What Difference Do Unions Make? Their Impact on Productivity and Wages in Latin America

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The Economic Effects of Unions in Latin America

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Ever since the classic analysis of union relative wages by H.G. Lewis (1963), the economic effects of trade unions have been a vibrant field of study in the United States. The empirical analysis of union effects has expanded to encompass outcomes other than wages—including profits, productivity, and employment—and to consider unionism in other countries, particularly the United Kingdom and Canada. A recent review of this literature is provided by Kuhn (1998).

Perhaps surprisingly, the empirical study of union effects has not spread far beyond these three industrialized, Anglo-Saxon countries in the four decades since 1963.[2] *What Difference Do Unions Make?* takes a major step towards filling the research gap by examining unionism in five Latin American economies, as well as comparing union density in North America and a sample of Latin American countries. At this point, very little is known about unions as economic actors in Latin America. The literature that does exist on Latin American unions instead tends to focus on the history of the various union movements and the constitutional and legal bases of unionism in the various countries of the region.[3] In addition to providing information to scholars and policymakers with an interest in Latin America, the studies in this volume thus constitute an important addition to the economic analysis of unionism, since they are among the first to extend empirical analysis into several institutional frameworks of collective bargaining that are very different from the Anglo-Saxon norm.

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[2] Most of the European research remains theoretical, though recently a few empirical studies have emerged (e.g., Holden, 1998).

[3] See, for example, Ojeda and Ermida (1993), Garza Toledo (2001), and O'Connell (1999).

To accomplish this goal a group of authors was selected to focus on three sets of questions. First, what factors influence the tendency of individual workers to belong to unions in Latin America? Are these factors the same as in North America (that is, the United States and Canada)? And what factors explain cross-national differences in unionization rates, both within Latin America and between Latin American and North American countries? Chapter 2 explores these questions. Second, what are the effects of private sector unions in Latin America on outcomes such as productivity, wages, investment and profits? How—if at all—do these effects differ from their estimated effects in other regions of the world? Chapters 3-6, which focus in turn on Peru, Brazil, Uruguay and Guatemala, examine these topics. Third, what are the effects of public sector unions in Latin America? To address this question, Chapters 7 and 8 analyze the effects of teachers' unions in Peru and Argentina on various dimensions of teacher performance, working conditions and student outcomes. Teachers' unions have become a much-studied institution in the United States because of high unionization rates among those professionals and because of teachers' central role in training the labor force of the future. The same considerations motivate this study of Latin America.

What Makes People Join Unions?

To investigate the determinants of union density (the share of workers belonging to labor unions), in Chapter 2 Susan Johnson uses comparable 1998 micro data surveys from six countries: Canada, Ecuador, Mexico, Nicaragua, the United States and Venezuela. Of these countries, Canada has the highest union density, at 29 percent of the labor force, and is therefore used as a convenient reference point for comparison with the remaining countries. Thus, Johnson asks what differences between Canada and the other countries might explain their lower rates of unionization, which are as follows: 22 percent in Venezuela, 16 percent in Mexico, 14 percent in the United States, 9 percent in Ecuador and 5 percent in Nicaragua.

Given the nature of her data, Johnson focuses exclusively on "structural" explanations of international differences in union density. Structural explanations are based on the premise that certain kinds of workers and/or jobs lend themselves more readily to unionization than others. For example, teenage workers may be hard to unionize because of low attachment rates to their jobs, and jobs in small, private sector firms may not provide adequate incentives for unionization because few economic rents are available to be transferred to workers. As a result, if some

Latin American countries have disproportionate shares of workers or jobs in hard-to-unionize categories, this may help explain their low levels of unionization. Of course, many "non-structural" factors such as historical, legal and political developments also affect union density levels across countries; these will appear in the "unexplained" portions of Johnson's gaps.

Johnson's first key finding is that, for the most part, the same personal and job characteristics are associated with a higher likelihood of union membership in all six countries studied. In particular, in both North America and Latin America, the following types of workers tend to be highly unionized: those in manufacturing, utility and transportation industries; those in professional, administrative, or manual occupations; those aged 45-54; workers in large firms; and public sector workers.[4] In all six countries, agricultural workers and workers under 34 or over 64 years of age tend to have low unionization rates. Johnson's findings in this regard are supported by Saavedra and Torero's finding in Chapter 3 that union membership is associated with having a permanent contract, working in a large firm and working in the public sector. In Chapter 5, Cassoni, Labadie and Fachola also find that union density is higher in Uruguay's public sector than in its private sector. The uniformity of these patterns of unionization, in the face of large differences in politics and institutions across the countries studied, strongly supports the idea that structural factors play a role in union density and are consequently worth exploring in a cross-national context.

Johnson's second key finding is that structural factors play a substantial role in explaining cross-national differences in unionization among the six countries she examines. Considering the gap between Canada and the four Latin American countries studied, she finds that international differences in the gender, age, industry, occupation, education and part-time/full-time mix of the labor force can account for as little as 36 percent of the gap, in the case of Mexico, and as much as 81 percent of it, in the case of Venezuela. Of these factors, the largest role is played by industry mix: even when self-employed and unpaid workers are removed from the analysis (as they are throughout the chapter), the much larger agricultural sectors in Latin American countries are a critical factor in explaining their low union density. Other factors playing a significant role in the Canada-Latin America union density gap are occupation mix and age, since the very young labor force in Latin America hinders unionization there. Accounting for the effects

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[4] According to Johnson's probit estimates, women are less likely to be unionized than men in five of the six countries, but this gender differential is statistically significant in only two of the six cases.

of public sector employment on union density differentials, however, presents some intriguing puzzles.[5] For example, according to the data, Venezuela (partly, no doubt, as a result of oil revenues) has a larger public sector and a greater share of employment in large firms than Canada. While this helps explain Venezuela's high unionization rate relative to other Latin American countries, it complicates the question of why Venezuela is less unionized than Canada. Such comparisons underscore the need to consider political and legal factors as well as structural ones.

Several other lessons can be drawn from Johnson's analysis. First, low unionization rates among paid workers in certain Latin American countries (for example, Ecuador and Nicaragua) are not *necessarily* a consequence of the political and legal features of those countries. Their labor forces are characterized by a high percentage of younger workers and a high percentage of employment in small agricultural enterprises—circumstances that would make unionization difficult in almost any institutional environment. Second, most determinants of unionization are the same in all the countries studied, with one interesting exception: unionization is concentrated among less-educated workers in North America, but among better-educated workers in Latin America. Thus the nature of the union movement, at least in its current form, and its likely effects on overall wage inequality are different in Latin America. Third, while demonstrating the importance of structural factors, Johnson's analysis also shows that other factors must play a role. In addition to the case of Venezuela noted above, the clearest example of this is provided by a comparison of Canada and the United States. Structurally, the measured differences between these two highly developed economies are minimal, especially compared to differences between North and South America. At the same time, union density in the United States was less than half of Canada's in 1998 and even less than the level in Mexico. A number of authors (such as Weiler, 1983) have therefore attributed most of the Canada-United States union density gap to legal factors affecting the representation process.

Other evidence of the effects of legal factors on union density emerges from Saavedra and Torero's study of Peruvian manufacturing in Chapter 3. According to the authors, union density in metropolitan Lima fell from about 40 percent in the late 1980s to 10 percent by 1998. An acceleration in the rate of decline was associated with important changes in the Collective Bargaining Law of 1993; since this decline occurred within narrowly defined labor market segments it cannot

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[5] This issue is discussed in further detail in the Data Appendix of Johnson (2004), the paper on which Chapter 2 is based.

be readily explained by structural factors. Sizable within-country changes in union density that accompany changes in collective bargaining legislation, such as occurred in Peru in the early 1990s, provide very suggestive evidence that, despite structural constraints, legislation can have a major impact on unionization in Latin America. Whether legislation could have an equally powerful effect in rural areas, however, remains an open question. Another obvious illustration of the importance of legal factors is the emergence of unions after the prohibition on collective bargaining in Uruguay was lifted in 1984.

Finally, taken together, Chapters 3-5 of this volume provide evidence of a crucial determinant of private sector union density that is neither legal, political, nor usually considered a "structural" factor: the degree of competition in product markets.[6] It is noteworthy that each of the three countries examined in these chapters—Peru, Brazil and Uruguay—underwent a dramatic episode of trade liberalization during the 1990s *and* a considerable decline in union density. Clearly, one main reason why workers join unions is that unions transfer economic rents from the firm's owners and consumers to workers; if competition reduces the size of those rents, union membership is less beneficial. The inescapable conclusion is that the continued reduction of trade barriers and deregulation of product markets is likely to be detrimental to the union movement in Latin America.

Private Sector Labor Unions and Economic Performance

What are the effects of labor unions on the economic performance of private-sector firms in Latin America? Chapters 3, 4 and 5 look at the manufacturing sectors of Peru, Brazil and Uruguay, respectively, using panel data on individual firms. Manufacturing is the "traditional" environment in which union effects on firm performance have been studied in the past (for example, Clark, 1984). By examining firms in this sector, the three chapters benefit from relatively reliable measures of output and productivity, as well as comparability with existing research. In all three of these countries, there is considerable heterogeneity across firms and over time in the prevalence of unions, and the authors exploit this heterogeneity in order to identify union effects. Notably, this is the case even in Brazil, where wage bargaining was highly centralized and union-bargained wage rates were automatically extended to non-union workers. In the Brazilian case,

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[6] Nickell (1999) provides a recent review of the literature on the important but often underemphasized link between product markets and unionization in the labor market.

issues such as working conditions, employment and the introduction of new technologies are bargained over at the plant level, and the authors measure these effects in their analysis. Finally, Chapter 6 offers insights into the role of unions in a very different environment: Guatemala's agricultural sector.

Taking a closer look at each of these four studies in turn, Chapter 3 analyzes the effects of unions on profits in Peru. Using a panel of manufacturing firms from 1994 to 1996, Saavedra and Torero find that unions reduce profits, even when firm fixed effects are held constant—a highly desirable specification to use when feasible. They also find that unions appear to reduce productivity, but this result is not robust to firm fixed effects.

Chapter 4 examines union effects in Brazil, where Menezes-Filho et al. study a panel of Brazilian manufacturing firms from 1988 to 1998. During this period, Brazilian firms faced a massive increase in exposure to foreign competition and union density declined, perhaps in response. Like Saavedra and Torero, the authors of Chapter 4, using a firm random effects model with year and industry dummies, find that an increase in union density or influence at the firm level tends to reduce profitability. In contrast, union density seems to have an inverted U-shaped effect on productivity and employment, both reaching a maximum at about 50 percent unionization. On the other hand, the authors find no significant union effect on investment. Since the majority of the firms in their sample were less than 25 percent unionized, the effect of union density in a typical Brazilian manufacturing firm is to *raise* productivity and employment. Probing the robustness of their results to permanent, firm-specific effects using a long-difference specification, the only result that remains statistically significant is that unions raise employment.

Turning to Uruguay, in Chapter 5 Cassoni, Labadie and Fachola base their analysis on a panel of establishments from 1988 to 1995. As in Brazil and Peru, this was a period of considerable trade liberalization in Uruguay. Another important trend during this period was a move away from centralized wage negotiations toward enterprise-level bargaining. The authors argue that this change should increase unions' likelihood of bargaining over employment as well as wages. In this panel, the authors find that unionization increases wages, reduces profits, increases employment and promotes investment, mainly by encouraging firms to substitute capital for labor. In agreement with the Brazilian results, but in contrast with the Peruvian results, Cassoni, Labadie and Fachola find that unionization raises productivity. Although the authors find an increased union emphasis on employment in the latter part of the period analyzed, this result is not statistically significant.

Chapter 6, which addresses union effects in Guatemala, departs from the preceding three chapters to look at the role of unions in a very different setting. Here, Urízar and Lée break ground in considering the effects of unions on large Guatemalan coffee plantations. Aside from being the only study of union productivity effects in the agricultural sector of which the editors are aware, this study also has the advantage of employing a better measure of output—and hence a better measure of productivity—than most other studies. Since all plantations produce the same product—coffee—their productivity can be measured in physical units. This circumvents a serious problem in much of the literature on union-productivity effects, namely that value-based measures of output are influenced by union effects on output prices as well as quantities.

Urízar and Lée's sample for analysis, based on their own survey, consists of 37 plantations, each of which provided complete data for four consecutive years between 1992 and 2000. Their focus in this chapter is only on the *productivity* effects of unions, not on other outcomes such as wages, profits or employment. Incorporating controls for the types of workers employed (temporary, permanent or administrative), land quantity and quality, a variety of detailed capital and technology measures, and region fixed effects, they find in a pooled generalized least squares (GLS) specification that unions—which are relatively uncommon on Guatemalan coffee plantations—appear to reduce productivity. This is perhaps not surprising given the very detailed work rules sometimes observed in plantation-level union agreements, even including restrictions on the number and size of holes to be dug per day.

Restricting their attention to the very small number of firms that changed union status, however, Urízar and Lée cannot confirm their productivity results in a fixed-effects specification. It is nonetheless interesting that their fixed-effects model shows a large productivity disadvantage in substituting permanent for temporary workers, a policy pursued by many unions in Guatemala.

When the results of all four studies of unions and firm performance in this volume are considered, what conclusions can be drawn? Mirroring the existing literature outside Latin America (see Kuhn, 1998, pp. 1046-1048), estimated effects of unionization on productivity differ across studies, with both positive and negative effects observed. Although this could reflect differences in definitions and techniques across studies, it more likely reflects true heterogeneity in union effects, as a number of authors (such as Clark, 1984) have argued. Theoretically, union productivity effects can be positive, because of employee "voice" effects, or negative, because of work rules and increased conflict, including strikes. Which

of these effects dominates can vary by industry, country, and time period, and it appears that Latin America is no exception in this regard. Neither blanket opposition to, nor unqualified support of, unions on productivity grounds is warranted by the studies in this volume. In all cases careful attention to details of industry, industrial relations, and production methods is required to assess union effects on productive efficiency.

This volume presents much more robust findings, however, about two other union effects. The first is the effect on profits. Given the fact that unions raise wages, the robust findings in this volume that unions reduce profits is both unsurprising and consistent with virtually all previous research.[7] Of course, this raises concerns about the likely effects of unions on firms' incentives to make new investments in plant, research and development, and equipment, but to date results on these questions have been much harder to characterize. A second union effect—that of *raising* employment levels—is also seen in all studies that address the issue in this volume. At first glance, this may seem paradoxical given that unions raise the price of labor to firms, but it is in fact consistent with the well-known "efficient contracts" model of unionism (for example, Brown and Ashenfelter, 1986): if unions care about employment as well as wages, Pareto-efficient contracts between unions and firms may stipulate higher employment levels than in competitive firms. This is especially the case in declining firms and industries in which unions have a special interest in preserving the jobs of their existing members.

It is also worth noting that all of the positive employment effects estimated in these chapters come from a period of deregulation, declining unionization, and increased exposure to competition. Thus, the data may be capturing employment cutbacks that occur in conjunction with both de-unionization and increased product competition, similar to what Brown and Ryan (1998) recently observed in a sample of deregulated British firms. Given the limitations of the data, the effects of unionism and product market competition may be partially confounded in these estimates, but it is clear that in Latin America, as elsewhere (see, for instance, Boal and Pencavel, 1994), *when negotiations occur at the plant or firm level*, unions do what they can to increase their members' employment or preserve their members' jobs. *De-unionization*, not unionization, is associated with employment cutbacks in Latin American as well as other data. While such cuts may eliminate inefficiencies, it is important to note that the short-term costs of reducing union power appear to include job losses at firms where union power

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7 See, for example, Ruback and Zimmerman (1984), Abowd (1989), Bronars and Deere (1990) and Machin and Stewart (1996).

is reduced. Although this is a perfectly sensible and plausible result, it is not what one would have predicted from a simple labor demand model.

Public Sector Labor Unions and Economic Performance

The final two chapters in this volume consider the effects of Latin American unions in the public sector. Mirroring considerable recent interest in the effects of teachers' unions in the United States and taking advantage of the relative abundance of data (compared to other public sector workers) on teachers' salaries, working conditions, and productivity (as measured by student outcomes), both chapters look at public school teachers.

Zegarra and Ravina's study of Peruvian teachers in Chapter 7 draws most of its data from a sample of schools where both teacher and student performance were observed as part of a national study to improve educational quality. In addition, some supplemental evidence is drawn from a group of about 500 teachers selected from a 1999 national household survey. Peruvian teachers' wages are negotiated centrally by a single national union, and these wage agreements apply to union and non-union teachers. As a consequence, any difference in outcomes between union and non-union teachers (or their students) must result from differences between individuals who voluntarily choose to belong to a union and those who do not, or from differences in the resources or students assigned to union teachers. Thus, one question posed by these authors is whether unionized teachers command better classroom and school resources than other teachers in Peru.[8]

Zegarra and Ravina find that in large schools, unionized teachers do not command better resources, while in small schools they do. The authors then look at direct measures of teacher performance (or "effort," in their terminology) based on classroom observation. These measures include indicators of effective time use during class, good control of the classroom and students' opinions about their teacher. Unlike some influential recent American studies (such as Hoxby, 1996), Zegarra and Ravina do not find that unionized teachers are less or more effective; nor are their students' standardized test scores any different. This result might, of course, be driven by their very small sample size (a group of 50 teachers, all of

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[8] Another important distinction in Peru is between tenured teachers and those hired on temporary contracts, which were introduced in 1993. Unfortunately, Zegarra and Ravina cannot estimate the effect of tenure on teacher performance, since their data on student outcomes contain only tenured teachers.

whom are on permanent, tenured contracts). Alternatively, it could be related to the structure of collective bargaining, in which both union and non-union teachers are covered by the same agreement, and union membership decisions may reflect personal political decisions without having detectable economic consequences at the individual level. Finally, Zegarra and Ravina present some evidence consistent with the expected, and intuitive, notion that unions attempt to increase their members' job security: union teachers are much more likely to be tenured than non-union teachers.[9]

In Chapter 8, Murillo et al. attempt to isolate some effects of teachers' unions in Argentina. In doing so, the authors face an institutional problem similar to that confronted by Zegarra and Ravina: in Argentina, teachers' salaries, education budgets, working conditions and regulations affecting teachers are all bargained at the provincial level between teachers' unions and the provincial government. Agreements apply to all teachers, regardless of union membership status. Therefore the appropriate measure of teacher union strength in Argentina is at the provincial level.

Looking across Argentina's 24 provinces in the late 1990s, the authors make several observations. First, strikes are more frequent in provinces with higher teacher union density, where teachers' unions are fragmented, and where their political relations with the governor (measured by criteria other than strikes, such as party affiliation) are adversarial. In addition, there is weak evidence that stronger unions reduce class size. Finally, again looking across 24 provinces and including a small number of control variables for provincial characteristics, strong teachers' unions do not seem to affect the size of the education budget. They do, however, seem to increase the share of the education budget devoted to salaries. From a different dataset of 1,534 individual teachers nationwide, the chapter also finds that unionized teachers express much lower job satisfaction than their non-unionized counterparts, mirroring a well-known result in other countries (for instance, Borjas, 1979).

If unions do indeed have the above effects in Argentina, how would this affect students? Clearly, on the basis of prior experience and studies in other countries, one would expect an increase in strikes (therefore, fewer class days) and teacher job dissatisfaction to compromise students' educational outcomes. Some supporting evidence for this contention is available from Argentina as well:

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[9] Of course, this correlation could also be explained by a greater willingness of already-tenured teachers to join unions. In the case of Peruvian teachers, however, Zegarra and Ravina maintain that most union membership decisions are relatively permanent and made fairly early in teachers' careers.

as the authors discuss, math scores are positively correlated with class days and teacher job satisfaction in a national sample of seventh-grade students between 1997 and 1999. In combination with the result that teachers' unions do not seem to raise education budgets, this suggests that teachers' unions have an adverse overall effect on student performance in Argentina, though clearly no direct link has been drawn. In sum, Argentine teachers' unions appear to increase their members' job security (as they do in Peru). In addition, teachers' unions increase industrial conflict and reduce teacher job satisfaction, perhaps harming students as a consequence. There is no evidence that these unions are successful in lobbying provincial governments for larger educational budgets—only a larger share of the budget for teacher salaries.

Pulling It All Together

Overall, what have the studies in this volume taught us about unions in Latin America? Certainly, one important lesson is methodological: given that bargaining institutions are often very different in Latin America from those in countries where the empirical study of unions originated, simplistic adaptation of empirical techniques developed in the latter environment and applied to the former will not always yield useful insights. The clearest examples of this difference involve the analyses of teachers' unions: in an environment where many aspects of compensation are bargained nationally and extended automatically to non-union as well as union workers, cross-sectional comparisons of compensation, working conditions and productivity of union members versus non-members are not very informative about union effects on these outcomes.

This methodological caution duly noted, however, perhaps the most surprising finding in this volume is a substantive one: *despite* the fact that institutions, laws and cultures differ so greatly both among Latin American countries and between Latin America and the rest of the world, it is striking *how much unions in all these countries have in common*. With one exception—worker education levels—Latin American unions are found in the same sectors of the labor market as in other parts of the world. As elsewhere, there is evidence that they are severely (and negatively) affected by increases in product market competition. Latin American unions fight (in most cases effectively) for the same things—higher wages, job security and increased employment—as unions elsewhere, and in all cases unions appear to reduce firms' profits in the process. As regards union effects on perhaps the most

interesting and controversial outcome, productivity, these results also mirror those in the United Kingdom and the United States: both positive and negative effects are observed, in different industries and at different times. A blanket case, either for or against unions, cannot be made on productivity grounds on the basis of the evidence presented in this volume. As elsewhere, careful attention to industry conditions, the structure of bargaining, and the nature of industrial relations is required to assess the effects of unions on the productivity of Latin American firms.

An Empirical Examination of Union Density in Six Countries: Canada, Ecuador, Mexico, Nicaragua, the United States and Venezuela

Susan Johnson[1]

Unions shape labor market outcomes, influence the broader economy and additionally affect non-economic aspects of a society. Unions directly affect the wages, benefits and working conditions of their own members and indirectly affect those of non-members. By providing workers with a "voice," unions create an alternative to "exit" when workers are dissatisfied and can therefore reduce job turnover. A union's involvement in the employment relationship affects the profitability and productivity of the firm, and unions can influence the overall distribution of wages and level of employment. Moreover, a strong union movement often plays a role in the political arena by upholding labor's rights and interests. While the importance of unions in these dimensions cannot be perfectly quantified, the usual measure of union influence and strength is union density, or the proportion of workers who belong to a union in a given economy.

This chapter examines and compares union density in six countries: Canada, Ecuador, Mexico, Nicaragua, the United States and Venezuela. Two determinants of union density are examined: (i) the structure of the paid labor force; and (ii) the probability that a worker with given labor force characteristics is a union member. The union density gap between Canada, the country with the highest union density, and each of the other countries is decomposed in order to explore the contribution of each determinant to the gap.

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Union Density

Union density, the proportion of paid workers who are union members, is a commonly used indicator of the strength and potential influence of the labor movement in a country. This chapter analyzes household survey data, from which comparable information from all six countries is available for 1998. The sample for each country is the civilian population, over 15 years of age, employed in the private or public sector with positive working hours in the reference week. Self-employed workers (incorporated or unincorporated) and those who perform unpaid work are excluded from the analysis. Observations with missing values for any variable are also excluded.

Union membership is used throughout the analysis because data on union coverage are not available for all countries.[2] As variables included in the decomposition analysis must be available and comparable across all six countries, the variables used in this chapter are limited to the following: gender, worker status (part-time/full-time job), age, education, occupation and industry. Data on the size of the public and private sectors and data on establishment size are not available for all countries, and consequently those variables are not included.[3] Table 2.1 presents data on union density for each country in 1998 and for other years where data are available. These data provide an overview of the size and vitality of the union movement in each country and permit a comparison across countries. In 1998 there is substantial variation in the degree of unionization across countries. Canada is the most highly unionized country, with a union density of 29 percent, followed by Venezuela (22 percent), Mexico (16 percent), the United States (14 percent), Ecuador (9 percent) and Nicaragua, the least unionized country (5 percent). The limited data available on union density over time suggest the union movement is stagnant or in decline in Canada, Mexico, the United States, Ecuador and Venezuela.

