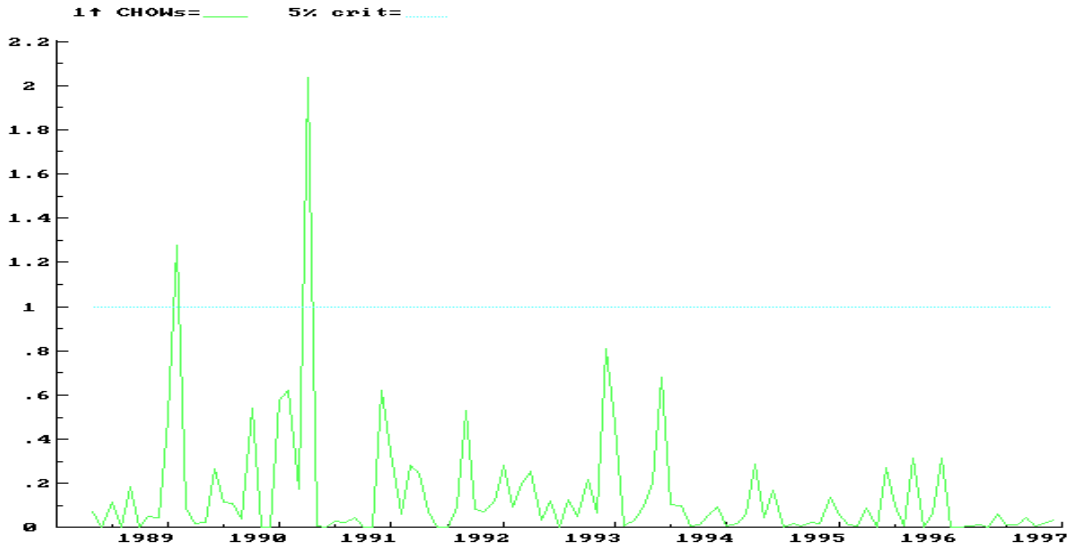

Figure 5

Productivity in the manufacturing sector

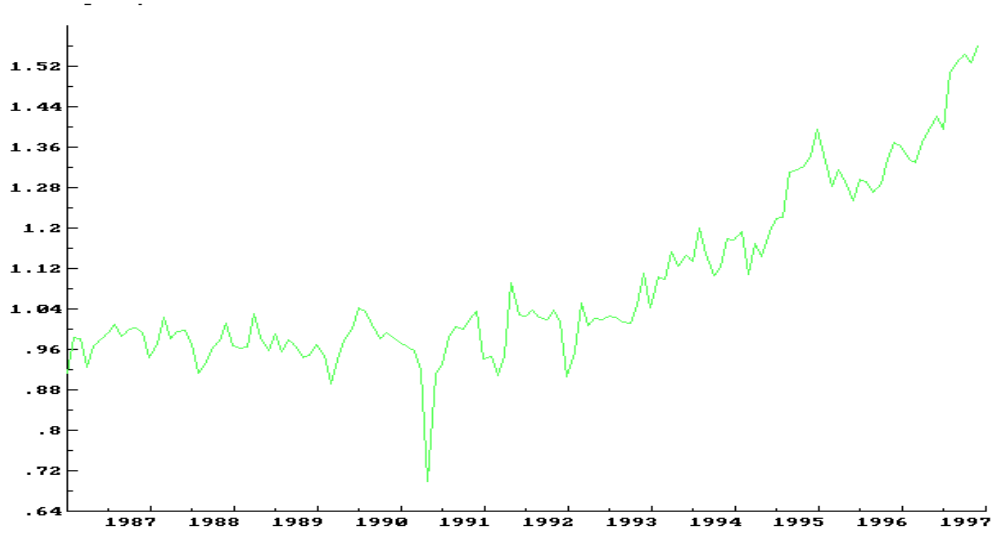

Figure 6

One-step-ahead Chow test of structural stability on VAR of productivity in manufacturing