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[2] Union membership is different from union coverage. The provisions of a collective agreement can cover workers even though they are not union members. For this reason, coverage is often the preferred measure for capturing the degree of union influence in an economy. Unfortunately, data on union coverage are not available for all countries, and union membership is thus used.

[3] Johnson (2004) examines the role of the public sector and establishment size in countries where these data are available.

Table 2.1. Union Density by Country

(Standard errors in parentheses)

	1984	1989	1992	1993	1994	1995	1996	1997	1998
Canada*								0.30 (0.003)	0.29 (0.003)
Ecuador						0.11 (0.005)			0.09 (0.005)
Mexico	0.24 (0.009)	0.22 (0.006)	0.21 (0.006)		0.18 (0.005)		0.16 (0.004)		0.16 (0.005)
Nicaragua									0.05 (0.005)
United States	0.19 (0.004)	0.16 (0.004)	0.16 (0.003)	0.16 (0.003)	0.16 (0.004)	0.15 (0.003)	0.14 (0.003)	0.14 (0.003)	0.14 (0.003)
Venezuela						0.23 (0.004)		0.21 (0.004)	0.22 (0.004)

*Data on union membership are not available from the Labour Force Survey for earlier years in Canada. However aggregate data on union membership are available from the Workplace Information Directorate (Human Resources Canada). Johnson (2002) examines union density in Canada from 1980 to 1998 using data from the Workplace Information Directorate and finds that Canadian union density remained relatively stable from 1980 to 1991 but declined from 1992 to 1998.

The Determinants of Union Density

Why is union density different across these countries? Differences in union density among the countries in the sample can be traced to: (i) differences in the proportion of the workforce with particular characteristics, and (ii) differences in the impact that each particular characteristic has on the probability of unionization.

Table 2.2 shows the proportion of paid workers by characteristic in 1998 for each country. The table shows there are substantial differences in the structure of the paid workforces across countries and that many of these differences are statistically significant. It should be noted, however, that the structures of the Canadian and American paid workforces are more similar than the structures of the Canadian and Latin American paid work forces. In Canada and the United States, for instance, women make up almost half of the paid labor force, while in Latin American countries women make up only about one third of the paid labor

force. The proportion of part-time workers varies across countries, from a low of 0.10 in Venezuela to a high of 0.30 in Canada. There are substantial differences across countries in the size of the service and agricultural sectors, and within Latin American countries there is substantial variation in the size of the agricultural sector. The educational structure of the workforce is also very different across countries. In the United States and Canada the proportion of the workforce with at least a high school education is greater than 0.80, while in the Latin American countries it is less than 0.35. The United States and Canada have older workforces than do the Latin American countries. The proportion of workers age 15-34 is about 0.4 in both the United States and Canada, while it reaches approximately 0.6 in Latin America. The size and importance of these differences suggest that structural factors likely account for some of the differences in union density across countries.

Table 2.3 presents the proportion of paid workers with a particular characteristic who are union members. This measures the unconditional probability that a worker with a particular characteristic is unionized and as such does not take into account interactions with other characteristics. As the table makes clear, there is substantial variation across countries in the likelihood that a worker with a given characteristic is unionized. It is also obvious that, not surprisingly, countries with higher union densities tend to be those with a higher probability of unionization for any given characteristic. Females are less likely to be unionized than males in Canada and the United States but more likely to be unionized in Latin American countries. Part-time workers are less likely to be unionized than full-time workers in Canada and the United States, but they are more likely to be unionized in Mexico and Venezuela. In all countries workers in the utility industry are more likely to be unionized, and workers in agriculture and trade are less likely to be unionized. The probability that farm and sales workers are unionized is quite low in all countries. There is a high probability that professionals and administrators are union members. In all countries those with "less than high school" are less likely to be unionized and, in most countries, those with "more than high school" are more likely to be unionized. Younger workers (15-19, 20-24) and, in most countries, older workers (55-64 and over 64) are less likely to be unionized than prime-aged workers (35-44, 45-54).

It is interesting to compare these results to those of Blanchflower and Freeman (1992) who calculated similar probabilities for a selected group of

Table 2.2. Proportion of the Paid Labor Force with Each Characteristic, 1998 *(Standard errors in parentheses)*

	Canada	Ecuador	Mexico	Nicaragua	USA	Venezuela
Female	0.47	0.32	0.33	0.33	0.48	0.35
	(00.003)	(00.008)	(0.006)	(00.010)	(00.005)	(0.004)
Part-time	0.30	0.21	0.15	0.21	0.24	0.10
	(0.003)	(0.007)	(0.005)	(0.009)	(0.004)	(0.003)
Industry						
Agriculture	0.01	0.20	0.12	0.27	0.01	0.07
	(0.0005)	(0.006)	(0.004)	(0.010)	(0.001)	(0.002)
Mining	0.02	0.01	0.01	0.006	0.004	0.01
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Manufacturing	0.18	0.13	0.22	0.13	0.18	0.17
	(0.002)	(0.005)	(0.005)	(0.008)	(0.004)	(0.004)
Utilities	0.01	0.01	0.01	0.01	0.03	0.01
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Construction	0.04	0.09	0.07	0.06	0.05	0.09
	(0.001)	(0.007)	(0.003)	(0.005)	(0.002)	(0.003)
Trade	0.16	0.21	0.14	0.14	0.23	0.19
	(0.002)	(0.008)	(0.004)	(0.007)	(0.004)	(0.004)
Transportation	0.05	0.05	0.05	0.04	0.05	0.05
	(0.001)	(0.004)	(0.003)	(0.005)	(0.002)	(0.002)
Finance	0.06	0.05	0.02	0.01	0.13	0.06
	(0.002)	(0.003)	(0.001)	(0.002)	(0.003)	(0.002)
Service	0.47	0.25	0.37	0.33	0.32	0.34
	(0.003)	(0.007)	(0.006)	(0.010)	(0.005)	(0.004)
Occupation						
Professionals	0.22	0.13	0.13	0.04	0.18	0.15
	(0.003)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)
Managers	0.09	0.02	0.02	0.03	0.13	0.03
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Administrators	0.17	0.09	0.13	0.14	0.16	0.15
	(0.002)	(0.005)	(0.004)	(0.007)	(0.004)	(0.003)
Sales	0.10	0.07	0.10	0.05	0.11	0.10
	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)

Continued

Table 2.2. Proportion of the Paid Labor Force with Different Characteristics, 1998 *(continued)*

	Canada	Ecuador	Mexico	Nicaragua	USA	Venezuela
Services	0.17	0.21	0.13	0.22	0.14	0.19
	(0.002)	(0.008)	(0.004)	(0.009)	(0.003)	(0.004)
Farm	0.02	0.19	0.11	0.24	0.01	0.07
	(0.001)	(0.006)	(0.004)	(0.010)	(0.001)	(0.002)
Manual	0.23	0.29	0.38	0.27	0.25	0.30
	(0.003)	(0.008)	(0.006)	(0.010)	(0.004)	(0.004)
Education						
Less than	0.17	0.66	0.76	0.79	0.13	0.66
High School	(0.002)	(0.008)	(0.005)	(0.009)	(0.003)	(0.004)
High School	0.21	0.14	0.09	0.08	0.33	0.19
	(0.002)	(0.006)	(0.004)	(0.006)	(0.005)	(0.004)
More than	0.62	0.20	0.15	0.13	0.54	0.14
High School	(0.003)	(0.006)	(0.005)	(0.007)	(0.005)	(0.003)
Age (years)						
15-19	0.05	0.15	0.12	0.15	0.05	0.09
	(0.001)	(0.006)	(0.004)	(0.007)	(0.002)	(0.002)
20-24	0.11	0.18	0.17	0.18	0.10	0.17
	(0.002)	(0.008)	(0.005)	(0.008)	(0.003)	(0.003)
25-34	0.27	0.29	0.31	0.30	0.25	0.32
	(0.003)	(0.008)	(0.006)	(0.010)	(0.004)	(0.004)
35-44	0.29	0.21	0.22	0.20	0.27	0.23
	(0.003)	(0.008)	(0.005)	(0.008)	(0.004)	(0.004)
45-54	0.20	0.10	0.12	0.10	0.20	0.13
	(0.002)	(0.005)	(0.004)	(0.007)	(0.004)	(0.003)
55-64	0.07	0.05	0.05	0.05	0.09	0.04
	(0.002)	(0.003)	(0.003)	(0.005)	(0.003)	(0.002)
Over 64	0.006	0.02	0.02	0.02	0.02	0.01
	(0.0005)	(0.003)	(0.002)	(0.003)	(0.001)	(0.001)

*Proportions within categories may not sum to one because of rounding.

Table 2.3. The Proportion of People with Each Characteristic Who Are Union Members in 1998

(Standard errors in parentheses)

	Canada	Ecuador	Mexico	Nicaragua	USA	Venezuela
Gender						
Female	0.27 (0.004)	0.11 (0.008)	0.19 (0.008)	0.07 (0.008)	0.11 (0.004)	0.28 (0.007)
Male	0.30 (0.004)	0.09 (0.005)	0.14 (0.006)	0.05 (0.006)	0.17 (0.005)	0.20 (0.005)
Work Status						
Part-time	0.24 (0.005)	0.09 (0.009)	0.25 (0.014)	0.06 (0.011)	0.09 (0.006)	0.26 (0.012)
Full-time	0.31 (0.003)	0.10 (0.005)	0.14 (0.005)	0.05 (0.005)	0.16 (0.004)	0.22 (0.004)
Industry						
Agriculture	0.04 (0.010)	0.004 (0.002)	0.002 (0.001)	0.008 (0.003)	0.004 (0.004)	0.02 (0.004)
Mining	0.26 (0.015)	0.04 (0.031)	0.42 (0.068)	0.16 (0.085)	0.06 (0.027)	0.54 (0.036)
Manufacturing	0.31 (0.007)	0.05 (0.009)	0.18 (0.011)	0.06 (0.018)	0.16 (0.008)	0.22 (0.010)
Utilities	0.61 (0.031)	0.54 (0.084)	0.51 (0.066)	0.23 (0.071)	0.32 (0.027)	0.50 (0.042)
Construction	0.28 (0.014)	0.02 (0.007)	0.02 (0.005)	0.002 (0.002)	0.19 (0.018)	0.13 (0.010)
Trade	0.12 (0.005)	0.02 (0.005)	0.06 (0.008)	0.01 (0.006)	0.06 (0.005)	0.03 (0.004)
Transportation	0.44 (0.014)	0.05 (0.015)	0.17 (0.022)	0.05 (0.021)	0.36 (0.022)	0.17 (0.016)
Finance	0.07 (0.007)	0.15 (0.024)	0.13 (0.034)	0.18 (0.089)	0.03 (0.005)	0.17 (0.014)
Service	0.35 (0.004)	0.25 (0.014)	0.24 (0.009)	0.10 (0.010)	0.18 (0.006)	0.40 (0.008)
Occupation						
Professionals	0.40 (0.006)	0.31 (0.020)	0.41 (0.018)	0.08 (0.024)	0.16 (0.008)	0.47 (0.012)

Continued

Table 2.3. The Proportion of People with Each Characteristic Who Are Union Members in 1998 (continued)

(Standard errors in parentheses)

	Canada	Ecuador	Mexico	Nicaragua	USA	Venezuela
Managers	0.10	0.23	0.15	0.08	0.06	0.22
	(0.006)	(0.040)	(0.031)	(0.032)	(0.006)	(0.020)
Administrators	0.26	0.21	0.24	0.14	0.12	0.30
	(0.006)	(0.022)	(0.015)	(0.018)	(0.008)	(0.011)
Sales	0.10	0.02	0.05	0.013	0.04	0.03
	(0.006)	(0.009)	(0.008)	(0.007)	(0.006)	(0.006)
Service	0.24	0.06	0.10	0.05	0.14	0.21
	(0.006)	(0.009)	(0.011)	(0.012)	(0.009)	(0.008)
Farm	0.16	0.003	0.001	0.007	0.05	0.03
	(0.015)	(0.002)	(0.0004)	(0.003)	(0.018)	(0.005)
Manual	0.39	0.05	0.14	0.05	0.22	0.18
	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)	(0.006)
Education						
Less than High School	0.26	0.04	0.12	0.04	0.09	0.18
	(0.006)	(0.004)	(0.005)	(0.005)	(0.008)	(0.004)
High School	0.27	0.13	0.28	0.08	0.15	0.29
	(0.006)	(0.014)	(0.019)	(0.019)	(0.006)	(0.009)
More than High School	0.30	0.25	0.28	0.13	0.14	0.36
	(0.004)	(0.015)	(0.015)	(0.019)	(0.005)	(0.012)
Age						
15-19	0.06	0.01	0.04	0.01	0.02	0.03
	(0.006)	(0.003)	(0.007)	(0.005)	(0.006)	(0.005)
20-24	0.14	0.02	0.09	0.02	0.05	0.10
	(0.007)	(0.005)	(0.009)	(0.007)	(0.007)	(0.007)
25-34	0.24	0.08	0.16	0.05	0.11	0.21
	(0.005)	(0.008)	(0.008)	(0.008)	(0.006)	(0.007)
35-44	0.34	0.17	0.25	0.09	0.17	0.32
	(0.005)	(0.013)	(0.012)	(0.015)	(0.007)	(0.009)
45-54	0.40	0.19	0.23	0.10	0.21	0.37
	(0.006)	(0.019)	(0.015)	(0.019)	(0.009)	(0.012)
55-64	0.35	0.19	0.19	0.04	0.17	0.32
	(0.011)	(0.028)	(0.025)	(0.017)	(0.012)	(0.020)
Over 64	0.10	0.05	0.04	0.000	0.09	0.16
	(0.023)	(0.019)	(0.018)	(0.000)	(0.018)	(0.030)

OECD countries in the mid 1980s.[4] In that study, the probability of unionization associated with any given characteristic is higher than in this chapter, possibly because the union densities of the countries they study are all substantially higher than the union densities of the countries included here.[5] There are also differences when the probability of unionization is compared within different worker characteristic categories. For all countries in their sample, Blanchflower and Freeman (1992) find that females are less likely to be unionized than males and part-time workers are less likely to be unionized than full-time workers. These same relationships exist for Canada and the United States in this study, but do not exist for the Latin American countries. They find only moderate differences between highly educated and less educated workers. In contrast, this chapter finds that workers with less than a high school education have lower unionization rates than those with higher levels of education. These differences are more pronounced for the Latin American countries than for Canada and the United States. Like this chapter, Blanchflower and Freeman (1992) find that younger workers are less likely to be unionized than older workers.

     In order to examine how differences in the probability of unionization across characteristics and countries affect differences in union densities, a clearer picture is needed of how each characteristic affects the probability of unionization. This requires a more sophisticated approach that models the determination of union status. Such a model isolates the marginal influence of each characteristic on the likelihood of unionization, controlling for the effects of other characteristics.

     Other researchers have used the following reduced form model to describe union membership status.[6] In this model, union membership is determined by decisions made by the worker, employer, union leaders and union organizers so that

$$union_{i,c} \begin{cases} = 1 \ fy_{i,c} > 0 \\ = 0 \ fy_{i,c} \le 0 \end{cases}$$

$$y_{i,c} = X_{i,c}\,\beta_c + \varepsilon_{i,c} \quad (1)$$

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[4] Blanchflower and Freeman (1992) use data from the International Social Survey Program to examine unionization in Australia, Austria, West Germany, the United Kingdom, the United States and Switzerland.

[5] This is also true for the United States, which is the only country included in both studies.

[6] See Riddell (1993), Doiron and Riddell (1993), Even and Macpherson (1990,1993), and Riddell and Riddell (2001).

where i is the individual worker and c is the country. y_{ic} is an unobserved variable that reflects the net benefit of union membership to the worker and includes the influence of the employer and union. X_{ic} are variables that capture individual characteristics that influence the union membership decision, β is the parameter vector and ε_{ic} is a random error that is assumed to be normally distributed. Equation (1) is a reduced form that views union membership status as the result of both supply and demand factors.[7] This probit model is estimated for each country in 1998.

Table 2.4 presents the change in the predicted probability of unionization if the variable changes from zero to one and all other variables are held constant at their means.[8] The results indicate that work status, industry, occupation, education, and age generally affect unionization in ways similar to those of the unconditional probabilities presented in Table 2.3. Once other factors that affect the probability of unionization are taken into account, however, the impact of gender (being female) on the probability of unionization is not statistically significant from zero for Canada, Mexico, Nicaragua and Venezuela, and has a negative, significant impact on the probability of unionization in Ecuador and the United States.[9] Table 2.4 shows that working in the manufacturing, utility, transportation or service industries (compared to working in the trade sector), having a professional, administrative or manual job (compared to working in sales), and being age 45-54 (compared to being age 35-44) are all factors that increase the probability that a worker is unionized in all six countries.[10]

Other workforce characteristics decrease the probability that a worker is unionized in all six countries. These characteristics include: working in the agricultural sector (compared to being in the trade sector), or being age 15-19, age 20-24, age 25-34 or over 64 (compared to being age 35-44). [11]

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[7] See Ashenfelter and Pencavel (1969) and Farber (1983).

[8] Table 2.2 presents descriptive statistics for the variables used to estimate the model for each country. The results of the probit equation estimation are presented in Table 4 of Johnson (2004).

[9] When the public sector variable is included in the regressions the impact of gender (being female) on the probability of unionization is negative and significant for the United States and is not significantly different from zero for the other countries. (The coefficients on administration and service industries are smaller and no longer statistically significant when public sector is included in the regression).

[10] When establishment size and public sector are included in the regressions, the size of the coefficients on manufacturing, utilities, transportation, service industries, professional, administrative and manual are smaller; while some remain statistically significant, others are no longer significantly different from zero (though most remain positive). The coefficients on age 45-54 are not much different when public sector and establishment size are included in the regressions.

[11] When public sector and establishment size are included in the regressions, the coefficients on agriculture and the age dummies are not substantially affected.

Table 2.4. Change in the Predicted Probability of Unionization if the Variable Changes from Zero to One and All Other Variables are Held Constant at their Mean for the Probit Estimates for Each Country, 1998*

	Canada	Ecuador	Mexico	Nicaragua	USA	Venezuela
Female	-0.01	-0.02	0.001	-0.005	-0.03	-0.01
Part-time	-0.01	-0.01	0.03	-0.002	-0.03	-0.01
Agriculture	-0.18	-0.01	-0.05	-0.005	-0.10	-0.01
Mining	0.04	0.002	0.36	0.14	-0.06	0.57
Manufacturing	0.08	0.03	0.10	0.05	0.04	0.29
Utilities	0.37	0.36	0.33	0.19	0.24	0.55
Construction	0.05	-0.01	-0.07	-0.02	0.06	0.17
Transportation	0.23	0.01	0.05	0.03	0.26	0.20
Finance	-0.12	0.07	0.02	0.13	-0.04	0.19
Service ind.	0.18	0.13	0.08	0.06	0.14	0.34
Professionals	0.17	0.02	0.25	0.001	0.02	0.24
Managers	-0.12	0.01	0.05	0.01	-0.06	0.08
Administrators	0.08	0.04	0.14	0.05	0.02	0.18
Service occ.	0.05	-0.02	0.003	0.01	0.06	0.07
Farm	0.13	-0.03	-0.09	0.01	0.14	0.01
Manual	0.22	0.003	0.06	0.04	0.13	0.09
Less than High School	-0.02	-0.04	0.01	-0.02	-0.04	-0.01
High School	0.001	-0.002	0.06	-0.01	-0.01	0.04
15-19	-0.21	-0.04	-0.08	-0.03	-0.08	-0.17
20-24	-0.16	-0.04	-0.07	-0.02	-0.08	-0.12
25-34	-0.09	-0.02	-0.04	-0.02	-0.04	-0.06
45-54	0.05	0.01	0.0003	0.01	0.03	0.03
55-64	0.02	0.04	-0.005	-0.01	0.01	0.03
Over 64	-0.19	-0.01	-0.06	n.a.	-0.04	-0.06

*The STATA program that produces these results is available in Long and Freese (2001).

Notes: (1) Omitted variables are; male, full-time, trade, sales, more than high school and age 35-44.

(2) There is no coefficient estimate for those over 64 in Nicaragua. This variable was dropped because it predicts failure perfectly.

Some characteristics have mixed effects on the probability of unionization, increasing it in some countries and reducing it in others. Workers in the finance sector in Canada and the United States are less likely to be unionized than their counterparts in Latin America (compared to workers in the trade sector). In the United States and Canada, the banking industry is very decentralized and is difficult to organize. In Latin America the banking industry is highly centralized and bargaining occurs at the industry level.[12] Managers in Canada and the United States are also less likely to be unionized than those in the Latin American countries (compared to those in sales occupations). In part this is because in the Latin American countries being a manager is positively correlated with large establishments and with being in the public sector, whereas this is not the case for North America.[13]

The impact of part-time status on union membership is not significantly different from zero for Nicaragua and Venezuela and is negative and significant for Canada, Ecuador and the United States. Nonetheless, part-time status continues to have a positive, significant impact on unionization for Mexico. The fact that Mexico has a much higher proportion of part-time workers in service industries and professional occupations, both highly unionized groups, may explain why a higher proportion of part-time workers in Mexico are unionized. Once these variables have been controlled for in the regression, however, the coefficient on the part-time variable remains positive and significant.[14] Institutional or other unobserved factors may explain the positive impact of part-time status on unionization in Mexico.

Decomposition

Differences in union density across countries may arise from either structural differences in their workforces (Xic) or from differences in the probability that a worker with a given set of characteristics is a union member (β_c). Table 2.2 shows that the structures of the countries' paid workforces differ substantially, while Table

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[12] This difference between the Latin American countries and the North American countries continues to hold true once controls for public sector and establishment size are introduced. See Johnson (2004) for details.

[13] When these variables are included in the country regressions, the coefficients on manager are no longer significant for the Latin American countries, while these coefficients continue to be negative and significant for the United States and Canada.

[14] When public sector and establishment size are included in the Mexican regression, the coefficient on the part-time dummy continues to be positive and significant. See Johnson (2004) for details.

2.3 shows that the probability that a worker with a given set of characteristics is a union member differs across countries.[15] It is possible to decompose the difference in union density across countries into a portion attributed to differences in the structure of their paid workforces and a portion attributed to differences in the probability that a worker with a given set of characteristics is unionized. The decomposition is analogous to a Oaxaca decomposition (1973) used for Ordinary Least Squares but is somewhat more complex because it takes into account the non-linear nature of probit analysis.

Two different approaches have been used to perform this type of decomposition.[16] Doiron and Riddell (1993) and Riddell (1993) use a method based on a first-order Taylor Series approximation of the probability of unionization. An alternative method used by Even and Macpherson (1990, 1993) is based on the predicted probabilities of unionization and provides an exact linear decomposition of the structural portion of the gap. In practice these approaches yield very similar results.[17] This chapter adopts the approach used by Even and Macpherson (1990).

Consider comparing union density in one country a to a base country b. Using estimates β_c for each country, an unbiased predictor of the union density in each country is

$$P_c = \left(\frac{1}{n} \right) \sum_{i=1}^{n_c} \Phi(X_{ic} \hat{\beta}_c) \quad (2)$$

where n_c is the size of the sample in country c; Φ is the standard normal cumulative density function; $X_{i,c}$ is a row vector of workforce characteristics for individual i in country c; and β_c is a column vector of coefficients from the probit estimation in country c. Predicted union density is the mean of the predicted probability of unionization for all the individuals in the sample.[18] The predicted total difference in unionization (*TOTAL*) between the base country b and the other country a is:

$$TOTAL = P_b - P_a \quad (3)$$

The total difference can be attributed either to differences in the structure of the workforce ($X_{i,c}$) or to differences in the coefficients (β_c) across the economies. To decompose the total difference into these two components define P_0:

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[15] Table 5 in Johnson (2004) shows that these differences are frequently statistically significant.

[16] Doiron and Riddell (1993) provide an excellent description and critique of each method.

[17] See Riddell (1993) and Doiron and Riddell (1993).

[18] The results presented in this paper use the probability weights for the sample to calculate the mean of the predicted probability of unionization.

$$P_0 = \left(\frac{1}{n_a}\right) \sum_{i=1}^{n_c} \Phi(X_{ia} \, \hat{\beta}_b) \quad (4)$$

This is the average predicted probability if each individual in country a retains his or her union determining characteristics, but the impact of these characteristics on the probability of union membership are those estimated for the base country b. Now it is possible to write an expression that decomposes the difference in union density between base country b and the other country a as

$$TOTAL = (P_b - P_0) + (P_0 - P_a) = STRUCT + PROB \quad (5)$$

The first term on the right-hand side of this expression is the part of the total difference in unionization due to the different structures of the paid labor forces (*STRUCT*). The second term captures the part of the total difference in unionization due to differences in the impact of the various workforce characteristics on the probability of being a union member in each country (*PROB*). To isolate the contribution of each specific workforce characteristic, X^k, to the structural part of the total difference in unionization, $STRUCT^k$, following Even and Macpherson (1990, 1993), this chapter uses

$$STRUCT^k = (P_b - P_0) \left[\frac{(\overline{X}_b^k - \overline{X}_a^k)\widehat{\beta}_b^k}{\sum\limits_{k=1}^{j} (\overline{X}_b^k - \overline{X}_a^k)\widehat{\beta}_b^k} \right] \quad (6)$$

where $\overline{X}_c^k$ is the average value of characteristic k in either the base country, b, or the other country, a. $\widehat{\beta}_b^k$ is the parameter estimate of the effect of characteristic k on the probability of unionization in the base country. This method is an exact linear decomposition that attributes the portion of the total difference in unionization due to structural differences across countries due to the share of characteristic k in the total net impact on unionization.[19]

Table 2.5 presents the results of the decomposition, using Canada as the base country because it has the highest union density of the six countries.[20] These results

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[19] It would seem desirable to use an analogous methodology to examine the contribution of each characteristic to the *PROB* portion of the gap. Jones (1983), however, has shown such a decomposition is not useful.

[20] The choice of Canada as the "base" country is arbitrary. The gap could also be decomposed using each of the other countries as the "base" country b and Canada as the "other" country a. This results in a different value of P_0 and therefore affects the decomposition. Johnson (2004) presents decompositions in which other countries are the "base" country. Although there are some differences, none of the substantive conclusions of this chapter is influenced by the choice of base country.

show there are substantial differences in the size of the union density gap across the countries. The decomposition reveals that *both* structural differences in paid workforces (*STRUCT*) *and* differences in probabilities that a worker with given characteristics is a union member (*PROB*) contribute positively to the density gap for *all* countries. Structural differences explain a larger part of the density gap between Canada and the Latin American countries than between Canada and the United States.

Structural differences between Canada and the Latin American countries account for at least 36 percent of the gap (Mexico) and as much as 81 percent of the gap (Venezuela). However, structural differences account for only 20 percent of the gap between Canada and the United States. Eighty percent of the density gap between Canada and the United States is explained by the fact that a similar worker in the United States has a much lower probability of being a union member than in Canada.[21]

It is interesting that the decomposition of the gap between Canada and the United States is so different from the decomposition of the gap between Canada

Table 2.5. Decomposition of the Union Density Gap in 1998, with Canada as Base Country, Following Even and Macpherson (1990) Methodology

	Canada-Ecuador	Canada-Mexico	Canada-Nicaragua	Canada-USA	Canada-Venezuela
Decomposition					
-parameters (PROB)	0.101 (520.5%)	0.081 (64%)	0.138 (59%)	0.117 (80%)	0.011 (18%)
-structural (STRUCT)	0.091 (470.5%)	0.046 (36%)	0.095 (41%)	0.029 (20%)	0.050 (82%)
Predicted Gap (TOTAL)	0.192	0.127	0.233	0.146	0.061
Actual Gap	0.192	0.127	0.233	0.146	0.061

% is the percent of the total gap explained by each determinant.

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[21] This result is very close to that of Riddell (1993) who found that in 1984, 15 percent of the Canada-United States density gap stemmed from to differences in the structure of the workforces and 85 percent from differences in the parameters affecting the probability of unionization. This study examined union coverage and used a different data source for Canada (the Survey of Union Membership).

and the Latin American countries, given that the gap is of comparable magnitude. Nevertheless, it is important to note that while structural differences explain a larger portion of the gap between Canada and the Latin American countries, the difference in the probability that a worker with similar characteristics is unionized is also important and accounts for at least 19 percent of the gap (between Canada and Venezuela) and as much as 64 percent of the gap (between Canada and Mexico).[22]

The portion of the gap due to differences in the characteristics of the workforces across countries is decomposed further in order to examine the contribution of each characteristic. The results are shown in Table 2.6. Gender and work status tend to slightly narrow the union density gap between Canada and the Latin American countries, and these results are robust to the incorporation of public sector and establishment size controls. These countries have lower proportions of women and part-time workers than Canada, and these groups are less likely to be union members. Gender has no impact on the gap between Canada and the United States, and work status slightly narrows the gap.

Differences in education across workforces moderately widen the gap between Canada and the Latin American countries. The wider gap can be explained by the higher proportion of workers with "less than high school" in Latin American countries compared to Canada and the fact that such workers are less likely to be unionized. Canada and the United States have similar proportions of workers with each level of educational attainment, and therefore this factor does not make a substantial contribution to the gap. [23]

For all countries, differences in the industrial composition of workforces account for a large part of the structural portion of the gap and tend to widen it. The contribution of industrial structure to the gap can be traced mainly to differences in the proportion of workers in agriculture and service industries in these countries. All of the Latin American countries have a larger agricultural sector than Canada, a circumstance that widens the union density gap, since this sector is less likely to be unionized. There is little difference in the proportion

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[22] When public sector and establishment size are included in the decompositions the results for Ecuador, Mexico, Nicaragua and the United States confirm that structural factors contribute positively to the gap and explain approximately 50 percent of the density gap between Canada and Ecuador, Mexico and Nicaragua, and 25 percent of the gap between Canada and the United States. The decomposition for Venezuela is sensitive to the inclusion of the public sector and establishment size variables. Structural differences between Canada and Venezuela narrow the gap by 43 percent.

[23] Since Latin American countries have a much higher proportion of workers with less than high school education compared to Canada, when public sector and establishment size are included in the analysis, education narrows the structural density gap between Canada and these countries.

Table 2.6. Detailed Decomposition of the Structural Portion of the Union Density Gap

	Canada-Ecuador	Canada-Mexico	Canada-Nicaragua	Canada-USA	Canada-Venezuela
STRUCT	0.091	0.046	0.095	0.029	0.050
Gender	-0.001 (-1%)	-0.001(-2%)	-0.001(-1%)	0.000(0%)	-0.001(-2%)
Part-time	-0.001(-1%)	-0.002(-4%)	-0.001(-1%)	-0.001(-3%)	-0.002(-4%)
Education					
LTHS	0.008	0.011	0.010	-0.001	0.009
HS	0.000	0.000	0.000	0.000	0.000
Total	0.008 (9%)	0.011(24%)	0.010(10%)	-0.001(-3%)	0.009(18%)
Industry					
Agriculture	0.034	0.021	0.045	0.000	0.012
Mining	0.000	0.000	0.000	0.000	0.000
Manufacturing	0.002	-0.002	0.002	0.000	0.000
Utilities	0.001	0.000	-0.001	-0.005	0.000
Construction	-0.002	-0.001	-0.001	0.000	-0.002
Transportation	0.000	0.000	0.002	0.001	0.000
Finance	-0.001	-0.005	-0.005	0.006	0.000
Service	0.028	0.014	0.017	0.019	0.019
Total	0.062 (68%)	0.027(59%)	0.059(62%)	0.022(76%)	0.030(60%)
Occupation					
Professionals	0.011	0.012	0.021	0.005	0.009
Managers	-0.007	-0.007	-0.006	0.004	-0.006
Administrators	0.005	0.002	0.001	0.001	0.001
Service	-0.002	0.001	- 0.002	0.001	-0.001
Farm	-0.015	-0.009	-0.018	0.000	-0.005
Manual	-0.009	-0.024	-0.006	-0.004	-0.012
Total	-0.017(-19%)	-0.023(-50%)	-0.011(-12%)	0.007(24%)	-0.014(-28%)
Age					
15-19	0.021	0.015	0.021	0.001	0.009
20-24	0.010	0.011	0.010	-0.001	0.010
25-34	0.001	0.003	0.002	-0.001	0.004
45-54	0.004	0.003	0.003	0.000	0.003
55-64	0.000	0.000	0.000	0.000	0.000
Over 64	0.003	0.002	0.002	0.003	0.001
Total	0.040(44%)	0.035(76%)	0.039(41%)	0.001(3%)	0.028(56%)

*Categories may not add up due to rounding.
**% is the percent of the structural gap accounted for by the work force category.

of workers involved in agriculture between Canada and the United States, thus this factor does not contribute to the gap between these two countries. The much lower proportion of workers in service industries in all countries relative to Canada widens the gap substantially because workers in service industries are more likely to be unionized.[24]

Differences in the occupational composition of the workforces influence the gap but do not appear to be as important as differences in industrial composition for understanding the density gap. Occupational composition narrows the density gap between the Latin American countries and Canada, but contributes to a widening of the union density gap between Canada and the United States. Though the higher proportion of manual workers in the United States narrows the gap because this group is more likely to be unionized, the higher proportion of managers and the lower proportion of professionals in that country widens the gap and this effect dominates.[25]

Differences in the age composition of the workforces play a very substantial role in understanding the structural portion of the gap between Canada and the Latin American countries. The age structure of the Latin American countries widens the density gap. The Latin American countries have a much higher proportion of younger workers (ages 15-34) who are less likely to be unionized and a lower proportion of prime-age workers (35-54) who are more likely to be unionized. The age composition of the Canadian and United States workforces is very similar, and this factor therefore has only a very small impact on the gap.

Summary and Conclusions

There is considerable variation in union density across Canada, Ecuador, Mexico, Nicaragua, the United States and Venezuela in 1998. Differences in the structure of the paid workforces and differences in the probability that a worker with given characteristics is a union member explain differences in union density across countries. Canada's paid workforce is more similar to that of the United States than to those of the Latin American countries. Taken together, the North American workforces are older, more highly educated and less likely to work in the agricultural sector than are the Latin American countries' workforces.

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[24] The inclusion of public sector and establishment size in the analysis reduces the contribution of "industry" to the gap.

[25] These results are robust to the introduction of controls for public sector and establishment size.

The empirical evidence shows that, across all countries, some workforce characteristics increase the probability that a worker is a union member. These characteristics are the following: working in the manufacturing, utility, transportation or service industry (compared to the trade sector), working in a professional, administrative or manual job (compared to being in a sales occupation), and being age 45-54 (compared to being 35-44). Other workforce characteristics decrease the probability across all countries that a worker is a union member. These characteristics are working in agriculture (compared to the trade sector), and being age 15-19, age 20-24, age 25-34 or over 64 (compared to being age 35-44). Given the diversity of the countries studied, this is a surprising level of consistency and suggests that workers with these particular characteristics are systematically more or less likely to be unionized irrespective of the economic, political or institutional environment.

Structural differences and differences in the probability that a worker with given characteristics is a union member influence union density in each country. How important is each of these factors in explaining the difference in union density between Canada and each of these countries? The decomposition, based on Even and Macpherson's (1990) methodology, reveals that both factors contribute to the gap in all countries. However, differences in the structures of the labor forces explain a larger portion of the gap between the Canadian and Latin American union densities than between the Canadian and United States densities. It is interesting, if not surprising, that the decomposition of the gap is different between Canada and the Latin American countries and Canada and the United States, given that the gap itself is of comparable magnitude.

Structural differences in Latin American countries that are important in explaining the union density gap with Canada include the following: a higher proportion of workers with lower educational attainment; a younger workforce; a higher proportion of workers in the agricultural sector; and a lower proportion of workers in the service sector. A substantial portion of the gap between union density in Canada and that in the Latin American countries cannot be explained by structural differences. At least 19 percent (Venezuela) and as much as 64 percent (Mexico) of the gap can be attributed to differences in the probability that a worker with given characteristics is less likely to be unionized in Latin America than in Canada. Other factors that influence the difference in the probability that a worker with given characteristics is unionized could include dissimilarities in legislation covering unionization or the employment relationship, variations in

the way the legislation is enforced, divergences in public attitudes toward unions, differences in employer opposition to unions, and disparities in what unions have to offer workers. Many of these factors are amenable to policy intervention.

Union Density Changes and Union Effects on Firm Performance in Peru

Jaime Saavedra
Máximo Torero[1]

Until the end of the 1980s, unions were a major player on the political and economic stage in Peru. The Peruvian Labor Code was one of the most restrictive, protectionist and cumbersome in Latin America. During the period 1971-1991, formal workers received absolute job security after a short probationary period. This meant that if a firm could not prove "just cause" for termination in labor courts, the worker could choose between being reinstated in a job or receiving a severance payment. From the employer's perspective, a worker was effectively "owner of his post." Unions played an important role in this setting, as they supported their members in the event of conflict with employers.

The nature of unions' activities in Peru, and in several Latin American countries, is crucial to understanding their potential effect on wages, productivity and investment. In a highly restrictive labor market, unions played the role of both protecting their members' jobs and negotiating for higher salaries, fringe benefits and working conditions. During the import-substitution period, when many labor institutions were developed, large economic rents in modern sectors of the economy were generated; the increase in social benefits for unionized workers, together with explicit profit-sharing schemes imposed by labor legislation, forced businesses to share those rents with workers. Pro-labor governments created complex labor legislation that allowed for the increase in non-wage benefits for workers in several non-tradable sectors, such as the banking sector, which also enjoyed economic rents because of oligopolistic structures.[2] Moreover, workers in soft budget constraint sectors (public administration and, in particular, state-owned enterprises) received salaries and benefits that in most cases were disproportionate to their productivity.

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[2] In other sectors, the associated increase in labor costs triggered a rise in informal sector employment.

In the 1990s those rents fell in the context of a more competitive environment, as a consequence of fast trade liberalization begun in 1991, the elimination of all price controls and a downsizing of the public sector through privatizations and layoffs. In 1991, the Employment Promotion Law started the deregulation of the Peruvian labor market. In 1992, a new Collective Bargaining Law was enacted. As a result of these changes in labor legislation (including fewer restrictions on organizing unions in small firms, decentralization of the collective bargaining process, reduction in red tape in the use of temporary contracts, and elimination of job stability, among others) union bargaining power diminished sharply. These changes also facilitated the continuation of a downward trend in union density that started at the end of the 1980s, when Peru was in the midst of its most severe economic crisis in recent history.

There has been very little rigorous quantitative analysis of the likelihood of unionization, the reasons for and the magnitude of the dramatic changes in union density, and the economic effects of unionization in Peru. This chapter describes the evolution of unionization and reveals a significant decline in union density and union membership. The chapter further analyzes how different variables, which before the reforms increased the likelihood of unionization, became much less important during the 1990s. Being a blue-collar worker, male, having a permanent contract and being long-tenured, were all factors that increased unionization likelihood until 1992; thereafter, their effects remained in many cases significant but were much smaller. After the Collective Bargaining Law, the only factor that remained important as a determinant of unionization was working in a large firm.

On the other hand, the literature has shown that unions affect the rules and procedures governing the employer-employee relationship in organized establishments, and that those rules and procedures have an effect on firm performance. This raises several questions, particularly in a country like Peru, with traditional management practices, even in large firms, and an aversion to worker participation in management. First, do unions have disparate effects on the level of productivity? Do unions reduce profits in Peru as they do in other countries? Will this effect on profits be correlated with the level of unionization within the firm? This chapter presents evidence showing that unions in Peru have a negative effect on profits and also a negative albeit less marked impact on labor productivity. There is some evidence that the negative effect on profits diminishes over time, as the rate of unionization in the overall urban economy decreases.

Conceptual Issues

Two conceptual issues must be considered in the analysis. The first is the unionization decision—that is, whether to work in a union or non-union firm. The second is the effect of unions on firm performance.

The Unionization Decision

In Peru, a worker faces the decision of accepting a job in a firm that has a union or in a firm that does not. This decision is constrained by the availability of jobs with certain characteristics and by the institutional framework. The ith worker will choose to remain in that job if the utility derived from it is higher than in a non-union firm—that is, if $U_i^u - U_i^n > 0$.

At the individual level, there are two decisions: to work in a unionized firm and to be affiliated with the union. In both cases, the decision is not entirely based on individual characteristics and tastes. Working in a firm with a union will depend on individual characteristics and also on firm characteristics, which determine the likelihood of a good employer-employee match. Firms with a union may have different organizational procedures and therefore different hiring standards. These firms may, for instance, raise education or experience requirements, or invest more in selecting workers so that higher productivity has to pay for higher labor costs. Alternatively, union firms may prefer younger workers who are less likely to become union members. Larger firms are more likely to have a union, both because of legal requirements and as a function of size.

In turn, when there is a union in the firm, the membership decision depends on individual characteristics and preferences for the goods and services that unions provide. If the worker values union benefits (such as job security and fringe benefits) more than costs, then the worker will join. Membership also allows access to certain benefits and gives the worker a reputation derived from complying with the group norm (Booth, 1985). It is possible that in the short run there are no pecuniary returns to membership, but there are long-term returns, as unionized workers are likely to have greater job stability. The cost faced by the worker is the payment of union dues, and in certain cases a different attitude toward the worker on the part of the firm. In this sense, membership may be less attractive for workers who hold or aspire to hold managerial positions.

Free-riding complicates the modeling of the membership decision. Some goods and services, such as access to fair grievance procedures, more benefits and

better pay, can only be consumed if the worker is affiliated with a union. Even though union membership is optional under Peruvian law, collective bargaining agreements apply to all workers whether they are unionized or not. This was particularly true before 1992, when collective bargaining was carried out at the industry level.

Several individual characteristics may affect the probability of working in a unionized firm and/or of becoming a union member. In the literature, women are less likely to unionize, as they are more likely to interrupt their careers. Moreover, time in the firm is expected to be positively related to affiliation. As the 1992 Collective Bargaining Law introduced the requirement that workers had to have a tenure of at least one year in order to become a member of a union, the effect of tenure is expected to be positive. Labor market experience and age should also be positively related to working in a union firm and union membership, as older workers value job stability more, and this may be easier to secure under the protection of a union. Younger workers may value union-provided benefits less and may prefer to be seen by the management as unrelated to the union. Married workers may be more likely to work in a unionized firm or become a member, since they place a higher value on job stability and fringe benefits.

Effects of Unions on Firm Performance

It is commonly argued that unions reduce competitiveness by raising prices above the competitive level. A study of unions and competitiveness conducted by Mishel and Voos (1992) concludes that, at the economy-wide level, collective bargaining and unionization have had "few if any" adverse effects on competitiveness, even though unions increase wages and benefits. Mishel and Voos (1992) further hypothesize that competition involves quality as well as price, and quality is more likely to be maintained and improved by highly participative systems in which workers are unionized. Moreover, the authors argue that, because most studies show unionized firms to be more productive than non-union firms, higher union wages are offset in part by higher productivity and in part by the reduction of oligopolistic profits.

Findings on profits leave less room for interpretation. Evidence for North America shows that unions have a negative effect on profits and on shareholder wealth (Addison and Hirsch, 1989, and Machin and Stewart, 1996). Menezes-Filho (1997) finds similar results for the United Kingdom.

The evidence on productivity and economic performance, on the other hand, is mixed. Eaton and Voos (1992), among others, have shown that union firms are more likely than their non-union counterparts to be involved in workplace innovation, especially cooperative arrangements such as teamwork and production gain sharing, which yield higher productivity. Non-union firms are more apt to concentrate on profit-sharing plans that have little direct impact on productivity. Kelley and Harrison (1992), in a study of 1,015 metal and machinery companies in the United States, find that unionized firms were as much as 31 percent more productive than non-union firms. In fact, even unionized branches of large companies were more productive than non-union branches of those companies using the same technology, paying similar wages, and making the same products.

On the other hand, the literature includes several examples of negative union effects on productivity and economic performance. In Japan during the 1950s, and in Germany and other countries during the 1960s, evidence suggests that poor labor-management relations contributed to weak economic performance (Marshall, 1987). Unions may further reduce productivity by several other means: promoting compensation practices that reduce rewards to effort (Kuhn, 1998), promoting job stability and thus reducing effort, as workers do not feel threatened by a layoff, and reducing flexibility in terms of hours, job description and workplace practices. However, Kuhn (1998) states that industry studies suggest that the effect of unions on productivity tends to be positive, and negative effects are restricted to periods and cases of contentious union-management relations.

In fact, there is evidence that the industrial relations climate influences economic performance. Belman (1992, pp. 45-46), for example, notes on the basis of an extensive review:

> The structure of bargaining, the history of labor management relations, the environment in which firms and employees operate, and the consequent attitudes of labor and management affect firm performance. In plants and firms in which there is little trust between employers and employees, in which production workers are largely excluded from decisions affecting them, and in which there is ongoing conflict over the boundary between subjects of bargaining and those under unilateral managerial control, there will be little incentive for workers and managers to share information, workers will only produce under compulsion, and the rules of the work site—originating from conflict—will be used to assert or limit control rather than improve

output. In contrast, in environments in which there is high trust, where employees and their unions are integrated into the decision process, and in which the parties accept the legitimacy of one another's goals, productivity gains and cost reductions can be realized through creative bargaining, cooperation in development of better production techniques, and a reduction in the use of restrictive work practices and monitoring.

Likewise, Freeman and Rogers (1993) have reviewed many studies that show the critical role of effective labor relations in economic performance and the dependence of effective labor relations on worker representation.

A final observation about unions and firm performance is that the institutional viability of unions depends heavily on their ability to transform themselves into high-performance organizations that protect and promote their members' interests while improving productivity and quality. Industrial unions that have developed attitudes, policies, and procedures that strengthen adversarial relationships and minimize cooperation appear to achieve better results in this regard. As noted above, although adversarial relations are inevitable and can be functional, they can become dysfunctional if the parties involved ignore their common interests. High-performance unions will therefore give greater weight to cooperation and allow for flexibility, and will not merely stress stability through contracts, rules, and regulations. Like the oligopolies and regulated monopolies with which they initially bargained, unions were established to "take labor out of competition" through rules and regulations. In a competitive global economy, however, it is difficult, if not impossible, to remove labor from competition by traditional means. As is the case for uncompetitive companies, unions' best option is to stress competition though productivity and quality, though minimum labor standards remain an important part of national economic strategies geared to high productivity. Peruvian unions, however, like many other labor organizations in Latin America, have not been considered high-performance organizations. In general, Peruvian unions have maintained a belligerent position toward firms, on the assumption that profits were a "pie" that should be shared between firms' owners and workers as part of a political bargaining process. Owners, on the other hand, were not able to develop a less adversarial relationship, so it is likely that the presence of unions in Peru has reduced labor productivity and profits.

The Data

The main source of data for this chapter is the Metropolitan Lima Household Survey from the Ministry of Labor, which is available annually for the period 1986-1998.[3] It is a rich dataset that includes all relevant labor market variables, including the presence of a union in the firm where the individual works (in which case the worker is considered "unionized"), and whether the worker belongs to the union (in which case the worker is considered "affiliated" or a "union member").[4]

To build the dataset for the firm level analysis, three sources of information are used. The first is the 1994-1997 Payroll Data Summary Sheets (*Hojas de Resumen de Plantillas*) from the Ministry of Labor. The second is the 1994-1997 Yearly Economic Survey of the Manufacturing Sector from the National Institute of Statistics and Data Processing (known by its Spanish acronym INEI) and the Ministry of Tourism, Industry and International Trade (known by the Spanish acronym MITINCI). Finally, information is collected from the Ministry of Labor on the number of unions in each sector, as well as start and end dates of unions within the specific firms.

The Payroll Summary Data Sheets are payroll forms that all private, formal firms with ten or more workers are legally required to present annually to the Ministry of Labor.[5] They contain information on the number of workers (blue-collar and white-collar workers), the total wage bill, and the number of workers (blue-collar and white-collar) affiliated with a union.[6] The Manufacturing Sector Survey (Yearly Economic Survey) contains detailed information on the production, sales, profits and investment of formal manufacturing firms with five or more workers. These surveys, which consist of three forms, are carried out each year in all the manufacturing companies of the country by MITINCI. Companies are required by law to answer this survey, although compliance is far from complete.

The first form is applied to companies with a maximum of four employees, the second to companies with five to nineteen employees, and the third to companies with twenty or more. The surveys differ in length according to company size:

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[3] Except for 1988, when the survey was not conducted.