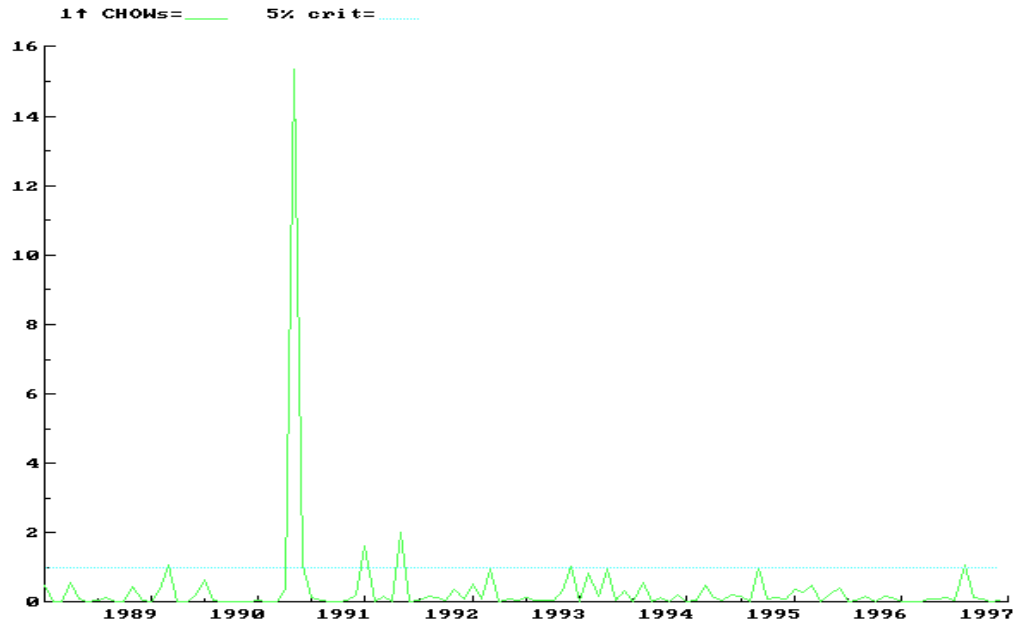

Table 1

Means and Standard Deviation for Union and Nonunion Workers

	1988				1992				1996			
	Union		Nonunion		Union		Nonunion		Union		Nonunion	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Individual characteristics												
Age (years)	33.5	9.93	31.7	10.8	33.8	11.1	32.0	10.6	34.5	9.76	32.3	10.7
Education (years)	6.74	3.96	5.78	3.87	6.73	3.84	5.80	3.72	7.45	3.93	6.23	3.70
Experience (years)	20.8	11.5	19.9	12.3	21.1	12.0	20.2	12.4	21.0	11.0	20.1	12.0
Gender (female=1)	0.198	0.399	0.259	0.438	0.223	0.416	0.262	0.440	0.226	0.418	0.259	0.438
Head of family	0.664	0.472	0.509	0.500	0.673	0.469	0.562	0.496	0.668	0.471	0.560	0.496
Race (white=1)	0.633	0.482	0.560	0.496	0.637	0.481	0.566	0.496	0.662	0.473	0.574	0.494
Tenure (years)	na		Na		6.32	6.61	4.14	5.72	6.66	6.88	4.35	6.07
Wage and non-wage benefits												
Ln Wage	3.40	0.914	2.92	0.903	2.90	0.777	2.43	0.765	3.20	0.834	2.71	0.782
Education/Training	na		Na		0.060	0.237	0.016	0.126	0.089	0.285	0.026	0.160
Health insurance	na		Na		0.398	0.490	0.179	0.383	0.507	0.500	0.204	0.403
Housing	na		Na		0.032	0.177	0.052	0.223	0.026	0.158	0.043	0.204
Meals	na		Na		0.497	0.500	0.281	0.449	0.560	0.496	0.330	0.470
Transportation	na		Na		0.539	0.499	0.356	0.479	0.585	0.493	0.375	0.484
Geographic variables												
Metropolitan area	0.560	0.496	0.531	0.499	0.499	0.500	0.499	0.500	0.529	0.499	0.459	0.498
Centre-East	0.033	0.180	0.078	0.268	0.027	0.161	0.075	0.264	0.030	0.170	0.081	0.273
North	0.057	0.231	0.085	0.278	0.036	0.187	0.053	0.224	0.032	0.177	0.059	0.235
Northeast	0.183	0.387	0.205	0.404	0.150	0.357	0.198	0.399	0.142	0.350	0.209	0.407
South	0.282	0.450	0.179	0.384	0.330	0.470	0.228	0.419	0.296	0.457	0.239	0.426
Southeast	0.445	0.497	0.453	0.498	0.457	0.498	0.446	0.497	0.499	0.500	0.413	0.492
Occupation												
Semi-skilled	0.430	0.495	0.474	0.499	0.483	0.500	0.527	0.496	0.466	0.500	0.550	0.493
Manager	0.065	0.247	0.052	0.222	0.076	0.265	0.055	0.228	0.087	0.283	0.054	0.227
Clerical	0.087	0.281	0.081	0.273	0.087	0.283	0.076	0.265	0.081	0.273	0.059	0.236
Sales	0.030	0.170	0.043	0.203	0.015	0.123	0.051	0.288	0.028	0.178	0.056	0.230
Technical	0.062	0.240	0.033	0.180	0.047	0.213	0.026	0.158	0.059	0.235	0.026	0.159
Skilled	0.214	0.410	0.120	0.325	0.191	0.393	0.092	0.289	0.184	0.387	0.093	0.290
Unskilled	0.113	0.316	0.198	0.398	0.106	0.308	0.173	0.378	0.095	0.305	0.162	0.369

Industry characteristics												
Turnover ratio	3.40	1.02	3.72	1.06	2.27	0.928	2.53	0.886	2.24	0.652	2.51	0.656
Overtime worked (≥48h/week)	0.497	0.500	0.485	0.502	0.261	0.161	0.358	0.480	0.306	0.461	0.382	0.486
Size of firms	na		Na		46.9	14.4	42.6	14.6	na		na	
Work-card	0.945	0.227	0.734	0.442	0.953	0.211	0.691	0.462	0.949	0.220	0.659	0.474
Effective protection	na		Na		21.91	(12.61)	19.38	(11.09)	na		na	
Import penetration	6.35	10.45	5.85	10.4	8.31	9.84	7.32	10.2	12.44	9.94	11.36	10.4
Export ratio	14.3	8.03	14.6	8.90	18.4	10.5	18.5	11.2	15.3	10.0	16.8	10.8
n	3,749		11,127		4,254		9,742		3,694		10,152	

Notes: Ln wage is deflated by CPI of December 1995. Turnover ratio is from IBGE. Size of firms is from RAIS/Ministry of Labour. Effective protection is from Pinheiro and Almeida (1994), Table 6. Import penetration and Export ratio were calculated with industry output values from Haguenauer *et al*. (1998), Table A1.2.3. Skilled workers = craftsmen, foremen and kindred workers; semi-skilled workers = operatives and kindred workers; unskilled workers = service workers.

Table 2

Standard deviation of log hourly wages and SD ratio

	1988		1992		1996	
	SD	SD ratio.	SD	SD ratio.	SD	SD ratio
1. Unconditional standard deviation						
All	0.931		0.799		0.844	
Union	0.914	1.012	0.777	1.016	0.834	1.066
Nonunion	0.903		0.765		0.782	
*2. Conditional standard deviation**						
All	0.713		0.578		0.614	
Union	0.730	1.085	0.565	1.060	0.644	1.160
Nonunion	0.673		0.533		0.555	

Notes: (*) Conditional standard deviation of predicted wages. Variables in the wage equation are metropolitan area residence, gender, race, head of family, work-card, education, experience, experience squared, overtime worked, seven occupation dummies, five region dummies, and 22 industry dummies. SD ratio is SD union/SD nonunion.

Table 3

Change in import penetration level - 1988-1996 - percentage points

High		Medium		Low	
Chemical	14.07	Apparel	9.45	Beverages	2.72
Electronic	20.28	Food	4.38	Furniture	2.95
Leather	15.24	Metallurgic	4.29	Paper	1.57
Mechanic	12.41	Mineral	5.40	Perfume	3.97
Other	24.75	Non-metallic	4.00	Publishing	2.33
Rubber	10.42	Pharmaceutical	6.87	Tobacco	0.74
Textiles	12.00	Plastics	4.56	Wood	3.53
Transport	10.34				
Weighted mean	14.60	*Weighted mean*	5.56	*Weighted mean*	2.85

Notes: The criterion is dividing the 2-digit industry by import penetration in thirds. The weighted means are based on the average employment share in 1988 and 1996.

Table 4

Conditional standard deviation of log hourly wages by industry groups according to the change in import penetration level and SD ratio

	1988		1992		1996	
	SD	SD ratio	SD	SD ratio	SD	SD ratio
1. High import penetration industries						
All	0.755		0.555		0.633	
Union	0.748	1.004	0.532	0.998	0.622	1.028
Nonunion	0.745		0.533		0.605	
n (All)	4,560		3,770		3,654	
2. Medium import penetration industries						
All	0.682		0.571		0.604	
Union	0.730	1.176	0.565	1.068	0.650	1.208
Nonunion	0.621		0.529		0.538	
n (All)	7,547		7,504		7,349	
3. Low import penetration industries						
All	0.581		0.499		0.523	
Union	0.621	1.144	0.540	1.208	0.633	1.382
Nonunion	0.543		0.447		0.458	
n (All)	2,236		2,063		2,238	

Notes: The 2-digit industry is classified in three groups according to changes in import penetration in 1988-1996. For details, see table. SD are from predicted conditional wages. Variables in the wage equation are metropolitan area residence, gender, race, head of family, work-card, education, experience, experience square, overtime worked, seven occupation dummies, five region dummies, and 22 industry dummies. SD ratio is SD union/SD nonunion.