[4] Table A.1 in the Annex of Saavedra and Torero (2002) shows the number of observations of salaried workers and how many are unionized workers from each year available. This allows for the construction of a repeated cross-section dataset pooling all years.

[5] The degree of compliance is high among large firms, and the probability of compliance increases with size.

[6] One drawback of this source of information is that it is "official" information used to calculate taxes and contributions. Hence some companies may under-report the number of workers and salaries paid in order to reduce the firms' taxable base.

the survey applied to companies with a maximum of four people includes nine chapters, while that applied to companies with twenty or more workers includes seventeen chapters. Specifically, in the case of companies with 20 or more workers, the chapters essentially include the following information:

i. working staff during the year;

ii. remunerations and other establishment staff expenditures during the year;

iii. establishment expenditure on electric energy;

iv. expenditure in raw material and auxiliary materials used by the establishment during the year;

v. expenditure on fuels and lubricants used during the year;

vi. annual establishment production;

vii. summary of the movement of the establishment's fix assets;

viii. maximum and effective production during the year by main production lines; and

ix. establishment net sales and miscellaneous income during the year.

The first dataset was built by merging firm-level information from the Yearly Economic Survey with information on the number of workers and wages from the Ministry of Labor dataset, then constructing a balanced panel of all formal manufacturing firms that report data. This dataset covers the 1994-1997 period, which will make it possible to measure the impact of the reduction of unionization since the labor reforms.[7]

Empirical Analysis

The empirical analysis encompasses several possible effects. They include changes in the following areas: union density, the characteristics of union and non-union members, the impact of unions on firm performance, labor productivity and profits.

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[7] Table A.2 of Saavedra and Torero (2002) provides some summary statistics on the balanced panel data set.

Changes in Union Density

Union density is defined here as the proportion of workers in firms where there is a union. As shown in Figure 3.1, among all wage earners, union density fell from an average of 40 percent during the period 1986-1991 to 30 percent in 1992, the year of the new Collective Bargaining Law, then continued falling to 10 percent in 1998. This decline was observed in both the public and private sectors. In the private sector there is a clear downward trend since 1988, which is even more pronounced after 1992, while in the public sector, there are three years when declines are observed, 1993, 1995 and 1996. In addition, union membership (that is, the percentage of workers in unionized firms who belong to a union) also fell sharply after 1992, as shown in Figure 3.2.[8]

Following the passage of the Collective Bargaining Law, the climate of industrial relations further changed. In order to be eligible to bargain at the sector level, unions were required to include as members the majority of that sector's workers, and those workers had to work in the majority of firms in the sector. The new law also allowed

Figure 3.1. Metropolitan Lima: Union Density, 1986-1998

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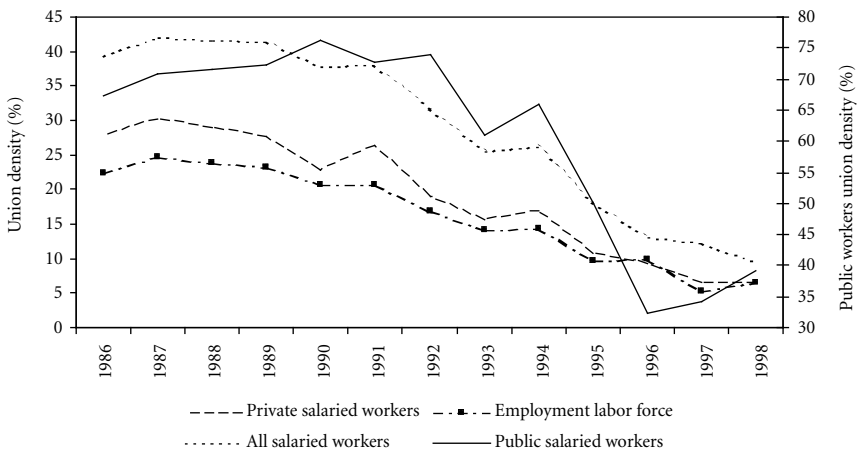
[8] It should be noted that union density as it is usually defined (as the percentage of all workers who belong to a union) can be derived from multiplying, for example, for 1998, 0.067 (fraction of workers in firms where there is a union) x 0.32 (fraction of workers in unionized firms that belong to a union). The first percentage also includes in the denominator self-employed workers, who account for almost half of the labor force.

Figure 3.2. Metropolitan Lima: Union Membership 1989-1998*
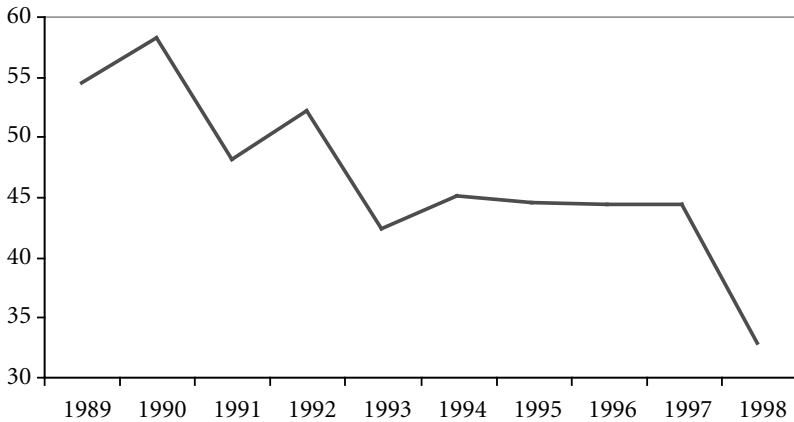
*Shows the percentage of workers in unionized firms who belong to a union
Source: Household Survey, Ministry of Labor-INEI.

for the creation of more than one union within a firm and increased to 20 the minimum number of workers required to form a union. In smaller firms, workers could designate delegates, but the administrative procedures required for the authorization in the ministry were cumbersome. Additional restrictions prohibited workers on probation and in management from belonging to a union, and workers could not belong to more than one union. Another important change that greatly undermined unions' ability to exert pressure was that strike days remained unpaid and that strikes could be called only after direct bargaining had failed.

Using a probit estimation for a pool of 13 household surveys for Metropolitan Lima, it is found that the likelihood of unionization among salaried workers underwent no statistically significant change between 1986 and 1991, as shown in Figure 3.3.[9] In 1993, however, this likelihood is 14 points smaller, while in 1997 it is 30 points smaller; these differences are statistically significant at the 95-percent level.[10] This suggests a breakpoint in union density immediately after the adoption of the Collective Bargaining Law.

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[9] The next section describes the data in detail.

[10] The figure reports marginal effects of year dummies, calculated as differences in the predicted probabilities, with all other variables evaluated at sample means. Variables included in the equations were controls for education, experience, industry, occupation, firm size and type of contract, and a dummy for public sector.

Figure 3.3. Metropolitan Lima: Unionization Probabilities
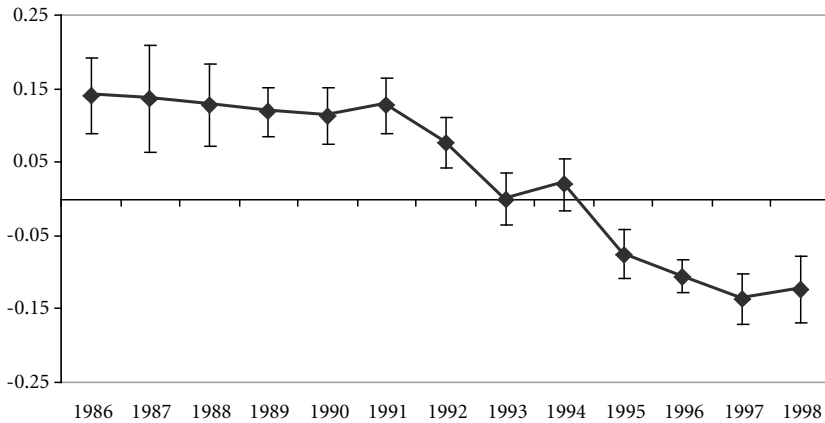
The vertical lines show confidence intervals at 95 percent significance.
Note: Marginal effects take as base year 1993.
Excludes 1996 because of problems with data for type of worker.

In fact, several authors (such as Bernedo, 1994; and Gárate, 1993) have reported a reduction in union density since the mid-1980s. As shown in Figure 3.4, the number of strikes fell from 780 in 1982 to 613 in 1990 and to only 36 in 1999, suggesting that unions' ability to exert effective political pressure diminished sharply during the 1990s. The reduction in union activity is also reflected in a decline in the number of *pliegos de reclamos* ("lists of demands") presented to the labor authorities from 1,164 in 1990 to only 179 in 1999. Perhaps the most telling examples of waning union influence occurred in 1990 and 1992. In 1990, the *Confederación General de Trabajadores de Perú* (CGTP), probably the most influential union during the 1980s, called upon its members to strike following the most drastic economic stabilization program in recent Latin American history; this call met with no success. The CGTP's call for another strike in 1992, in response to the passage of the Collective Bargaining Law, was also a failure.

In spite of the magnitude of the decline in union density, this change is not related to a sector composition effect. As shown in Table 3.1, most of the changes in unionization rates are within industries and other classifications (marital status, gender, white/blue collar, educational status, firm size, public or private status and type of contract). In the period before the Collective Bargaining Law,

Figure 3.4. Evolution of Strikes and Workers Involved, 1970-1998

.... Strikes   ——— Workers

Table 3.1. Decomposition of Changes in Unionization Rate *(%)*

	1986-1992			1998-1993		
	Between Effect	Within Effect	Interaction	Between Effect	Within Effect	Interaction
Marital Status	1.15	99.08	-0.24	2.72	100.09	-2.80
Gender	0.00	100.02	-0.02	-1.34	101.08	0.26
Blue/White Collar	2.82	93.08	4.10	1.15	98.48	0.37
Public/Private Sector	27.69	61.25	11.06	14.33	89.61	-3.94
Education	-2.44	107.56	-5.11	-0.23	101.05	-0.83
Firm Size	28.62	69.26	2.12	3.82	99.01	-2.82
Contract	35.92	57.60	6.48	35.66	72.98	-8.64
Full/Part Time	0.94	100.59	-1.53	3.33	95.78	0.89
Industry	28.90	74.09	-2.99	12.45	92.73	-5.19
Absolute Change in Unionization Rate (points)		-7.29			-13.26	

74 percent of the reduction was due to within-industry reductions, and only one fourth was related to changes in the composition of employment by industry. In all cases, within-category reductions in unionization rates are more important. In particular, when employment is divided between the public and private sectors, it is apparent that the reduction in public employment (a high union density sector) represented almost one third of the total reduction in density. Moreover, the increase in temporary employment and in employment among smaller firms, both low-density categories, independently contributed almost a third to the overall reduction. In the period 1993-1998, only the further increase in temporary employment had a role in explaining the further reduction in union density. Aside from that, all reductions in the post-Collective Bargaining Law years occurred within categories.

Who Is (and Was) Unionized

Table 3.2 shows sample means for different categories of workers using the datasets for Metropolitan Lima and Urban Peru. Unionized workers are more likely to be more educated, older, and with significantly longer tenures than non-unionized workers. They are also more likely to work in a large firm and to have a permanent contract. When union members are compared with non-members (among those who work in a unionized firm), the pattern is similar; members, however, are more likely to be blue-collar workers. In addition, raw earnings are higher for non-members after the labor reforms.

It is assumed that the difference in utility between working in a unionized firm and in a non-union firm varies with individual characteristics, preferences, firm characteristics and institutional arrangements that affect the costs and benefits of each alternative. The probability that an individual works in a unionized job is represented by

$$u_i = X_{1i}\pi_1 + X_{2i}\pi_2 + \varepsilon_i$$

where u is the reduced form of the unobserved utility gain from working in a unionized firm or belonging to a union for worker i, X_1 is a vector of individual characteristics and X_2 is a vector of firm characteristics. In terms of individual characteristics, it should be noted that there is a prior decision to participate as a wage-earning worker in the labor market rather than being self-employed. In order to take into account the bias in the coefficient that may arise from non-random selection into a salaried job, first-stage probit regressions are estimated

Table 3.2. Metropolitan Lima: Means and Deviations of Variables by Union and Union Membership 1986-1998

	1986-1987			1989-1992					1993-1998			
	Total salaried	Firms without union	Firms with union	Total salaried	Firms without union	Firms with union			Total salaried	Firms without union	Firms with union	
						Total	Non members	Members			Total	Non members
Real wage (soles of 1994)	836.45 (908.2)	698.88 (811.64)	1038.33 (1000.01)	404.98 (618.3)	374.18 (660.63)	456.82 (535.64)	499.02 (641.9)	499.02 (419.37)	592.70 (838.35)	557.08 (821.75)	737.47 (888.12)	777.29 (1031.45)
Married	0.54 (0.49)	0.46 (0.49)	0.66 (0.47)	0.54 (0.49)	0.48 (0.49)	0.65 (0.47)	0.56 (0.49)	0.56 (0.44)	0.49 (0.49)	0.47 (0.49)	0.61 (0.48)	0.51 (0.49)
Male	0.69 (0.46)	0.68 (0.46)	0.70 (0.45)	0.69 (0.46)	0.68 (0.46)	0.71 (0.45)	0.68 (0.46)	0.68 (0.44)	0.68 (0.46)	0.69 (0.46)	0.66 (0.47)	0.65 (0.47)
Blue collar worker	0.31 (0.46)	0.33 (0.46)	0.28 (0.44)	0.32 (0.46)	0.37 (0.48)	0.25 (0.43)	0.21 (0.4)	0.21 (0.45)	0.34 (0.47)	0.36 (0.48)	0.26 (0.43)	0.24 (0.42)
Public sector	0.29 (0.45)	0.15 (0.35)	0.49 (0.49)	0.27 (0.44)	0.11 (0.31)	0.53 (0.49)	0.45 (0.49)	0.45 (0.48)	0.18 (0.38)	0.11 (0.3)	0.50 (0.49)	0.46 (0.49)
Secondary education	0.54 (0.49)	0.60 (0.48)	0.46 (0.49)	0.51 (0.49)	0.56 (0.49)	0.41 (0.49)	0.41 (0.49)	0.41 (0.49)	0.51 (0.49)	0.55 (0.49)	0.36 (0.47)	0.36 (0.47)
Higher education	0.31 (0.46)	0.25 (0.43)	0.39 (0.48)	0.38 (0.48)	0.32 (0.46)	0.48 (0.49)	0.52 (0.49)	0.52 (0.49)	0.39 (0.48)	0.36 (0.47)	0.54 (0.49)	0.57 (0.49)

Continued

Table 3.2. Metropolitan Lima: Means and Deviations of Variables by Union and Union Membership 1986-1998

(continued)

	1986-1987			1989-1992					1993-1998			
	Total salaried	Firms without union	Firms with union	Total salaried	Firms without union	Firms with union Total	Non-members	Members	Total salaried	Firms without union	Firms with union Total	Non-members
Medium firm	0.07	0.07	0.07	0.08	0.09	0.06	0.06	0.06	0.07	0.07	0.07	0.07
	(0.25)	(0.26)	(0.25)	(0.26)	(0.28)	(0.23)	(0.24)	(0.22)	(0.25)	(0.26)	(0.24)	(0.24)
Large firm	0.49	0.26	0.83	0.48	0.24	0.87	0.85	0.85	0.40	0.28	0.86	0.84
	(0.49)	(0.43)	(0.37)	(0.49)	(0.42)	(0.33)	(0.35)	(0.32)	(0.48)	(0.45)	(0.35)	(0.36)
Permanent contract	0.61	0.45	0.84	0.58	0.43	0.83	0.69	0.69	0.43	0.35	0.75	0.63
	(0.48)	(0.49)	(0.36)	(0.49)	(0.49)	(0.37)	(0.46)	(0.2)	(0.49)	(0.47)	(0.43)	(0.48)
Temporary contract	0.09	0.09	0.09	0.10	0.10	0.10	0.15	0.15	0.19	0.19	0.17	0.25
	(0.28)	(0.28)	(0.28)	(0.29)	(0.3)	(0.29)	(0.36)	(0.2)	(0.38)	(0.39)	(0.37)	(0.43)
Part time	0.15	0.16	0.14	0.14	0.14	0.15	0.15	0.15	0.19	0.17	0.25	0.23
	(0.35)	(0.36)	(0.34)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.38)	(0.37)	(0.43)	(0.42)
Tenure	7.01	4.62	10.55	7.00	4.81	10.68	7.04	7.04	5.21	4.14	9.59	6.36
	(8.23)	(6.46)	(9.23)	(8.17)	(6.46)	(9.34)	(8.04)	(9.23)	(7.17)	(6.21)	(8.95)	(7.59)
Potential experience	16.73	14.59	19.89	16.18	14.37	19.21	15.47	15.47	15.13	14.16	19.10	16.12
	(13.08)	(12.63)	(13.08)	(12.68)	(12.24)	(12.83)	(11.84)	(12.77)	(12.24)	(12.01)	(12.34)	(12.14)

for the decision to work as a salaried worker. They are then used to correct for self-selection in the unionization probits.

Probit estimations were carried out for three sub-periods, 1986-1987, 1989-1992 and 1993-1998, pooling yearly cross sections in each case. The first is a short period of fast economic growth, the second is a period of sharp economic recession, both before the change in labor legislation and the launching of other structural reforms, and the third is a period of growth after structural reforms; the results are shown in Table 3.3. Blue-collar workers and public sector workers are more likely to work in a unionized firm, although the size of the effect falls sharply after 1993. Those with higher education are more likely to belong to a union, although the effect is significant only during the post-reform period. As expected, moreover, workers with more experience and those with longer tenures in a firm also have a higher likelihood of working in a unionized firm. Again, the effect is much smaller after the reforms.

Working in a large or medium-sized firm also increases the likelihood of unionization, but this effect also falls clearly after 1993. Having a permanent or temporary job—both formal worker categories—increases the likelihood for workers who do not have a contract (the likelihood being slightly higher for temporary workers). In the wake of the 1992 labor legislation reform, however, temporary workers have a clearly lower probability of working in a unionized firm. During the 1990s the deregulation of the labor market facilitated the use of these contracts, and it was thus easier for employers to deter temporary workers from joining or forming a union. Even if these workers have the legal right to organize, the employer retains the option of simply not renewing the contract of a worker who joins a union. In light of these circumstances, the use of temporary fixed-term contracts increased sharply in Peru during the 1990s.

The previous results were replicated using similar regressions estimated on an annual basis. The two panels in Figure 3.5 show the estimated marginal effects of different variables over time. The similarity of the results of these yearly estimations indicates that the results are not an artifact of pooling the data in sub-periods.

For the sake of clarity, it should be reiterated that not all workers in unionized firms are in fact union members. As mentioned above, membership may give workers certain benefits, such as protection of their rights, better working conditions and more benefits, as well as a reputation derived from complying with the group norm. Membership is nonetheless voluntary, and collective bargaining agreements apply to all workers independently of whether they are unionized. Table 3.4 shows the result of a probit estimation analyzing the characteristics

Table 3.3. Metropolitan Lima: Probability of Working in a Unionized Firm, Probit Coefficients and Marginal Effects

	1986-1987				1989-1992				1993-1998			
	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects
Married	0.122 (2.49)**	0.048	0.057 (0.92)	0.016	0.084 (2.19)**	0.034	-0.002 (0.04)	0.000	-0.082 (2.09)**	-0.009	-0.116 (2.48)**	-0.005
Male	-0.184 (2.58)***	-0.073	-0.003 (0.05)	-0.001	-0.064 (0.85)	-0.025	0.198 (3.03)***	0.034	0.147 (4.14)***	0.017	0.282 (6.39)***	0.010
Blue-collar worker	0.375 (6.07)***	0.146	0.612 (7.71)***	0.194	0.252 (5.24)***	0.100	0.469 (7.16)***	0.099	0.292 (6.77)***	0.039	0.334 (5.24)***	0.016
Public sector	0.879 (9.40)***	0.320	0.571 (6.24)***	0.181	1.157 (10.50)***	0.410	0.897 (11.77)***	0.226	0.986 (13.80)***	0.199	0.793 (8.47)***	0.062
Secondary education	0.007 (0.07)	0.003	-0.201 (1.82)*	-0.048	-0.083 (0.93)	-0.025	-0.281 (2.97)***	-0.047	0.224 (3.46)***	0.008	0.115 (1.40)	0.003
Higher education	0.238 (1.34)	0.094	-0.009 (0.06)	-0.002	0.078 (0.43)	0.025	-0.198 (1.49)	-0.035	0.709 (10.33)***	0.043	0.392 (4.23)***	0.013
Potential experience	0.042 (7.27)***	0.013	0.003 (0.42)	0.001	0.034 (7.89)***	0.011	-0.002 (0.40)	0.000	0.027 (5.80)***	0.001	0.007 (1.30)	0.000
Potential experience squared	-0.042 (4.06)***	-0.016	-0.002 (0.11)	0.000	-0.028 (3.55)***	-0.011	-0.001 (0.12)	0.000	-0.039 (4.65)***	-0.006	-0.017 (1.60)	-0.001

Continued

Table 3.3. Metropolitan Lima: Probability of Working in a Unionized Firm, Probit Coefficients and Marginal Effects *(continued)*

	1986-1987				1989-1992				1993-1998			
	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects
Firm of 20 to 49 workers	0.538 (5.37)***	0.170			0.677 (8.00)***	0.176			0.537 (5.94)***	0.032		
Medium size firm	1.011 (9.78)***	0.355			1.163 (13.27)***	0.357			0.860 (9.77)***	0.071		
Large firm	1.721 (20.18)***	0.609			1.984 (27.69)***	0.661			1.370 (17.82)***	0.179		
Permanent contract	0.447 (5.42)***	0.108			0.550 (8.11)***	0.077			0.405 (5.89)***	0.013		
Temporary contract	0.571 (5.16)***	0.146			0.570 (6.62)***	0.081			0.249 (3.54)***	0.007		
Part time	0.204 (2.61)**	0.059			0.157 (2.40)**	0.029			0.242 (4.86)***	0.011		
Tenure	0.030 (7.06)***	0.007			0.027 (7.56)***	0.004			0.011 (3.70)***	0.000		
Controls for occupation and industry	NO	NO	YES	YES	NO	NO	YES	YES	NO	NO	YES	YES

Continued

Table 3.3. Metropolitan Lima: Probability of Working in a Unionized Firm, Probit Coefficients and Marginal Effects *(continued)*

	1986-1987		1989-1992		1993-1998	
	Coeffs.	Marg. effects	Coeffs.	Marg. effects	Coeffs.	Marg. effects
Unionization and employment (salaried/ self-employed)	- 0.698	- 0.1911	- 0.618	0.026	0.868	0.8331
status error correlation (standard error)	(0.159)**	(0.142)	(0.195)**	(0.16)	(0.118)***	(0.042)***
Uncensored observations	3811	3811	6724	6724	808 9	8089
Wald Chi2	522.3 (9)	1104 (30)	1084.2 (11)	2213 (32)	870 (12)	9357 (33)

Figure 3.5. Metropolitan Lima: Probability of Working in a Unionized Firm *(marginal effects)*
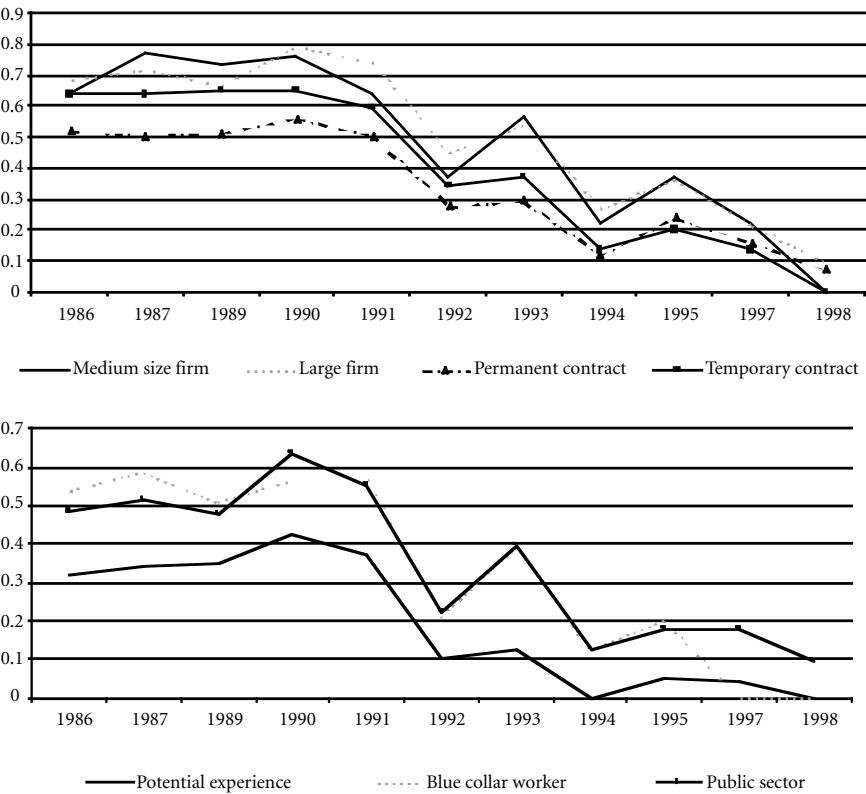
that drive union affiliation, conditional on working in a unionized firm. Again, blue-collar workers are more likely to be affiliated. Education, however, seems to have a clear negative effect on the likelihood of union membership. Among these workers, everyone has some type of contract because unionized firms are all formal firms, but the likelihood of affiliation is higher for those with permanent contracts.[11] Workers with more experience and longer tenure are also more likely to be affiliated with a union.

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[11] Strictly speaking, however, there is informality even in firms where there is a union, as there is some degree of informal employment in medium-sized firms and marginally in large firms (Saavedra and Maruyama, 1999).

Table 3.4. Metropolitan Lima: Probability of Union Membership for Workers in Unionized Firms

	1989-1992			1993-1998		
Married	0.053 (2.03)*	0.040 (1.51)	0.041 (1.54)	0.094 (2.70)**	0.076 (2.11)*	0.073 (1.96)
Male	0.031 (1.23)	0.035 (1.39)	0.041 (1.53)	0.011 (0.31)	0.054 (1.49)	0.087 (2.29)*
Blue-collar worker	0.227 (7.25)**	0.256 (7.96)**	0.214 (5.42)**	0.177 (3.59)**	0.237 (4.50)**	0.163 (2.41)*
Public sector	0.206 (7.82)**	0.174 (6.01)**	0.054 (1.45)	0.166 (4.42)**	0.108 (2.48)*	-0.049 (0.83)
Secondary education	-0.080 (1.75)	-0.155 (3.16)**	-0.115 (2.21)*	-0.034 (0.54)	-0.103 (1.58)	-0.048 (0.69)
Higher education	-0.114 (2.34)*	-0.234 (4.47)**	-0.133 (2.26)*	-0.021 (0.30)	-0.155 (2.15)*	-0.088 (1.08)
Firm of 20 to 49 workers		-0.129 (1.25)	-0.055 (0.52)		0.145 (1.05)	0.197 (1.34)
Medium firm		-0.186 (1.87)	-0.128 (1.23)		0.099 (0.74)	0.191 (1.35)
Large firm		-0.159 (1.93)	-0.105 (1.19)		0.084 (0.72)	0.192 (1.59)
Permanent contract		0.243 (5.05)**	0.293 (5.44)**		0.158 (2.71)**	0.234 (3.38)**
Part time		0.045 (1.40)	0.053 (1.59)		0.137 (3.38)**	0.096 (2.21)*
Tenure		0.018 (9.39)**	0.019 (9.44)**		0.020 (8.04)**	0.021 (8.02)**
Potential experience	0.018 (1.56)	0.005 (1.56)	0.007 (2.05)*	0.033 (7.47)**	0.018 (3.73)**	0.016 (3.03)**
Potential experience squared	-0.024 (4.03)**	-0.020 (3.16)**	-0.023 (3.56)**	-0.047 (5.51)**	-0.038 (4.24)**	-0.031 (3.28)**
Controls for occupation and industry	NO	NO	YES	NO	NO	YES
Observations	2325	2325	2325	1459	1459	1459
Wald Chi2	187.24 (9)	322.51 (15)	335 (29)	92 (10)	204.04 (16)	245.98 (30)

Robust z statistics in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1% Number of degrees of freedom of Wald-chi2 in parenthesis Includes year effects within each pooled sample

In sum, the reduction in union bargaining power and the increase in the requirements imposed by the 1992 law in order to form a union reduced the availability of jobs in unionized firms for most types of workers.

Impact of Unions on Firm Performance

Following Clark (1980), Machin and Wadhani (1991) and Black and Lynch (1997), this chapter measures the effects of unions on economic performance. In general, the presence of unions in a firm leads to a different structure of incentives for management and hence to changes in both managerial behavior and company performance. The analysis to be conducted here mainly seeks to determine whether unionization will negatively affect a firm's performance. Based on a group of performance measures, the empirical approach comprises two stages. The first stage consists of a simple statistical analysis to study performance changes in firms with and without unions. The second stage involves a regression analysis that controls for the differences between firms, the sectors to which they belong and the competition structure that they face.

The statistical analysis, following Boubakri and Cosset (1998), consists first of computing the performance variables for each company for the years for which information is available. Firms are then divided into those with unions and those without, and means are computed for each performance variable for the unionized and the non-unionized firms. Once means are calculated, differences between unionized and non-unionized firms are calculated:

$$\Delta \overline{P} = \left[\overline{P}^{unionized} - \overline{P}^{nonunionized} \right] \quad (1)$$

In the simplest possible model to capture the effect on performance with no regressors, performance in firm i during period t depends only on the union dummy,

$$P_{i,t} = \alpha + \gamma Union_{i,t} + u_{i,t} \qquad E(u_{i,t} / Union_{i,t}) = 0 \quad (2)$$

Coefficients in this specification are likely to be biased for two reasons. First, the two types of firms may have different characteristics and therefore different performances unrelated to their union status. Second, differences between unionized and non-unionized firms may simply be capturing differences in performance across time. In a more complete specification, regressors are added to the model that will control for observable characteristics at the firm level, and sectoral and macroeconomic variables are also included that will attempt to

capture these shocks. Further included is a variable to measure the intensity of unionization (percentage of workers) as a way of capturing the impact of within-firm density on performance. In the regression analysis for each of the performance indicators, different specifications are used based on:

$$P_{i,t} = f(X_{it}, \; Union_{it}, \; S_{jt}, \; Y_t, D_i) \quad (3)$$

where $P_{i,t}$ are the different performance measures for firm i in period t. Specifically analyzed are the effects of a union on labor productivity and the rate of return on sales. X_{it} are firm characteristics, such as firm size (approximated by the number of employees), firm sector, number of blue collar and white collar workers, the percentage of the firm's output that is exported, age of the firm in years, capital labor ratio, the wage bill and advertising as a proportion of sales. $Union_{it}$ is the union dummy, which could change over time, and S_{jt} consists of four digit-level Standard Industrial Classification industry-level variables. S_{jt} includes the degree of concentration of the industry, and the proportion of imports with respect to total domestic consumption. D_i are sector or firm fixed effects, depending on the specifications, which makes it possible to control for unobserved time-invariant characteristics, and Y_t are year effects. An alternative specification uses

$$P_{i,t} = f(X_{it}, \; Union\; Density_{it}, \; S_{jt}, Y_t, D_i) \quad (4)$$

where *Union Density* is the percentage of firm workers who are union members, a figure that may vary over time.[12] Equations (3) and (4) are estimated using Ordinary Least Squares (OLS) on the 1994-1996 panel of manufacturing firms described in the data section. The empirical results are presented below.

Table 3.5 shows raw means for performance indicators and other firm-level variables. It suggests that non-union firms are clearly more profitable, and the gap between the two types of firms and its significance increases with firm size. Medium and large union firms have a statistically significant advantage in labor productivity (gross value of production per worker). These first differences await econometric analysis, but they may reflect the observed differences in capital intensity per employee and value of physical assets per unit of value added, indicators that are clearly higher among union firms, irrespective of size. These firms consistently consume more electricity per worker and also have a higher use of installed capacity. Finally, raw differences in wages show that salaries are

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[12] It should be noted that for the period 1995-1997 industry-level bargaining was not possible, so membership was limited to unions established at the firm level.

Table 3.5. Differences in Means between Firm Performance Indicators of Unionized and Non-Unionized Firms

Firm Size		L <= 9	9 < L <= 49	49 < L <= 99	L >99
Value of physical assets per unit of value added	Non-Union	1.155 (- 3.456)	1.238 (2.476)	1.567 (2.385)	1.476 (1.590)
	Union		1.339 (1.465)	2.078 (2.878)	2.074 (2.233)
t - test			4.79 **	11.6 0**	23.33 **
Capital labor index	Non-Union	0.853 (1.628)	0.909 (2.016)	1.479 (2.245)	1.178 (1.450)
	Union		0.986 (1.455)	2.163 (2.906)	1.909 (3.543)
t - test			4.42 **	15.94 **	19.62 **
Electricity expenditure per worker	Non-Union	1121 (1635)	1263 (2408)	1309 (1760)	1184 (1191)
	Union		1514 (2366)	1877 (1919)	2564 (4334)
t - test			11.35 **	18.09 **	31.39 **
Usage of installed capacity	Non-Union	0.588 (0.223)	0.555 (0.255)	0.493 (0.289)	0 .509 (0.239)
	Union		0.586 (0.260)	0.561 (0.280)	0.561 (0.216)
t - test			11.05 **	11.51 **	14.69 **
Return over assets	Non-Union	0.020 (1651)	0.097 (0.292)	0.082 (0.383)	0.123 (0.295)
	Union		0.071 (0.363)	- 0.071 (0.480)	0.002 (0.342)
t - test			- 8.68 **	- 19.99 **	- 27.34 **
Gross value of production by worker (S/. of 1994)	Non-Union	95608 (118458)	102659 (220543)	101878 (118731)	104516 (98833)
	Union		87541 (135968)	124351 (111421)	149301 (172247)
t - test			-6.96 **	10.68 **	21.88 **

Continued

Table 3.5. Differences in Means between Firm Performance Indicators of Unionized and Non-Unionized Firms (continued)

Firm Size		L <= 9	9 < L <= 49	49 < L <= 99	L >99
Average blue-collar wages	**Non-Union**	150.362 (170.77)	28 9.432 (268.63)	386.755 (319.22)	468.384 (376.384)
	Union		405.201 (293.60)	579.124 (419.45)	790.172 (882.36)
t - test			48.58 **	30.88 **	34.97 **
Average white-collar wages	**Non-Union**	449.746 (403.84)	858.131 (833.62)	1339.56 (1357.44)	1518.508 (1016.8 5)
	Union		1083.681 (868.05)	1606.186 (1149.44)	2656.139 (4796.15)
t - test			30.80 **	12.23 **	23.78 **

Notes:
- Significance level: * 5%, ** 1%
- t-statistic for Ho: Difference of means

$$\frac{(\bar{x}_1 - x_2)}{S_{x1} - S_{x2}} = \frac{(\bar{x}_1 - x_2)}{\sqrt{\frac{(n_1 - 1)s^2_1 + (n_2 - 1)s^2_2}{(n_1 + n_2 - 2)}} * \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

significantly higher in union firms, differences that appear to increase with firm size. A more detailed analysis of two performance variables, labor productivity and the rate of return on sales, is presented below.

Effects on Labor Productivity

As mentioned above, the first-difference analysis shows that labor productivity is higher among larger union firms. Figure 3.6 further explores this issue, using the within-firm unionization rate in order to capture the possible effect of heterogeneity in union intensity.[13] The size of the circles represents the proportion of companies in each bracket of unionization rate. Panel A shows that labor productivity is larger in firms with higher union densities, although the difference

[13] Within-firm rates of unionization (or union intensity) go from 1 to 5 and correspond to union densities of]0-20],]20,30],]30-40],]40-50] and 50 percent or more of employees unionized, respectively. Only firms with a union are included in this analysis.

seems to be only between firms with a density smaller than 20 percent and the rest. Dividing the sample by firm size, it is found that among firms with fewer than 49 employees (Panel B), there is a negative effect on labor productivity as the rate of unionization increases. Moreover, the negative effect is clearly greater at the highest rate of unionization. In the case of medium-size firms the effect is not clear. However, among large firms (Panel D) there is a clear positive effect on labor productivity as the rate of unionization increases. In the last two cases, there is a homogeneous distribution of companies among the different rates of unionization. This is different from what happens in small firms, since most of them have high unionization rates.

Table 3.6 estimates specification (3) using OLS to validate the impact of unions on labor productivity, controlling for firm characteristics and the market structure of the sector in which firms operate. As shown, the impact of the union dummy is negative in basic specifications, but disappears as certain firm-specific variables and sector variables are included. In addition, the interaction of the union dummy with firm size, which could have confirmed the relationship between the union productivity effect and size, also loses significance as more firm and sector controls are included.

Table 3.7 shows the results of using specification (4), including the within-firm unionization rate instead of a union dummy. As in the previous specification, the interaction effect of unions and firm size disappears as firm and sector-specific controls are included. However, the average effect across time retains its significance in all of the six models presented. There is a negative relationship between union intensity and labor productivity, which is robust to the introduction of firm-level observables and also sector-level fixed effects, but it is absorbed once firm-level fixed effects are included.[14]

There are two other interesting results. First, the four-firm concentration index, as a proxy of the competitive environment, always has a positive and significant sign. A possible explanation is that, in oligopolistic sectors, competition drives the permanent introduction of better production techniques, which in turn increase labor productivity; alternatively, this result could be reflecting the effect of concentration on product prices, which increases dollar output measures. Second, the capital labor index is positive and significant in all specifications, confirming a positive relationship between capital intensity and labor productivity. Capital

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[14] On the other hand, it is clear that input ratios will have different effects on productivity in each sector, so that the estimated union effect may also depend on parameter differences and the level of the input ratios at which the union/non-union comparison takes place.

Figure 3.6. Impact of Unions on Value of Gross Production per Worker *

Panel A
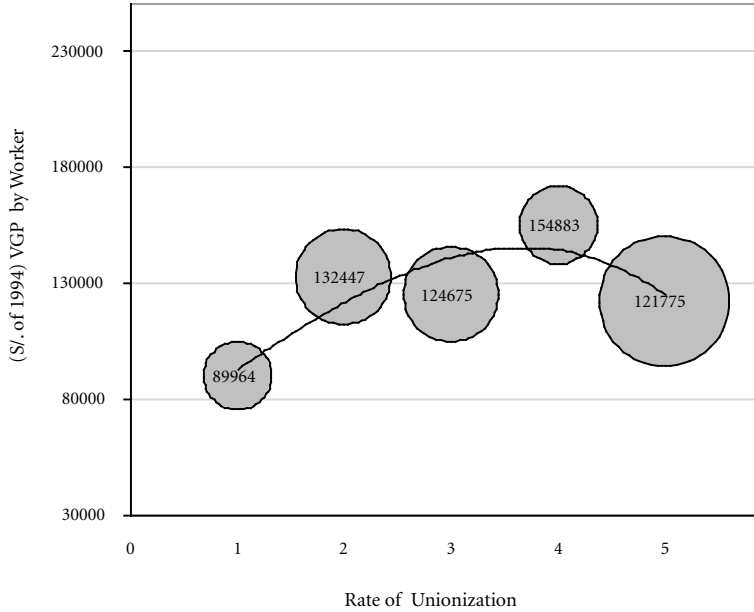
Panel B Small Firms with Union
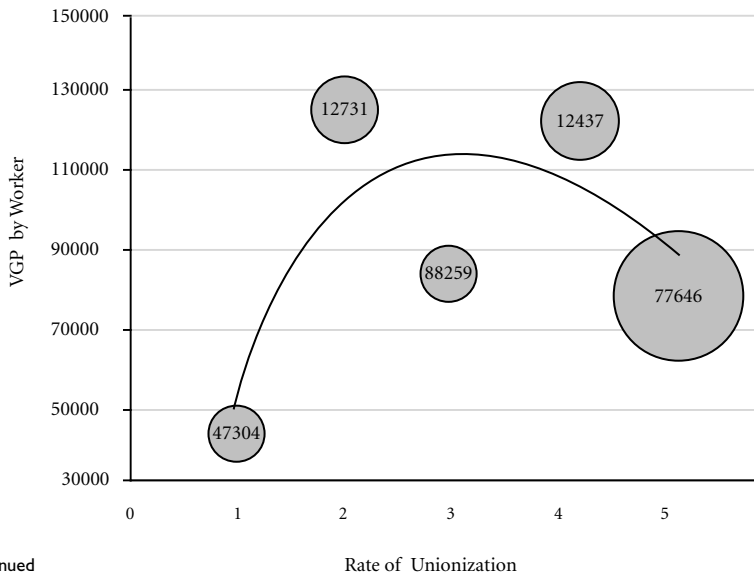
Continued

Figure 3.6. Impact of Unions on Value of Gross Production per Worker * *(continued)*

Panel C Medium Firms with Union

Panel D Big Firms with Union

Table 3.6. Unionization and Firm Performance, Dependent Variable: Production by Total Employment

(t-statistics in parentheses)

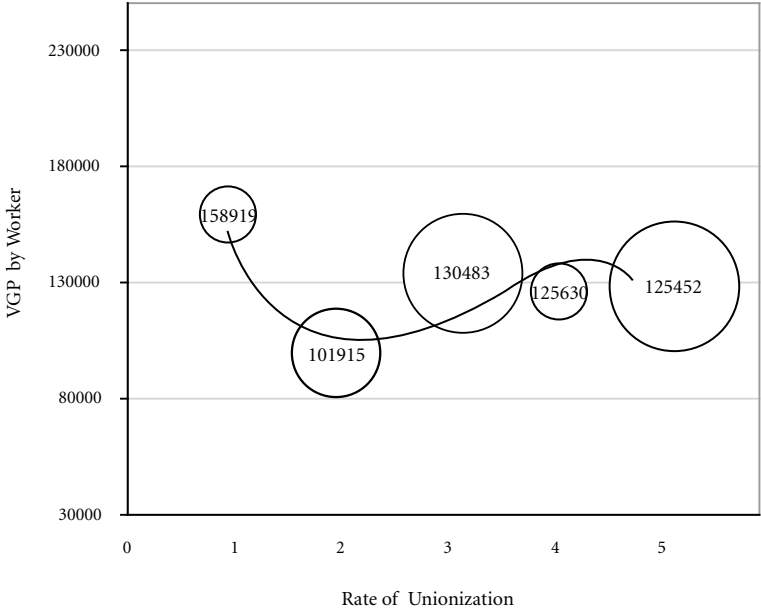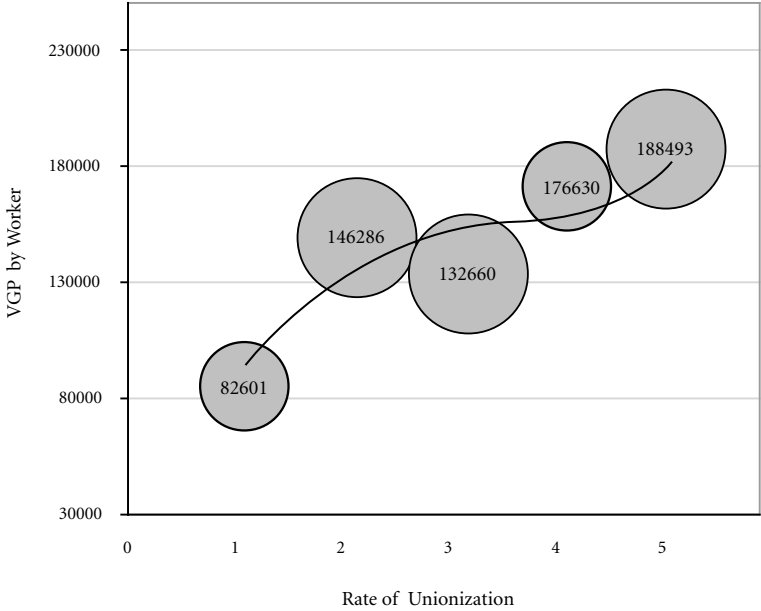|	model 1	model 2	model 3	model 4	model 5	model 6	model 7
Union (Yes=1, No=0)	-27.6027 (1.923)	-28.4019 * (2.070)	-38.2798 ** (2.819)	-23.4725 (1.920)	-14.6469 (1.199)	-16.5799 (1.372)	12.5524 (0.59)
Union* Size2	43.4929 * (2.464)	42.8481 * (2.450)	38.8574 * (2.209)	1.1099 (0.062)	-3.5900 (0.206)	-1.4632 (0.085)	-30.0872 (-1.39)
Union * Size3	70.5552 ** (3.831)	65.4049 ** (3.682)	58.6774 ** (3.277)	7.8446 (0.422)	0.1644 (0.009)	-1.5464 (0.085)	-30.8378 (-1.17)
Year 1995	14.1590 (1.133)	20.0657 (1.612)	19.4899 (1.571)	24.5273 * (2.089)	18.4540 (1.571)	18.5541 (1.580)	14.2064 ** (2.77)
Year 1996	6.4075 (0.530)	14.0054 (1.163)	12.7019 (1.051)	14.3964 (1.277)	9.3453 (0.832)	9.3175 (0.830)	
Industry concentration index		1.1623 ** (5.527)	1.1243 ** (5.437)	0.9766 ** (4.930)	1.0718 ** (5.531)	.2273 ** (5.825)	0.3835 (1.59)
Age of the firm (years)			0.9939 ** (3.082)	0.5658 (1.677)	0.3344 (1.000)	0.4290 (1.231)	1.0133 (0.31)
Capital labor ratio				20.6923 ** (6.183)	20.5274 ** (6.147)	20.1666 ** (6.030)	9.8792 ** (3.61)
White collar wage bill (10^{-3})				13.1650 (1.846)	12.0389 (1.803)	11.7461 (1.764)	-4.2742 ** (-2.90)
Exports / output				156.0332 ** (3.274)	162.9561 ** (3.414)	159.1394 ** (3.314)	-36.1010 (-0.81)

Continued

Table 3.6. Unionization and Firm Performance, Dependent Variable: Production by Total Employment

(t-statistics in parentheses) (continued)

	model 1	model 2	model 3	model 4	model 5	model 6	model 7
Imports in the firm's 4-digit SIC industry (%)					1369.9659 **	1537.3516 **	1574.3730 **
					(2.719)	(2.849)	(2.92)
Advertising as percentage of total sales					472.9611 **	451.4623 **	-330.1033 *
					(3.316)	(3.117)	(-2.12)
Sector fixed effects						YES	
Firm fixed effects							YES
Constant	104.0862 **	48.5995	28.9413	-5.5618 (0.391)	-18.2522	67.2138	55.6982 (0.62)
	(10.631)	**(3.610)	(1.905)		(1.353)	(1.719)	
Observations	1030	1030	1030	1006	1004	1004	1004
F	3.200	9.100	8.960	27.370	25.150	18.490	4.370
Prob > F	0.007	0.000	0.000	0.000	0.000	0.000	0.000
Rho							0.8036
F test that all u i =0							7.90
Prob > F							
R-squared	0.0154	0.0506	0.058	0.216	0.234	0.242	0.046

Notes:
- White test was applied to check for heteroskedasticity.
- In models 4, 5, and 6 Newey-West standard errors are reported.
- Size 1 L ≤ 9 (control category); Size 2 9 < L ≤ 49; Size 3   L ≥ 49