Table 5

Union and nonunion inter-industry wage differentials

	1988		1992		1996	
Industry	Union	Nonunion	Union	Nonunion	Union	Nonunion
Apparel	-0.1690*	-0.1679*	-0.2228*	-0.0836*	-0.1735*	-0.1034*
Beverages	-0.1666*	-0.0559	-0.0454	-0.0355	0.0558	0.0184
Chemical	0.4147*	0.1465*	0.3367*	0.1246*	0.1605*	0.1048*
Electronic	0.0585	0.1610*	0.1328*	0.1082*	0.0302	0.0910*
Food	-0.2607	-0.1515*	-0.1411*	-0.1051*	-0.0889*	-0.0973*
Furniture	-0.1558*	-0.0453	-0.2250*	-0.0029	-0.0712	0.0598*
Leather	-0.0515	-0.0683	-0.2550*	-0.0935	-0.3765*	-0.1667*
Mechanic	0.0364	0.1606*	-0.0007	0.0517	0.0451	0.0693*
Metallurgic	0.0594*	0.0256	0.0438*	0.1034*	0.0405*	0.0988*
Mineral	0.3823*	0.3659*	0.2630*	0.0838*	0.3121*	0.0569
Non-metallic	-0.0863*	-0.0604*	0.0068	-0.0710*	-0.0479	-0.0348
Other	-0.1246	-0.0871*	-0.1063	-0.0678*	-0.1243*	0.0030
Paper	0.0524	0.1744*	0.1790*	0.1516*	0.0323	-0.0896*
Perfumes	-0.2089	-0.2242*	0.1090	0.0508	0.1181	-0.1131
Pharmaceutical	0.0849	0.1655*	0.2223*	0.1301*	0.2009*	0.3055*
Plastic	-0.0335	0.0549	-0.0495	0.0305	-0.0922	0.0083
Publishing	-0.2421*	-0.0827*	-0.1047*	0.0103	-0.0475	0.0316
Rubber	0.1293	0.0497	0.0338	0.0024	0.3804*	0.0096
Textiles	-0.1172*	-0.0439	-0.0573*	0.0250	-0.0538	-0.0365
Tobacco	0.0905	-0.0521	0.1816*	0.3012*	-0.0052	0.0020
Transport	0.2157*	0.2171*	0.2473*	0.2839*	0.1497*	0.1942*
Wood	-0.2159*	-0.0511*	-0.1979*	-0.0349	-0.1206*	0.0218
R^2	0.6385	0.5512	0.5288	0.4847	0.5950	0.5043
F-test	163.73	340.38	118.22	228.13	134.53	257.23
n	3,749	11,127	4,254	9,742	3,694	10,152
Weighted and adjusted SD	0.1818	0.1317	0.1492	0.0466	0.0878	0.0203
Correlation union-nonunion†	0.7820**		0.8408**		0.5471**	

Notes: Other regressors in the wage equations are metropolitan area residence, gender, race, head of family, work-card, education, experience, experience square, overtime worked, seven occupation dummies, and five region dummies. † Spearman rank correlation coefficient. (*) Significant at the 5 percent level. (**) Significant at the 1 percent level.

Table 6

Weighted average wage premium change by import penetration - 1988-1996

	High	Medium	Low
Union	-0.0436	0.0301	0.1223
Nonunion	-0.0294	0.0210	0.0674

Notes: For details on import penetration groups, see Table 3. Inter-industry wage premia are as estimated in Table 5. Weights are the average weights in 1988 and 1996 by union status according to industry group.

Table 7

OLS regression estimates of the impact of changes in the coefficients of industry dummies by union status on changes of product demand, 1988-1996

	Union	Nonunion
Domestic demand	0.1777*	0.0800*
Export	0.0360	0.0250
Import	0.0260*	0.0720*
R^2	0.4052	0.3684
F-test	4.08*	3.50*
N	22	22

Notes: Industry dummy coefficients are from Table 5. (*) Significant at the 5 percent level.

Table 8

Decomposition of the differences in union and nonunion wages and union mark-up (%)

Sources of wage gap (%)	1988	1992	1996
Coefficients + constant	0.333	0.357	0.320
Endowments	0.667	0.643	0.680
Estimated union mark-up (%)	6.0	2.4	11.0

Table 9

Coefficients of selected variables

	1988		1992		1996	
	Union	Nonunion	Union	Nonunion	Union	Nonunion
Education	0.124	0.091	0.080	0.073	0.093	0.082
Experience	0.055	0.045	0.028	0.036	0.046	0.039

Notes: All coefficients are significant at the 1% level.