Table 3.7. Unionization and Firm Performance, Dependent Variable: Production by Total Employment
(t-statistics in parentheses)

	model 1	model 2	model 3	model 4	model 5	model 6	model 7
Within-firm union density	-53.6279**	-56.3851**	-66.4230**	-41.6226**	-29.0291*	-30.0998*	50.8911
	(3.372)	(3.613)	(4.112)	(3.321)	(2.345)	(2.398)	(1.45)
Percentage unionized* Size 2	83.5006**	88.7422**	72.8800*	1.2599	2.2565	2.7024	-3.8937
	(2.611)	(2.693)	(2.156)	(0.037)	(0.070)	(0.085)	(-0.08)
Percentage unionized* Size 3	176.8531**	161.0282**	139.6397**	36.7403	31.3961	26.1915	61.8592
	(4.307)	(3.982)	(3.348)	(1.011)	(0.880)	(0.740)	(1.30)
Year 1995	14.0695	19.7856	19.2208	24.4463*	18.4412	18.5117	13.1916**
	(1.134)	(1.599)	(1.557)	(2.082)	(1.568)	(1.573)	(2.58)
Year 1996	8.3775	15.5143	13.9327	14.5197	9.6054	9.5081	
	(0.702)	(1.305)	(1.167)	(1.297)	(0.861)	(0.853)	
Industry concentration index		1.1412**	1.095**	0.9701**	1.0656**	1.2203**	0.3857
		(5.447)	(5.382)	(4.898)	(5.509)	(5.803)	(1.60)
Age of firm (years)			0.8814**	0.4299	0.1856	0.2705	-33.1453
			(2.696)	(1.282)	(0.559)	(0.781)	(-0.75)
Capital labor ratio				20.5505**	20.2831**	19.9601**	9.3545**
				(6.166)	(6.111)	(6.003)	(3.40)
White-collar wage bill (10-3)				12.8300	11.6477	11.3264	-4.0798**
				(1.841)	(1.795)	(1.753)	(-2.78)

Continued

Table 3.7. Unionization and Firm Performance, Dependent Variable: Production by Total Employment (continued)
(t-statistics in parentheses)

	model 1	model 2	model 3	model 4	model 5	model 6	model 7
Exports / output				52.0977**	58.9002**	54.6562**	-33.1453
				(3.258)	(3.399)	(3.287)	(-0.75)
Imports in the firm's 4-digit SIC industry (%)					1385.3154**	1555.1054**	1516.4570**
					(2.746)	(2.884)	(2.82)
Advertising as percentage of total sales					463.4382**	439.5453**	-325.8920**
					(3.200)	(2.970)	(-2.10)
Sector fixed effects						YES	
Firm fixed effects							YES
Constant	103.2841**	49.0048**	30.8234*	-3.4072	-15.9255	61.4497	-0.4083
	(10.921)	(3.751)	(2.031)	(0.242)	(1.199)	(1.445)	(0.00)
Observations	1030	1030	1030	1006	1004	1004	1004
F	4.570	10.050	9.560	27.320	25.090	18.400	4.860
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rho							0.8121
F test that all u i =0							7.99
Prob > F							0.000
R-squared	0.022	0.056	0.062	0.215	0.233	0.241	0.047

Notes:
White test was applied to check for heteroskedasticity. In models 4, 5, and 6 Newey-West standard errors are reported.
Size 1 L ≤ 9 (control category); Size 2 9 < L ≤ 49; Size 3 L ≥ 49

Figure 3.7. Impact of Unions on Capital-Labor Ratio*

Panel A All Firms
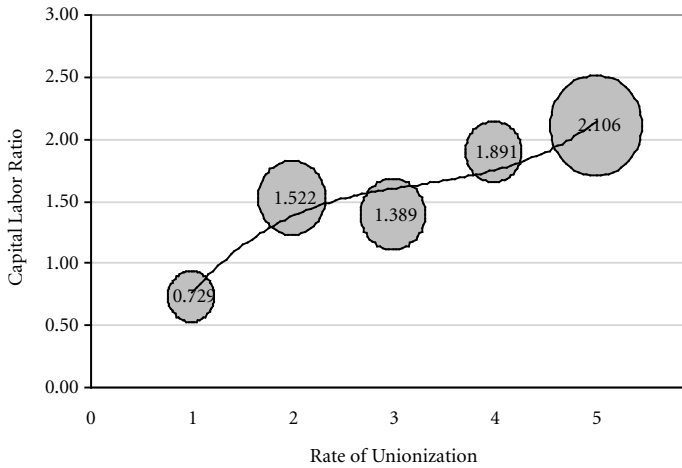
Panel B Small Firms with Union
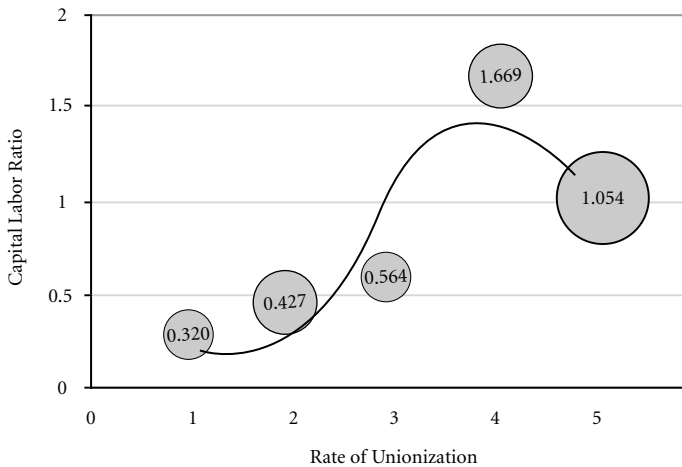
Figure 3.7. Impact of Unions on Capital-Labor Ratio* *(continued)*

Panel C Medium Firms with Union
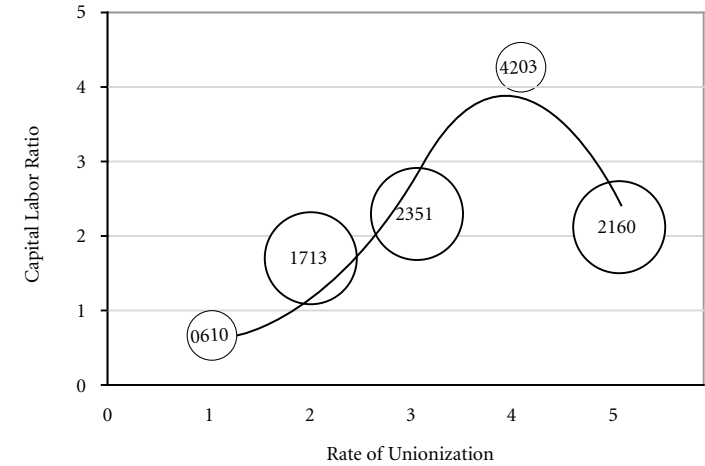
Panel D Large Firms with Union
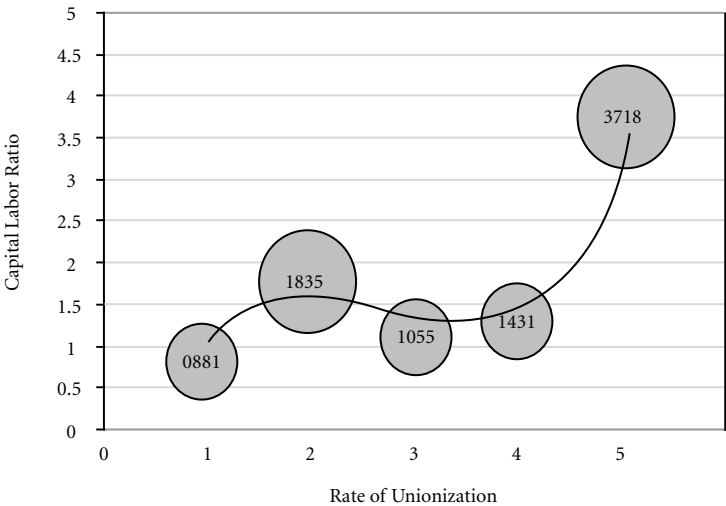
*The within-firm rates of unionization (or union intensity) go from 1 to 5 and are respectively]0-20],]20,30],]30-40],]40-50] and 50 percent or more of employees unionized. Only firms with a union are included in this analysis.

intensity might also be endogenous, as firms with higher union densities may choose more capital-intensive techniques. In fact, as shown in Table 3.5, two indicators of capital intensity (capital labor ratio and electricity expenditure per worker) show a significantly higher value in unionized firms with respect to non-unionized firms. Moreover, Figure 3.7 shows a clear positive relation between union intensity and capital intensity, irrespective of the size of the firm. Within firm sizes, however, the effect tends to be non-linear.

Effects on Profits (Rate of Return over Sales)

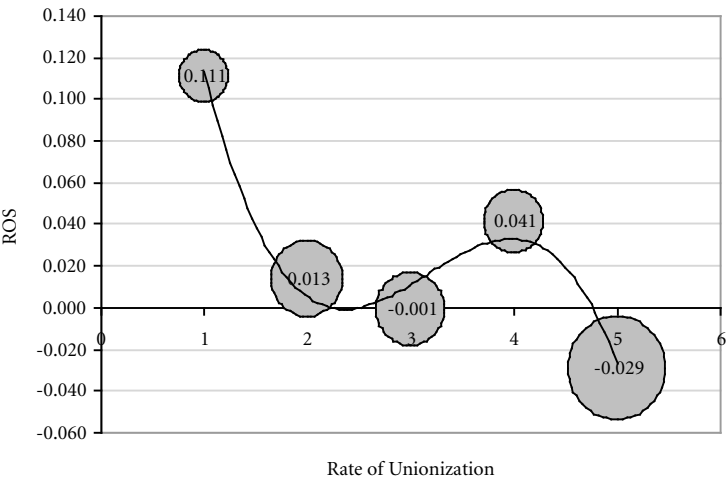One of the most important findings of research in the United States has been that unionization is associated with markedly lower profitability (see Belman, 1992, for a summary of 11 American studies). A similar pattern has been found for the United Kingdom. The main explanation for this result is that the effect of unions on wages exceeds the possible positive effect of unions on productivity. Morishima (1991), however, finds contrary results for Japanese firms.

As previously mentioned, a simple first-difference analysis (see Table 3.5) suggests a negative impact of unions on profits. Figure 3.8 analyzes differences in average profit within unionized firms. Within all firm sizes, group profits are lower the higher the union density in the firm. Tables 3.8 and 3.9 present alternative specifications of equations (3) and (4), first using a dummy variable for the presence of unions and then using the within-firm union density variable. In both cases, there is a negative and significant effect of unions on profits across all specifications, an effect that is robust to the introduction of both sector and firm fixed effects.

In general, the evidence points to a sizeable negative effect of unionization on profits. When using a union dummy, Table 3.8 suggests that the return on sales is, on average, 19 percent lower in unionized firms, an effect that is reduced by approximately four percentage points when firm and sector control variables are included. In the estimation where firm-level fixed effects are included, the negative effect on profits is 17.5 percent. Moreover, the results suggest that during the three years of the sample the impact of unions on profits diminishes, although it is still significant. This can be explained as a consequence of the changes in the unionization legislation, which reduced union power and therefore its impact on profits. In the specification where firm-fixed effects are introduced, however, the year dummies lose their significance.

Figure 3.8. Impact of Unions on Return on Sales

Panel A All Firms

Panel B Small Firms with Union

Figure 3.8. Impact of Unions on Return on Sales *(continued)*

Panel C Medium Firms with Union
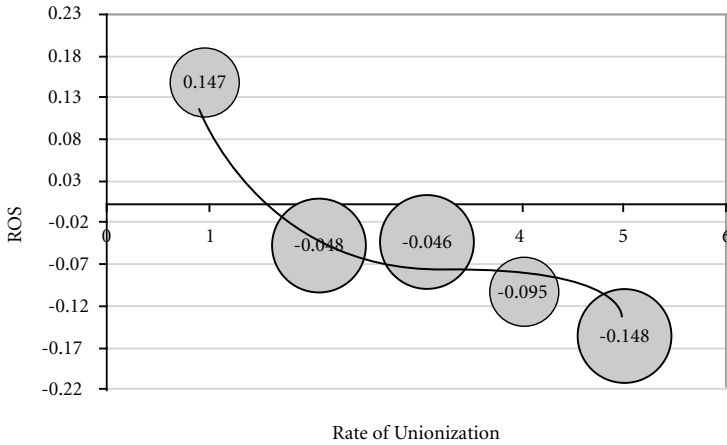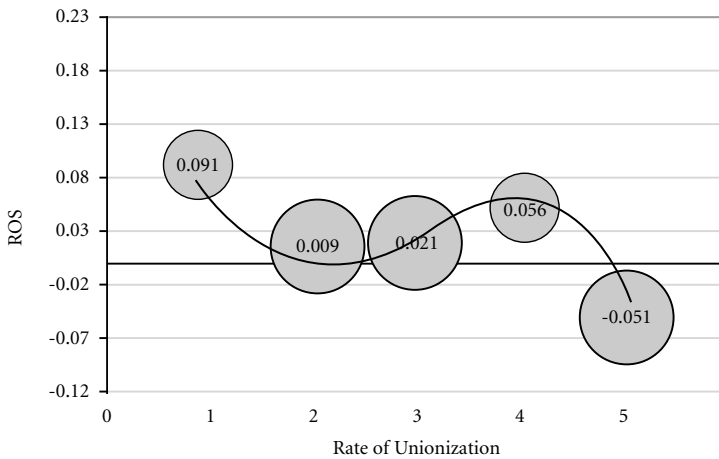
Rate of Unionization

Panel D Large Firms with Union

Rate of Unionization

*The within-firm rates of unionization (or union intensity) go from 1 to 5 and are respectively]0-20],]20,30],]30-40],]40-50] and 50 percent or more of employees unionized. Only firms with a union are included in this analysis.

Table 3.8 Unionization and Firm Performance, Dependent Variable: Return on Sales (ROS)
(t-statistics in parentheses)

	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8
Union (Yes=1, No=0)	-0.1904**	-0.1896**	-0.1865**	-0.1737**	-0.1633**	-0.1642**	-0.1551**	-0.1747*
	(4.884)	(4.884)	(4.666)	(4.332)	(4.148)	(4.187)	(3.975)	(2.508)
Union * Size 2	0.1294*	0.1259*	0.1266*	0.1274*	0.1216*	0.1272*	0.1276*	0.0246
	(2.426)	(2.370)	(2.380)	(2.403)	(2.348)	(2.467)	(2.494)	(0.687)
Union * Size 3	0.1056*	0.0969	0.0975	0.1014	0.1072*	0.1097*	0.1037*	0.0717
	(1.964)	(1.807)	(1.816)	(1.894)	(2.046)	(2.102)	(2.002)	(1.628)
Year 1995	-0.1449**	-0.1364**	-0.1364**	-0.1362**	-0.1412**	-0.1452**	-0.1467**	
	(4.669)	(4.423)	(4.423)	(4.428)	(4.667)	(4.778)	(4.866)	
Year 1996	-0.1507**	-0.1393**	-0.1391**	-0.1378**	-0.1361**	-0.1404**	-0.1395**	
	(4.965)	(4.575)	(4.565)	(4.537)	(4.545)	(4.669)	(4.678)	
Industry concentration index (CI 4)		0.0013**	0.0013**	0.0012**	0.0013**	0.0013**	0.0013**	0.0008
		(3.168)	(3.183)	(2.967)	(3.375)	(3.305)	(3.276)	(1.113)
Age of firm (years)			-0.002	0.000	0.0006	0.0004	0.0005	-0.0573**
			(0.333)	(0.022)	(0.849)	(0.543)	(0.726)	(4.309)
Total employment (10^2)				-0.162**	-0.0186**	-0.0196**	-0.0197**	-0.0031
				(2.807)	(3.134)	(3.319)	(3.348)	(0.228)
Capital labor ratio					-0.0409**	-0.0399**	-0.0394**	-0.0450**
					(9.199)	(9.003)	(8.944)	(4.681)

Continued

Table 3.8 Unionization and Firm Performance, Dependent Variable: Return on Sales (continued)

(t-statistics in parentheses)

	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8
White collar wage bill (10^{-3})					0.0140**	0.0133**	0.1320**	-0.0018
					(3.176)	(2.983)	(2.991)	(0.348)
Exports/output					0.0727	0.0882	0.0897	0.1828
					(1.293)	(1.572)	(1.609)	(1.356)
Imports in the firm's 4-digit SIC industry						-0.253	-0.0419	-1.4775
(%)						(0.285)	(0.046)	(0.820)
Advertising as a percentage of total sales						1.1545**	0.8917**	-0.5088
						(3.555)	(2.697)	(1.004)
Sector fixed effects							YES	
Firm fixed effects								YES
Constant	0.2091**	0.1469**	0.1518**	0.1597**	0.1635**	0.1621**	-0.4136*	1.6975**
	(9.193)	(4.899)	(4.547)	(4.782)	(4.876)	(4.791)	(2.213)	(4.672)
Observations	1108	1108	1108	1108	1108	1108	1108	1108
F	11.01	10.92	9.37	9.24	05.41	14.23	11.18	5.38
Prob> F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rho								0.936
F test that all u=0								2.780
Prob> F								0.000
R-squared	0.050	0.056	0.056	0.063	0.137	0.148	0.167	0.083

Notes: White test was applied to check for heteroskedasticity. Size 1 L < 9 (control category). Size 2 9 ≤ L ≤ 49. Size 3 L ≥ 49.

Table 3.9 Unionization and Firm Performance, Dependent Variable: Return on Sales (ROS)

(t-statistics in parentheses)

	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8
Within firm union density	-0.3562**	-0.3561**	-0.3480**	-0.3336**	-0.2850**	-0.2818**	-0.2905**	-0.2729*
	(4.818)	(4.837)	(4.619)	(4.438)	(3.875)	(3.845)	(3.993)	(2.336)
Percentage Unionized * Size 2	0.2358*	0.2250*	0.2267*	0.2266*	0.1991*	0.2118*	0.2162*	0.0313
	(2.276)	(2.179)	(2.194)	(2.202)	(1.984)	(2.119)	(2.185)	(0.435)
Percentage Unionized * Size 3	0.1342	0.1233	0.1246	0.1239	0.1241	0.1329	0.1353	0.0388
	(1.248)	(1.151)	(1.163)	(1.162)	(1.192)	(1.280)	(1.316)	(0.441)
Year 1995	-0.1377**	-0.1287**	-0.1287**	-0.1281**	-0.1304**	-0.1343**	-0.1365**	
	(4.670)	(4.361)	(4.360)	(4.358)	(4.507)	(4.615)	(4.737)	
Year 1996	-0.1392**	-0.1290**	-0.1285**	-0.1259**	-0.1213**	-0.1256**	-0.1277**	
	(4.798)	(4.438)	(4.417)	(4.346)	(4.243)	(4.369)	(4.848)	
Industry concentration index (CI 4)		0.0013**	0.0013**	0.0012**	0.0013**	0.0013**	0.0014**	0.0008
		(3.205)	(3.234)	(3.000)	(3.412)	(3.333)	(3.338)	(1.108)
Age of firm (years)			-0.0004	0.0001	0.0006	0.0003	0.0006	-0.0485*
			(0.511)	(0.093)	(0.802)	(0.458)	(0.838)	(3.805)
Total employment (10^2)				-0.182**	-0.0201**	-0.0211**	-0.0209**	-0.0097
				(3.219)	(3.423)	(3.608)	(3.596)	(0.702)
Capital labor ratio					-0.0401**	-0.0393**	-0.0386**	-0.0419**
					(9.010)	(8.831)	(8.749)	(4.339)

Continued

Table 3.9 Unionization and Firm Performance, Dependent Variable: Return on Sales (continued)

(t-statistics in parentheses)

	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8
White collar wage bill (10^{-3})	0.1992**	0.1366**	0.1441**	0.1519**	0.0133**	0.0126**	0.0126**	-0.0023
	(9.184)	(4.690)	(4.412)	(4.658)	(3.016)	(2.830)	(2.867)	(0.443)
Exports/output					0.0622	0.0778	0.0784	0.1692
					(1.105)	(1.383)	(1.407)	(1.254)
Imports in the firm's 4-digit SIC industry (%)						-0.2654	-0.0524	-1.7903
						(0.299)	(0.058)	(0.994)
Advertising as a percentage of total sales						1.1092**	0.8277**	-0.4966
						(3.405)	(2.499)	(0.979)
Sector fixed effects							YES	
Firm fixed effects								YES
Constant	0.1992**	0.1366**	0.1441**	0.1519**	0.1544**	0.1536**	-0.4783*	1.4545**
	(9.184)	(4.690)	(4.412)	(4.658)	(4.708)	(4.633)	(2.574)	(4.188)
Observations	1080	1080	1080	1080	1080	1080	1080	1080
F	11.450	11.330	9.740	9.890	15.440	14.140	11.340	5.210
Prob> F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rho								0.916
F test that all u=0								2.760
Prob> F								0.000
R-squared	0.0494	0.0582	0.0584	0.0672	0.1370	0.1471	0.1689	0.0810

Notes: White test was applied to check for heteroskedasticity. Size 1 L < 9 (control category). Size 2 9 ≤ L ≤ 49. Size 3 L ≥ 49.

The impact of unions on profits is also negative and significant when within-firm union intensity is used instead of a dummy variable (see Table 3.9). The magnitude of the effect falls as controls are introduced, but the effect is still large. In this case only the 1995 interaction is significant, and again, time effects cannot be identified in the firm-level fixed effects specification. As with the finding for labor productivity, the impact of industry concentration is positive and significant in explaining the rate of return over sales. Capital intensity, however, has a negative effect. It is therefore clear from the evidence presented here that unionized firms earn substantially lower returns than their non-union counterparts. The results also show a negative, albeit less robust, impact on labor productivity, and there is also evidence that unionized firms are more capital-intensive.

Summary and Final Comments

There is evidence of a clear reduction in union density immediately after the passage of the Collective Bargaining Law in 1992. Holding constant worker and firm observable characteristics, unionization diminished sharply after 1993. Being a blue-collar worker, male, in a permanent contract and long tenured, increased unionization likelihood until 1992; thereafter, the effects of these characteristics were in many cases significant but much smaller. The only factor that remained important as a determinant of union status was working in a large firm. When the reduction in union density is decomposed, it is found that most of the reduction is observed within categories, and the reduction in union density is not related to a sector composition effect. However, before the change in collective bargaining legislation, reductions in public employment, a high union density sector, contributed almost one third to the total reduction in density. The increase in temporary employment and in employment in small firms, both low union density sectors, also contributed to the overall reduction. But in the period 1993-1998, after the labor market reforms, only the further increase in temporary employment played a small role in explaining the further reduction in union density, and most of the changes were observed within categories and economic sectors.

With respect to the impact of unions on firm performance, a simple first-difference analysis finds that unions have a negative impact on profits for all firm sizes. Within unionized firms, profits are lower the higher the union density in the firm. The econometric analysis finds a robust negative effect of 17.5 percent, even after controlling for firm and sector characteristics and firm fixed effects. There is

some evidence that this effect diminishes over time, which is consistent with the fact that unionization sharply declined and unions saw their power diminished, partially as a consequence of the Collective Bargaining Law of 1992. The decline in the negative union effect, however, could not be confirmed in all specifications. The impact of unions on profits is also negative and significant when within-firm union intensity is used instead of a union dummy. The magnitude of the effect falls as controls are introduced, but the effect is still large. Overall, there is clear evidence that unionized firms earn substantially lower returns than their non-union counterparts.

As far as other measures of performance are concerned, labor productivity is negatively related to the presence of a union in the firm, although the negative effect disappears once firm characteristics, particularly capital intensity, are controlled for. Capital intensity is clearly higher among unionized firms and is also higher among firms with higher within-firm union density. A negative effect on productivity may be related to the history of contentious labor management relations, as management and unions were in many cases suspicious of each other's goals and strategies. The high degree of unions' politicization, and the infiltration of terrorist groups into many large unions in the manufacturing sector during the 1980s, led to circumstances in which there was very little trust and no incentive to work cooperatively so as to improve working conditions or enhance production techniques.

Summarizing, the evidence derived from the analysis is consistent with a bargaining model of union-firm interaction in which the union clearly affects profits negatively and has a negative, albeit not statistically significant, effect on labor productivity. The negative effect on profits, with a small or nil effect on productivity, explains the strong opposition of firms in Peru to the revival of a union movement. Clearly, the possibility of unions' having a positive effect on productivity, which could in turn lead to higher rates of investment and productivity growth, implies a fundamental change in labor-management relations in Peru.

Unions and the Economic Performance of Brazilian Establishments

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Numerous studies have investigated the economic impact of unions, examining the effects of union presence and density on economic performance and efficiency variables at the plant, firm or industry level. The outcomes examined reflect either static performance, such as profitability and productivity, or dynamic efficiency, such as physical capital and research and development (R&D) investments.

In the United States, for example, Mishel and Voos (1992) and Hirsch (1991) provide comprehensive surveys of the economic impact of unions, with the general finding that unions adversely affect economic performance. Menezes-Filho (1997) uses panel data to find that unions have a negative impact on profitability in the United Kingdom, but that this effect declined over the 1980s, a period of harsh anti-union legislation. Moreover, Menezes-Filho, Ulph and Van Reenen (1998) find a negative correlation between unions and R&D spending in the United Kingdom, but this correlation basically disappears when they control for cohort dummies and technological opportunities. Gregg, Machi and Metcalf (1993) find that unionized firms experienced faster productivity growth in the United Kingdom in the late 1980s. Finally, Fallick and Hasset (1999) find that union certification significantly reduces a firm's investment, whereas Black and Lynch (1997) find that unionized establishments that have adopted new industrial relations practices have higher productivity than otherwise similar non-union plants.

In Latin America, however, there are very few econometric studies of the economic effect of unions. This is very surprising, given unions' well-known

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role in shaping economic and political outcomes in the region. When studies have been conducted, as in the case of union effects on wages, the results have proven interesting. Arbache (1999), for instance, finds that unions increase wage dispersion in Brazil, an effect contrary to that found in almost all studies in the developed world. Such findings highlight the need for research on the effect of unions on firms' economic performance in Latin America, so that the role of unions can be better understood and economic policies devised to improve the relationship between workers and managers.

Regional integration and globalization have made the need for research even more pressing. Like other Latin American countries, Brazil has recently undergone a dramatic trade liberalization process, with tariffs declining from an average of 57.5 percent in 1988 to about 15.6 percent in 1998. The literature on unions and international trade shows that increasing imports and the removal of trade barriers may have a negative impact on union wages (see Driffill and Van der Poeg, 1995, and Gaston and Tefler, 1995). One important research and policy question that can also be addressed with this research is what happened to the union impact on firms' economic performance after the rapid trade liberalization process, which brought more competition to the market.

In an attempt to arrive at a sound empirical basis for policy, this chapter presents work indicating that unions seem to affect the economic performance of Brazilian establishments, especially in terms of profitability, employment and productivity. The results using the pooled sample indicate that unions tend to reduce profitability, whereas the relationship between union density and productivity, employment and average wages seems to be concave. These performance indicators first rise with union density up to a certain level, usually about 50 percent, and then start to decline. The results suggest that some unionism may be good for the plants' economic performance, although too much unionism may begin to have negative effects.

A Brief History of Union Activity in Brazil

The main hypothesis that this chapter will investigate is whether trade unions have had a negative impact on the economic performance of Brazilian firms, measured in terms of profitability, productivity and capital investment. The chapter also seeks to examine the conjecture that changes in Brazilian trade policy in the early

1990s, which increased competition in the product market, altered unions' ability to affect these outcomes.

The data available seem adequate to test these hypotheses, since information was collected on many economic variables at the establishment level over time, and establishments were surveyed in terms of unionization and other industrial relations policies throughout the 1990s. It was therefore possible to summarize the main changes that occurred in the industrial relations policies of the firms in the sample and relate those changes in the competitive environment to the division of rents within each firm.

The legal environment in which Brazilian unions operate makes for a particularly interesting history, since Brazil is one of the few countries that have not signed International Labour Organization (ILO) Convention 87, which guarantees workers' freedom to organize. According to the Convention, workers are entitled to decide on matters of union organization and structure without any interference from other actors. In particular, under the principle of freedom to organize, workers are entitled to decide whether labor should be represented by a single union or multiple unions. In Brazil, where workers' representation is regulated by the law and the Constitution, workers do not have the freedom to organize unions of their own. In order for Brazil to become a signatory of ILO Convention 87, the country's Constitution would have to be changed.

Until 1988, the Labor Code greatly restricted union activity in Brazil. Unions were subject to interference and even takeover by the government, and the law limited the size of union boards of directors to 25 members. In order to be legally recognized, moreover, unions needed a formal authorization from the Labor Secretary, known as the "Union Letter" (*Carta Sindical*), and unions could only organize workers belonging to categories defined in the Labor Code; workers outside of those categories consequently had no access to representation. Brazil's Labor Code has the further peculiarity of not recognizing unions' right to organize and to represent workers at the plant level. The smallest unit represented is the city, and, consequently, the smallest bargaining unit is supposed to be the city as well.

These restrictions on unions, however, were to some extent offset by the concession of certain rights to the unions. The most important is exclusive jurisdiction; once a union is recognized by the government, it becomes the sole representative of workers. In addition, the law created the "Union Tax," a compulsory fee deducted from the pay of all workers belonging to the corresponding category, even non-members. The Union Tax corresponds to the value of one day's work and is deducted annually, in March. The revenue is distributed in the following

proportions: 60 percent to the local (city) union, 15 percent to the state federation, 5 percent to the national confederation, and 20 percent to the Labor Department.

Brazilian labor law additionally complemented union regulation by offering personal opportunities to union officers. For instance, within the Labor Department, some positions were reserved for labor union officers; the Labor Court system similarly set aside hundreds of positions for union officials. These politically motivated appointments were used by successive governments to co-opt labor leaders, and this legal apparatus has enabled the government to control the labor movement since the 1930s; the resulting combination of repression and co-optation allowed the country to industrialize with minimal industrial conflict. In this sense, the model may be considered a success.

The 1988 Constitution changed some of the old provisions and created a situation similar to that prevailing in the United States and Canada by eliminating all forms of government interference in union affairs. On the other hand, the new Constitution retained the single union principle. It also kept the "Union Tax" and created a second compulsory contribution, whose value is to be decided by a "workers' assembly" organized by each union.

The changes of 1988, however, did not address the longstanding problem of legitimacy. The old system was repressive but consistent, combining elements of restrictions with compensating privileges, while the system that has emerged from the new Constitution is very ambiguous. Unions have won more freedom but, rather than assuming the risks and responsibilities that should come with freedom, they have managed to keep the old privileges. As a result, Brazilian unions currently enjoy both a legal guarantee of monopolistic representation and the right to collect compulsory fees. They are free to define categories of workers but do not represent them at the plant level.

The new environment for organized labor has produced very curious results. Because of the maintenance of both the Union Tax and the union monopoly, there are many incentives to create new unions; Brazilian Labor Department figures indicate that there are about 18,000 unions in the country. At the same time, however, union officers are still relatively insulated from rank-and-file pressures to represent workers' interests. Nonetheless, it cannot be said that all unions are led by non-representative, illegitimate officers. In fact, many members of the *Central Unica dos Trabalhadores,* Brazil's labor union congress, advocate the signing of ILO Convention 87, and some Brazilian unions return the Union Tax contribution to workers. Some unions additionally work to establish formal representation at

the plant level through Workers' Councils, and to establish direct negotiations with management.

What these arrangements mean in practical terms is that all Brazilian workers in formally organized firms are represented by a trade union, and unions engage in collective bargaining at least once a year. Bargaining outcomes are automatically extended to all workers in the industry, irrespective of the membership status of individual workers. This means, for instance, that wage increases negotiated at the bargaining table apply to all workers in the industry, even to non-members. Moreover, all workers in a firm are entitled to the wage increase, even if there are no union members within the firm's labor force.

Trade unions do negotiate, however, on a firm-by-firm and even plant-by-plant basis, on working conditions and practices, employment levels, shifts and introduction of new machinery, among other issues. Hence this chapter tests the hypothesis that the wages and practices defined at the industry level act as a floor (outside option) for workers' demands within a firm, and that a second-round bargaining process takes place within each establishment, which will affect various performance measures, depending on the relative bargaining power of its workers. This bargaining power depends on the presence of unionized workers and of a workers' council in the firm, and also on whether the firm recognizes the union for bargaining purposes.

The period covered by the data used in this study is 1990-2000. As mentioned above, the legal framework for union activity in Brazil was reformed in the 1988 Constitution and has not changed during the period. Consequently, variations in union effects cannot be attributed to changes in the legal and institutional framework, but should be related to other structural changes, especially the economic reforms initiated in the Collor administration, since 1990.

In the 1990s, during the administrations of Presidents Itamar Franco and Fernando Henrique Cardoso, Brazil started a process of opening its domestic markets, restructured many industries, privatized state-owned enterprises, deregulated some industries, and transferred to the private sector many services that had previously been performed by the state.[2] Thus, in the period under study, there were a number of important changes in the Brazilian markets of goods and services. These reforms have affected the labor market and very probably have changed the elasticity of demand of labor. Changes in union effects should be attributed to those changes, rather than to regulation of union activity.

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[2] For an overall view of the privatization process that took place in Brazil, see Annex 2 of Menezes-Filho, Zylberstajn, Chahad and Pazello (2002).

In sum, trade unions have played a very important role in Brazilian society, especially in recent times, since the democratization process that took place in the early 1980s. Despite unions' significance, however, no econometric study has attempted to assess the impact of unions on static and dynamic efficiency. This chapter aims to fill that gap.

Theory and Econometric Methodology

Models of union-firm bargaining are generally applications of a class of game theoretical models first described by Nash (1953). Bargaining models can be either static and axiomatic (as formulated by Nash, 1953) or dynamic and strategic (first analyzed by Rubinstein, 1982). Binmore (1982) describes the conditions under which the two types of models generate identical solutions. The differences and correspondences between the two types were also examined in detail by Binmore, Rubinstein and Wolinsky (1986).

In order to describe a game, one needs to specify its form, the players' preferences and strategies, and the *status quo* points. In the games to be examined in this chapter, the bargaining process takes place over time, consisting of a sequence of bargaining periods. At each point in time, one of the players suggests an agreement, and the other can either accept or reject it. If the other player accepts the proposal, the game ends. If the proposal is rejected, the game goes on to the next bargaining period, and it is now the other player's turn to propose an agreement. The players' strategies are sequences of rules that will govern the behavior of each player at each stage of the game, and that may or may not depend on the entire history of the game.

In order to fully describe the bargaining process, one has to specify the firm and union's utility functions, the disagreement pay-offs of both parties and the scope of the bargaining. Bargaining can be over wages only (right-to-manage model), over wages and employment (efficient bargaining: see McDonald and Solow, 1981) or over wages, employment and investment (see Grout, 1984). The division of rents and the equilibrium level of investment will depend on the union's relative bargaining power and the disagreement pay-offs.

Some studies introduce competition into the product market, assuming that there are two firms and that each firm bargains over wages, with the union representing its workers in the first stage. In the second stage, each firm sets its output and employment to maximize profits for a given wage level (the right-to-

manage model). The product market competition (second stage) takes place only between the two firms (both produce a homogeneous product) and takes the form of a Cournot-Nash model.[3]

On the basis of the theoretical ideas and the data availability described above, the goal here is to estimate simple panel data econometric models such as:

$$Y_t = \alpha_i + \beta Union_{it} + \theta Competition_{it} + \gamma X_{it} + \delta_t + \varepsilon_{it} \quad (1)$$

where i indicates a firm observed in year t, Y is the dependent variable of interest (profitability, productivity, investment or wages), α_i is the unobserved firm fixed effect, *Union* is a proxy for union power (that is, union density), *Competition* proxies for local and foreign product market competition, and the vector X represents econometric controls potentially correlated with unionization and with performance indicators, such as market share.

If the coefficient on unionism is found to affect wages, investment, productivity and/or profitability, this would give empirical support to the proposition, described above, that the division of rents and the equilibrium level of investment of a firm will depend on the union's relative bargaining power.

As panel data are available, there are many possible estimation strategies. First, the data will be pooled and simple Ordinary Least Squares (OLS) models will be estimated. The aim is to have an idea of the size of the union impact on different indicators of economic performance in Brazil, and compare them with available estimates in developed and developing countries. The sample will then be split and separate regressions run for the periods before and after trade liberalization, in order to determine whether the coefficient on union density is stable over time. Finally, it would be very interesting to interact the union variable with product market competition in order to determine whether the union impact varies with the degree of monopoly power enjoyed by the firm (see Stewart, 1993).

In a second stage, time-varying (retrospective) information on union density, together with the firm-level performance variables, will be used to estimate equation (1) in first differences, so as to eliminate the unobserved firm-level heterogeneity that is constant over time. This is intended to check whether the union impact estimated using the pooled sample is biased because of omitted variables that are constant over time. It is also desirable to run separate first-differences equations for the beginning and end of the decade to test for temporal parameter stability.

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[3] See Dowrick (1989), Davidson (1988), Dobson (1994) and Menezes-Filho (1997).

Finally, information on new industrial relations practices, also gathered by the survey, will be used to determine whether the introduction of these practices has improved efficiency, and whether their effect on performance differed according to union status.

The Data

The data used in this chapter come from two different sources. The first source is a firm-level survey, the Annual Industrial Survey (*Pesquisa Industrial Anual, PIA*), conducted almost every year from 1988 to 1998 by the Brazilian Census Bureau.[4] The survey covers a sample of firms operating in the manufacturing sector. An average number of 10,000 firms is surveyed annually: (i) all firms with more than 1,000 employees; and (ii) a random sample of firms with fewer than 1,000 employees.

The variables to be used from the surveys are: payroll, fringe benefits, sales revenue, cost of raw materials and energy, value added, investments in machines, plants and buildings, number of employees and capital stock. With these variables the following performance indicators were constructed:

- **Profitability** = ((Sales Revenue – Wages and Salaries – Fringe Benefits – Raw Materials)/Sales Revenue).
- **Productivity** = log (Value Added (Sales Revenue – Cost of Raw Materials – Capital Depreciation – Energy and other inputs)/ **Employment** (Number of Employees)).
- **Investment Rate** = (Investments in Machines/Capital Stock).
- **Employment Level** = log (Number of Employees).
- **Average Wages** = log (Amount paid in Annual Wages)/Total Number of Employees).

Unfortunately, there is no information on unionism in the Industrial Surveys. Thus, as in Menezes-Filho (1997) and Menezes-Filho, Ulph and Van Reenen (1998), a retrospective survey was conducted among manufacturing firms in order to acquire information about the present and past union status of the workforce, as well as proxies for the strength of unions' bargaining power and the effects of new industrial relations policies. Firms were also asked about the degree of competition that they face, both domestic and international, now and during the trade liberalization process.

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[4] For budgetary reasons no survey was conducted in 1991.

About 1,100 manufacturing plants from different regions were surveyed, most with a medium to large number of employees. The interviews were conducted by telephone, which led to the extremely high response rate of 95 percent, or 946 establishments. Of those plants, 650 appeared in the Industrial Surveys. Unfortunately, when the sample is restricted to those establishments with valid information on the main variables for at least four consecutive years, the total dropped to 285 establishments, the sample size for the rest of this chapter. Moreover, a change in PIA methodology between the 1995 and 1996 surveys resulted in the dropping of many firms surveyed before 1996, as well as the inclusion of new firms. In order to maximize the information on the time dimension, the sample was restricted to those firms that were observed before and after this change. Some robustness tests using the whole sample were conducted, however, and the results will be reported where pertinent.

Table 4.1a. presents the number of establishments surveyed every year, and Table 4.1b. shows the balance of the panel. It is apparent that the number of establishments is reasonably constant over time, and most plants are followed for 9 or 10 years, which represents almost the whole period.

Table 4.2 describes the main variables to be used in the empirical exercises. The data in the sample accord well with the stylized facts of the Brazilian economy in the 1980s and 1990s. Employment fell drastically between 1990 and 1992, although it is still a matter of debate whether this was because of the trade liberalization process or the deep recession in 1991 and 1992. The further fall between 1996 and 1998 could stem from sample selection, since many firms were

Table 4.1a. Sample Size

Years	88	89	89	92	93	94	95	96	97	98	Total
Establish-ments	232	227	234	262	263	279	268	276	221	275	2,537

Table 4.1b. Balance of the Panel

Years	4	5	6	7	8	9	10	Total
Establishments	13	13	10	23	11	69	149	288

dropped from the survey due to the changes noted above. Real wages were largely stable between 1988 and 1994, rising continuously afterwards, and productivity rose abruptly between 1990 and 1992, remaining somewhat constant between 1992 and 1998. The fact that labor productivity falls in most typical recessions suggests that the rise in productivity between 1990 and 1992 was driven by trade liberalization.[5] Investment fluctuated a great deal over the period, whereas mark-ups rose conspicuously between 1990 and 1992, but then declined after 1994. The figures in italics refer to the balanced panel, and these figures are not qualitatively different, so they are not driven by changes in the sample composition.

Table 4.3 gives the results of the survey in terms of union presence and importance over the sample period. In about half of the establishments, less than 25 percent of the workforce is unionized; the other half is roughly equally divided among the other quartiles of union density. There is consequently enough variation in union density to attempt to identify its effects on economic performance.

Union density varied over time as well as among firms; during the period considered, 10 percent of firms reported an increase in union density between 1995 and 2000, 58 percent reported stability and 32 percent reported a reduction. The figures for 1990 and 1995 are approximately the same, which raises suspicions of measurement errors in the answers for this period. In terms of union recognition, about 81 percent of establishments recognized unions for bargaining purposes in 2000, and this percentage was roughly constant over time. Finally, only about 24 percent of plants reported the presence of union representatives in their workforce, and this percentage varies only slightly over time. As plants did not report many changes in union recognition or the presence of a workers' council over time, identification of the long-differences specification will have to rely on changes in union density.

Table 4.4 compares the means of the economic variables described above in more and less unionized establishments. As shown in the table, there is a non-linear (concave) relationship between employment, average wages and capital investment and the percentage of unionized workers in 2000.[6] All of these variables rise with unionization up to certain level, decreasing afterwards. With respect to productivity and profitability, there is a continuous decline with unionization. In terms of union recognition, all performance measures, except for capital investments, are lower in establishments that explicitly bargain with trade

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[5] The authors thank Peter Kuhn for pointing out this relationship.

[6] It should be noted that this level of unionization is an end-of-period measure and that the level of unionization has changed over the sample period, as Table 4.2 makes clear.

Table 4.2. Descriptive Statistics

Years	Employ- ment	Real Wage (R$ 1998)	Productivity (R$ 1998)	Investment (1,000,000 R$ 1998)	Profitability (% Revenue)
1988	1,184	669	47,106	7.84	0.29
	1,127	*696*	*48,671*	*7.36*	*0.29*
1989	1,104	737	48,023	10.38	0.32
	1,181	*789*	*51,650*	*11.84*	*0.33*
1990	1,093	636	41,225	5.27	0.29
	1,066	*656*	*43,114*	*5.34*	*0.29*
1992	871	715	63,876	3,67	0.41
	964	*746*	*67,969*	*4.24*	*0.45*
1993	845	780	67,972	3.96	0.40
	918	*788*	*70,415*	*4.69*	*0.45*
1994	951	750	66,865	3.67	0.42
	967	*761*	*58,787*	*4.10*	*0.43*
1995	912	867	51,331	4.44	0.26
	888	*915*	*46,750*	*4.78*	*0.27*
1996	634	1,017	59,107	4.41	0.32
	670	*1033*	*54,112*	*4.76*	*0.32*
1997	600	1,043	64,660	5.19	0.32
	634	*1040*	*60,871*	*5.95*	*0.32*
1998	577	1,068	63,879	5.82	0.31
	606	*1120*	*60,723*	*7.58*	*0.30*
88-98	**870**	**832**	**57,813**	**5.35**	**0.34**
	902	*854*	*56,406*	*6.07*	*0.34*

Source: Pesquisa Industrial Anual, Instituto Brasileiro de Geografia e Estatística (PIA-IBGE).
Notes: For definitions of the variables, see text. Total number of observations is 2,437. Numbers in italics are for the balanced panel, which includes 1,410 observations.

Table 4.3. Description of Union Variables

Plant Union Density							
Density – 2000							
Den<=25%	50%	Changes in Union Density over time					
25%<Den<=50%	23%						
50%<Den<=75%	13%	↑ 90-95	= 90-95	↓ 90-95	↑ 95-00	= 95-00	↓ 95-00
Den > 75%	14%	11%	61%	28%	10%	58%	32%
Union Recognition							
Level – 2000		Changes in Union Recognition over Time					
NO	YES	↑ 90-95	= 90-95	↓ 90-95	↑ 95-00	= 95-00	↓ 95-00
19%	81%	1%	98%	1%	1%	98%	1%
Workers' Council							
Level – 2000		Change in the Presence of a Workers' Council over Time					
NO	YES	↑ 90-95	= 90-95	↓ 90-95	↑ 95-00	= 95-00	↓ 95-00
76%	24%	3%	96%	1%	4%	94%	2%

Note: Number of firms = 288.

Table 4.4. Average Performance by Union Status

Variable	Employ-ment	Wages	Produc-tivity	Invest-ment	Profit-ability	N
Density						
Den ≤ 25%	608	783	63,844	3.37	0.36	1,254
25%>Den≤50%	1,236	991	57,005	8.48	0.34	581
50%>Den<=75%	1,169	886	49,337	8.29	0.31	338
Den>75%	911	696	46,193	3.23	0.29	364
Recognition						
No	871	978	66,741	5.32	0.38	487
Yes	870	797	55,692	5.36	0.33	2,050
Workers' Council						
No	747	820	59,832	4.56	0.34	1,913
Yes	1,246	869	51,621	7.79	0.34	624

Source: PIA-IBGE.

unions. The presence of a workers' council, on the other hand, is associated with higher employment, wages and capital investments, but with lower mark-up and productivity.

Results

The findings can be divided into several categories, as follows: pooled sample results, union effects over time, the results of long-differences equations and the effects of the introduction of profit-sharing.

Pooled Sample

Table 4.5 presents the results of the levels regressions, using the 1988-1998 pooled data.[7] All estimates were arrived at using a random effects model that takes into account the presence of serial correlation induced by persistent firm-specific effects.[8] In the first column, the results of using profitability or mark-up as the dependent variable are set forth. First, it seems that union density is negatively associated with profitability, even after controls are allowed for market share, market concentration, employment, capital intensity and 22 sector dummies.[9] The estimated coefficient implies an elasticity, at mean profitability and density, of about -0.06. It is interesting to note that both market share and market concentration positively affect profitability, suggesting the importance of efficiency and market power in Brazilian industry.

In terms of employment, a positive and significant coefficient is reported in column (2), which implies an elasticity of 0.13. This suggests that unionized plants employ more people, even when industry in which they operate, market share, concentration and capital intensity are considered. It appears from the results in column (3) that unions do not affect the plants' investment decisions. The only impact that was precisely measured in the investment equation was a negative market concentration, which suggests that market power is not very good for growth.

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[7] The results of these regressions should perhaps be better interpreted as conditional correlations, since no controls are allowed for firm fixed effects or other endogeneity issues. The industry-fixed effect is nonetheless included.

[8] Long-differences specifications that control for fixed effects are discussed below.

[9] The concentration measure used is based on the authors' survey, in which managers were asked whether they faced more or fewer than five competitors in their market.

Table 4.5. Levels Regressions, 1988-1998

Controls	Profitability	Employment	Investment	Value Added	Wages
Union Density	-0.063*	0.392**	-0.020	-0.315**	0.120
	(0.032)	(0.141)	(0.042)	(0.138)	(0.082)
Market Share	0.812**	8.068*	0.067	8.093**	3.370**
	(0.247)	(0.810)	(0.439)	(0.986)	(0.406)
Concentration	0.037*	0.037	-0.054**	0.045	0.035
	(0.019)	(0.087)	(0.026)	(0.085)	(0.051)
Capital/Sales	-0.013**	-0.047**	-		-0.011
	(0.002)	(0.004)			(0.003)
Ln (employment)	-0.010	-	-0.008	0.779**	0.881**
	(0.008)		(0.015)	(0.034)	(0.013)
Ln (capital)	-	-	-	0.110**	-
				(0.024)	
Mark-Up	-	-	0.061**	-	-
			(0.014)		

Source: PIA-IBGE.
Note: Random effects regression, standard errors in parentheses. Based on 2,529 observations and 288 groups. Industry and time dummies included.
* Significant at 10 percent.
** Significant at 5 percent.

In terms of value added, the results indicate that more unionized plants have lower output, with the same levels of employment and capital, than less unionized ones. At mean density the elasticity is -0.11, a significant figure. It is interesting that market share has a positive and substantial impact on productivity, but that concentration does not, implying a cost-based interpretation for the market share effect. In terms of average wages, the impact of union density is positive but not significant at conventional levels. It is also interesting, however, that both market share and employment have positive and significant estimated coefficients in the wage equations. This provides evidence of a non-competitive wage determination process, in particular of rent sharing.

The models have so far imposed the restriction that the relationship between unionization and performance is linear (or log-linear), but both the descriptive statistics presented in Table 4.4 and the results of Menezes-Filho, Ulph and Van Reenen (1998) suggest a non-linear relationship between union density and the

performance indicators. Table 4.6 therefore includes union density squared as an additional explanatory variable in all the models estimated in Table 4.5.[10]

The results of the random effects specifications show that, in general, the linear restriction does not seem to fit well with the data. The exception to this rule is the profitability equation, where the inclusion of density squared inflated the standard errors, because of multicollinearity, without adding more information to the specification. It therefore seems that more unionized plants tend to have lower profits under all conditions.

Table 4.6. Levels Regressions, Non-Linear Density, 1988-1998

Controls	Profitability	Employ-ment	Investment	Value Added	Wages
Density	-0.032	1.889**	-0.021	0.836*	1.262**
	(0.110)	(0.485)	(0.147)	(0.437)	(0.288)
Density Squared	-0.013	-1.580**	-0.005	-1.200**	-1.253**
	(0.115)	(0.510)	(0.154)	(0.501)	(0.302)
Share	0.824**	7.997**	0.043	7.956**	3.289**
	(0.246)	(0.609)	(0.440)	(0.986)	(0.405)
Concentration	0.037	0.001	-0.052**	0.038	0.015
	(0.019)	(0.085)	(0.026)	(0.085)	(0.050)
Capital/Sales	-0.013	-0.046**	-	-	-0.011
	(0.002)	(0.004)			(0.003)
Controls	Profitability	Employment	Investment	Value Added	Wages
Ln (employ-ment)	-0.011	-	-0.006	0.775**	0.876**
	(0.008)		(0.015)	(0.034)	(0.013)
Ln (capital)	-	-	-	0.107**	-
				(0.024)	
Mark-up	-	-	0.060	-	-
			(0.047)		

Source: PIA-IBGE.

Notes: Random effects GLS regression. Standard errors in parentheses. Based on 2,529 observations and 288 groups. Industry and time dummies included. All columns include indicators of change in union density between 1988 and 1998.

* Significant at 10 percent.

** Significant at 5 percent.

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[10] It is important to note that two indicators of change in union density were included in all columns.

Union effects on employment, however, are mixed. Table 4.6 clearly shows that employment grows only up to a certain level of unionization, thereafter declining. Employment reaches a maximum at a union density of 60 percent; about 24 percent of plants have higher densities. In terms of investment, the results remain the same as in the linear case, with no union effects on growth. The results using value added as a dependent variable, however, are quite significant. The relation seems to be concave, with the marginal impact reaching its maximum at mean union density (34 percent). In establishments where more than 80 percent of the workers belong to a trade union, productivity is actually lower than in non-unionized ones. A similar phenomenon occurs with average wages, but the impact reaches its maximum when half of the plant's workforce is unionized, and it never leads to lower wages than in non-unionized settings.

The results as a whole imply that unionism always reduces profitability, defined as the share of total sales that goes to shareholders or is reinvested. Some unionism, however, is actually good for plants' performance in terms of value added, additionally leading to increases in wages and employment. When union density reaches about 35 percent of the plant's workforce, the impact in terms of productivity starts to reverse and, after 50 percent of employees are unionized, further increases in unionism lead to lower employment and wages. If wages and employment depend on the plant's performance, the presence of trade unions may facilitate communication between workers and managers, increasing efficiency and productivity, which translate into higher pay and job security. When unions have too much power, however, they seem to impede progress and lead to the deterioration of all performance indicators.

Union Effects over Time

In a period of significant changes in the economic environment, as described above, it is important to test for the time stability of the estimated coefficients. To this end the data were grouped by periods. Table 4.7 reports the estimated coefficients of the union density variable in OLS regressions using the various performance indicators as dependent variables. It must be emphasized that union density as reported by managers in 2000 is used as the main independent variable in the regressions, but that controls are included for the plants whose managers report changes in density between 1990 and 2000.

The grouping was chosen according to changes in the Brazilian economy. The period between 1988 and 1990 was a period of high inflation and slow growth.

Table 4.7. The Union Effect Over Time

1988-90	Profitability	Employ-ment	Investment	Value Added	Wages
Density	-0.310**	1.676**	-0.152	0.209	1.224**
	(0.138)	(0.336)	(0.560)	(0.367)	(0.237)
Density Squared	0.279**	-1.598**	0.101	-0.668*	-1.190**
	(0.136)	(0.350)	(0.443)	(0.392)	(0.232)
1992-1994					
Density	-0.232**	1.242**	0.001	-0.187	1.253**
	(0.113)	(0.346)	(0.050)	(0.302)	(0.194)
Density Squared	0.180*	-1.017**	-0.005	-0.070	-1.256**
	(0.113)	(0.376)	(0.053)	(0.317)	(0.197)
1995-98					
Density	0.269**	2.224**	-0.027	1.329**	0.802**
	(0.086)	(0.272)	(0.053)	(0.475)	(0.187)
Density Squared	-0.323**	-2.045**	0.011	-1.790**	-0.819**
	(0.091)	(0.294)	(0.055)	(0.480)	(0.199)

Source: PIA-IBGE.
Note: Standard Errors (robust to heteroskedasticity) in parentheses. Industry and time dummies included. All controls in Tables 4.5 to 4.9 are included in the regressions.
* Significant at 10 percent.
** Significant at 5 percent.

Moreover, trade liberalization, with a large reduction in trade tariffs, began in 1988. Between 1992 and 1994 inflation reached its peak and the trade liberalization process was completed, and in 1994 the Real stabilization plan was implemented. Between 1995 and 1998, inflation was quite low and stable, a program of mass privatization was implemented and the economy was growing.

Column (1) reports the results of the profitability regressions, which show that the estimated parameters behave differently across periods, especially before and after the 1994 stabilization plan. Before then, increases in union density led to lower profitability, but this relationship was reversed when around half the workers in the establishments were unionized. After stabilization, the situation was turned around, with unionization first increasing, then decreasing plants' mark-ups. One possible explanation for these findings is that in periods of very high and

growing inflation, the concept of relative prices lost most of its meaning and the distributive conflict between unions and managers could always be solved through price increases (see Amadeo and Pero, 2000). After 1994, profitability followed the behavior of other indicators, rising and then declining with unionization, as will be discussed below.

The behavior of the relationship between employment and unionization is quite stable over time, as column (2) shows. The intensity of this relationship varies somewhat, with the biggest effects after stabilization. In terms of investment, no effect was found in any of the sub-periods. With respect to value added, a negative relationship with union density is noticeable before 1994, whereas after stabilization the non-linear pattern is evident. Finally, the concave relationship between density and wages is apparent in all periods, although slightly less intense in the final period.

Long-Differences Equations

Tables 4.8 and 4.9 report the results of regressions that use the change in union density as an explanatory variable for changes in the performance measures over the same period.[11] The aim of these exercises is to test the robustness of the results after the elimination of plant-specific effects.[12] The results of the profitability regressions for the 1995-1998 period (Table 4.8, first column) indicate that a decline in union density tends to raise mark-ups, though the effect is imprecisely estimated. In terms of employment, the result of the levels' specification is reproduced, with a decline in density leading to a decline in employment. This is an important result, since it confirms that trade unions tend to increase employment in Brazil.[13]

In terms of investment, once again no significant results were obtained, but declines in union density tend to increase productivity, and significantly so, as the results in the fifth column reveal. The relationship between wages and unionization all but vanishes in the long-differences specifications, which indicate that plant fixed effects might be contaminating the levels results. With respect to the other controls, it is noticeable that the positive (and significant) market share and

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[11] As reported by the managers who answered the survey. The omitted variable is "constant union density" throughout.

[12] It must be said that unions effects are notoriously difficult to capture in first-differences specifications (see Hirsch, 1991; and Bronars and Deere, 1990).

[13] Interactions between rise in density and density were performed to capture non-linearities in the long-differences specifications, but they provided no significant results.

Table 4.8. Long Differences: 1998-1995

	Δ Profit-ability	Δ Employ-ment	Δ Invest-ments	Δ Value Added	Δ Wages
Rise in Density	-0.004	0.094	0.027	0.321	0.002
	(0.054)	(0.133)	(0.039)	(0.282)	(0.073)
Decrease in Density	0.056	-0.202**	0.008	0.526**	-0.002
	(0.040)	(0.093)	(0.024)	(0.234)	(0.054)
Rise in Local Competition	0.045	-0.021	-0.023	0.205	0.077
	(0.075)	(0.223)	(0.044)	(0.208)	(0.093)
Constant Local Competition	0.048	-0.003	-0.020	0.204	0.074
	(0.078)	(0.231)	(0.048)	(0.229)	(0.097)
Rise in Foreign Competition	0.187**	0.043	0.014	0.249	0.021
	(0.062)	(0.139)	(0.036)	(0.227)	(0.095)
Constant Foreign Competition	0.156**	0.117	0.020	0.387	0.071
	(0.058)	(0.145)	(0.039)	(0.231)	(0.093)
Δ Market Share	0.233	6.836**	0.642	2.865	1.719*
	(0.847)	(2.378)	(0.634)	(2.195)	(0.939)
Δ Employment	0.024	-	0.019	0.997**	0.838**
	(0.030)		(0.018)	(0.110)	(0.056)
Δ Capital/Sales	-0.016	-0.078**	-	-	-0.027
	(0.004)	(0.018)			(0.008)
Δ Capital	-	-	-	-0.084	-
				(0.146)	
Δ Profitability	-	-	-0.006	-	-
			(0.035)		
N	255	255	255	255	255

Source: PIA-IBGE.
Note: Standard errors (robust to heteroskedasticity) in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.

Table 4.9. Long Differences: 1995-1990

	Δ Profit-ability	Δ Employ-ment	Δ Invest-ments	Δ Value Added	Δ Wages
Rise in Density	-0.112	0.053	0.022	-0.033	0.086
	(0.071)	(0.086)	(0.050)	(0.217)	(0.074)
Decrease in Density	-0.019	-0.051	-0.023	-0.045	0.122**
	(0.056)	(0.067)	(0.057)	(0.153)	(0.063)
Rise in Local Competition	0.011	0.282	-0.024	-0.131	-0.078
	(0.071)	(0.191)	(0.049)	(0.198)	(0.151)
Constant Local Competition	0.088	0.221	0.056	-0.012	-0.112
	(0.072)	(0.187)	(0.047)	(0.201)	(0.152)
Rise in Foreign Competition	-0.084	0.298**	-0.071	-0.394	-0.295**
	(0.119)	(0.089)	(0.061)	(0.325)	(0.105)
Constant Foreign Competition	-0.064	0.368**	-0.145**	-0.424	-0.326**
	(0.118)	(0.111)	(0.066)	(0.312)	(0.110)
Δ Market Share	1.236	2.728**	1.236	7.153**	3.253**
	(1.320)	(0.958)	(1.064)	(2.758)	(0.758)
Δ Employment	-0.002	-	-0.042	0.276**	0.647**
	(0.058)		(0.076)	(0.135)	(0.088)
Δ Capital/Sales	0.004	0.048**	-	-	0.000
	(0.012)	(0.016)			(0.017)
Δ Capital	-	-	-	0.089	-
				(0.071)	
Δ Profitability	-	-	-0.438	-	-
			(0.357)		
N	221	221	221	221	221

Source: PIA-IBGE.
Note: Standard errors (robust to heteroskedasticity) in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.

employment coefficients in the wage equations indicate that these relationships are robust to fixed effects.

The findings for the 1990-1995 period are much less significant. This may stem from major changes in the macroeconomic environment measurement errors in managers' answers on conditions further in the past.

The Introduction of Profit-Sharing

The managers of the establishments were also asked about the introduction of other industrial relation policies to improve the relationship between employees and managers so that productivity can rise. The indicators used were the introduction of profit-sharing, a program of "quality and productivity" and giving employees' a greater say. For reasons of space the only results presented here are for profit-sharing, the variable for which the results look most interesting.

The results from Table 4.10 indicate that the introduction of profit-sharing is associated with a rise in all performance indicators, with significant effects on profitability and value added, and imprecisely estimated impacts on employment and average wages. The results must be interpreted with caution, however, since attributing a causal interpretation to this relationship requires a relatively strong assumption about the correlation between the introduction of profit-sharing and the structure of the error term.

Table 4.10. Profit-Sharing: Long Differences, 1998-1995

	Δ Profit-ability	Δ Employ-ment	Δ Invest-ment	Δ Value Added	Δ Wages
Introduc-tion of Profit Sharing	0.123**	0.117	0.032	0.732**	0.086
	(0.036)	(0.102)	(0.026)	(0.225)	(0.056)
N	255	255	255	255	255

Source: PIA-IBGE.
Note: Standard errors (robust to heteroskedasticity) in parentheses; all controls from Table 4.9 are included.
* Significant at 10 percent.
** Significant at 5 percent.

Table 4.11. Profit Sharing and Unionization, Long Differences: 1998-1995

	Δ Profit-ability	Δ Employ-ment	Δ Invest-ment	Δ Value Added	Δ Wages
Union Density	-0.070	0.071	-0.048	-0.785	0.002
(2000)	(0.086)	(0.246)	(0.047)	(0.846)	(0.134)
Introduction of	0.066	0.105	0.026	0.550**	0.071
Profit Sharing	(0.050)	(0.126)	(0.028)	(0.187)	(0.071)
Profit Sharing *	0.166	0.029	0.019	0.564	0.041
Union Density	(0.122)	(0.306)	(0.066)	(0.739)	(0.170)
N	255	255	255	255	255

Source: PIA-IBGE.

Note: Standard errors (robust to heteroskedasticity) in parentheses; all controls from Table 4.9 are included.

** Significant at 5 percent.

The results in Table 4.11 indicate that the effects of the introduction of profit-sharing may depend on the degree of unionization in the establishment (Black and Lynch, 1997). Columns (1) and (4) show that more unionized firms had lower profitability and productivity on average than less unionized ones, but this was offset by the introduction of profit-sharing, although interactive terms were not precisely estimated. One possible interpretation of the results is that profit-sharing was introduced as a way to successfully counteract the decline in economic performance that took place in more unionized establishment in the late 1990s.

Conclusions

The results of this chapter indicate that unions seem to affect the economic performance of Brazilian establishments, especially in terms of profitability, employment and productivity. The findings from the pooled sample indicate that unions tend to reduce profitability, whereas the relationship between union density and productivity, employment and average wages seems to be concave. These performance indicators first rise with union density up to a certain level,

usually about 50 percent, and then start to decline. Hence some unionism may be good for plants' economic performance, although too much unionism may begin to have negative effects.

The profitability effect varies greatly over time, especially before and after the hyperinflation period, but union effects on wages, employment and productivity are quite robust over time. Moreover, these effects are also captured in long-differences specifications, which use changes in unionization as explanatory variables to control for establishment-fixed effects, with the exception of the union effect on wages.

There is also evidence that the introduction of profit-sharing schemes was associated with an improvement in performance, both in terms of productivity and profitability. Moreover, it seems that this effect was somewhat stronger in more unionized establishments than in their less unionized counterparts. This may indicate that unions, by improving communication between managers and employees, make the introduction of profit-sharing more efficient. Finally, unionized establishments that did not introduce new industrial relation policies experienced a downward trend in performance in the 1990s.

The Economic Effects of Unions in Latin America: Their Impact on Wages and the Economic Performance of Firms in Uruguay

Adriana Cassoni
Gaston J. Labadie
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This chapter examines the impact of unionization and the level of bargaining on wages and on the economic performance of firms in Uruguay's manufacturing industries. Previous work on the impact of labor market institutions (Cassoni, Labadie and Allen, 1995) has shown the significance of unionization in understanding employment determination, labor mobility and the performance of the Uruguayan labor market. The response of wages to macroeconomic conditions was also examined, leading to the conclusion that the observed compression and lower response are the consequences of the resumption of collective bargaining (Cassoni, Allen and Labadie, 1996). This same conclusion was also found in a comparison of the evolution of wages and employment before and after re-unionization (Cassoni, Allen and Labadie, 2000a). However, that same study also found evidence indicating a decrease in the wage gap generated by unions in the mid 1990s. These changes could be linked to the fact that firms and unions started bargaining at a more decentralized level, as well as to a change in the issues over which negotiations took place, including employment and working conditions. Evidence was also found of reduced turnover in unionized industries.

In light of these findings, a new study was carried out in order to further explore these effects. Its conclusions showed that, starting in 1992, unions have

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had a positive impact on employment, while their effect on wages has declined (Cassoni and Labadie, 2001). Trade unions are also found to buffer the effects of fluctuations in product demand and of external shocks on employment; the extent of firm-level bargaining has also buffered those effects. Finally, it was also shown that unions affect the distribution of employment between production and non-production workers. Given the relative wages of these categories, unions reduce the proportion of production workers. Nevertheless, since they also buffer the impact of external shocks on the employment mix, the direction of the total effect depends on the degree of import penetration and the share of exports in the total sales of each manufacturing industry.

It is therefore clear that unions introduced rigidities into the labor market in the 1980s, especially by raising the wage above its market clearing level. The fact that unions did not bargain over employment caused lower rates of hiring, while the fear of strikes generated labor hoarding. Firms used hours of work in order to adjust their labor input to fluctuations in product demand. At the beginning of the 1990s, however, workers started worrying about job instability, while the rules of bargaining changed, mainly with the elimination of the previous mandatory extension of collective agreements. This in turn promoted the inclusion of work conditions as a bargaining issue and led to the gradual upsurge of decentralized bargaining at the firm level.

What effects did these phenomena have on firm performance? Two different scenarios can be imagined. First, the rigidities introduced by union action in the mid 1980s, mainly high wages, could have become an incentive for firms to move toward more capital-intensive technologies. They would have thus increased the level of investment to achieve productivity gains and higher rates of profit, which should have implied a further reduction in the level of employment. It should be noted, however, that the same outcome could have also been secured under a bargaining model in which job stability was an issue, so that cooperation between labor and management would have eased the introduction of new technology while the effects on labor demand were not necessarily negative. Another possible scenario is that unions kept bargaining over wage levels and preventing firms from adjusting the employment level, thus reducing productivity. In a context of increased competition, profitability should also be reduced. Further, underinvestment should be expected, since unions would also have tried to obtain extra rents from capital.

The three indicators mentioned—the investment rate, profitability and productivity—are generally seen as good indicators of firm performance. Hence,

determining the effects of trade unions on these variables will help to explain the real mechanisms at work. In order to do so, these effects are estimated using data from 1988 to 1995 at the establishment level. The dataset includes not only surviving establishments but also new ones and those that closed during the period. The methodology makes it possible to overcome some of the problems arising from the use of aggregate data as discussed in the literature, as well as some of the biases resulting from mortality selection in a balanced panel (Hamermesh, 1993).

Stylized Facts about the Uruguayan Economy in the 1980s and 1990s[2]

Uruguay began to implement a series of policies geared to opening its economy in the mid 1970s. It was not until the early 1990s, however, that the effects were felt at the micro level, both in terms of production and the allocation of local firms' resources. This was partly because of initially high tariff levels, and partly because of non-tariff barriers. At the same time, the reciprocal tariff reductions with Argentina, Brazil and Paraguay brought about by the Mercosur agreements introduced strong competitive pressure into an economy that was heavily dependent on the region in terms of its exports and imports, and yet also heavily threatened by regional competitors.

By 1988, Uruguay had successfully overcome the 1982-1984 economic recession, during which GNP declined by 15 percent, and favorable external conditions allowed the country to grow until 1990. However, the historical significance of external regional shocks was once again felt in 1991, when Argentina implemented the Convertibility Plan, which effectively pegged the Argentine peso to the US dollar. This measure changed the relative prices of tradables and non-tradables, with positive product and employment impacts on Uruguay's service and non-tradable industries. Exports to Argentina increased 130 percent in 1991 and 74 percent in 1992, moving Brazil to second place as a destination for Uruguayan exports. These circumstances led to growth, but with a change in the share of the tradable and non-tradable sectors, as shown in Figure 5.1. Uruguay's stabilization plan, in turn, although more gradual and less comprehensive than Argentina's, also began to have positive effects in 1991 and 1992. Inflation, which had peaked at 129 percent in 1990, declined to 30 percent in 1996. As a result, imports into Uruguay increased greatly between 1990 and 1995, partly because of

[2] This section is largely based on de Brun and Labadie (1997).

tariff reduction and trade preferences granted through Mercosur, and also because of exchange rate appreciation and an increase in domestic spending. At the same time, exports to Brazil and Argentina also increased significantly, especially in terms of their relative share.

The macro changes described above were particularly felt by firms in the manufacturing sector in Uruguay. Manufacturing accounted for 27 percent of GDP in 1987 but steadily declined to 18 percent in 1999. The sector's composition also changed. In 1985-1987, 21 percent of total sales were exports, while in 1999 that figure rose to 30 percent. There is additionally great variance within the manufacturing sector. Industries like textiles and leather, which already had export levels of around 40 percent in 1985, were exporting nearly 80 percent of their sales in 1995; industries like paper and printing, or metal products, have never exported more than 20 percent of sales. Still, all industries significantly increased their export levels during the 1990s. At the same time, as shown in Figure 5.3, the share of exports going to Mercosur increased, enhancing the importance of the region and the vulnerability of local industries to regional shocks and regional competitors.

Figure 5.1. Total and Sector GNP (average index 1983=100)
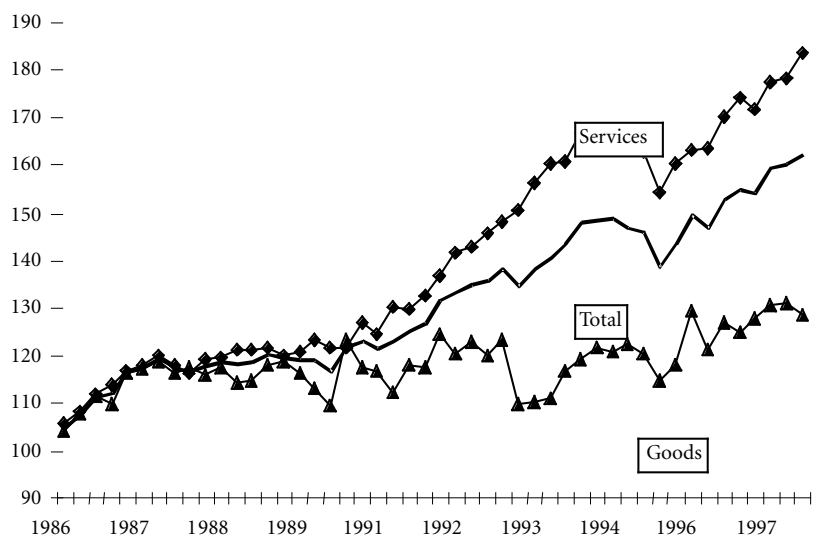
Source: Central Bank of Uruguay.

Figure 5.2. Regional Imports/Total Imports *(percentage)*
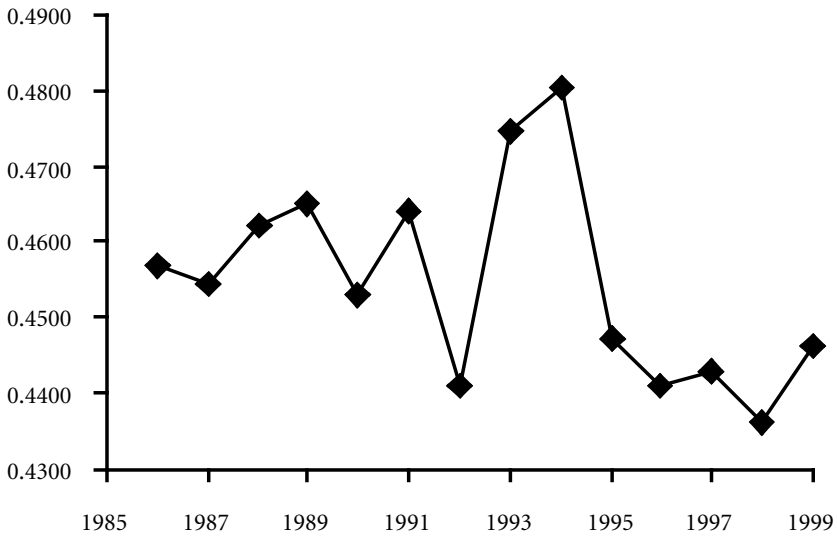
Figure 5.3. Regional Exports/Total Exports *(percentage)*
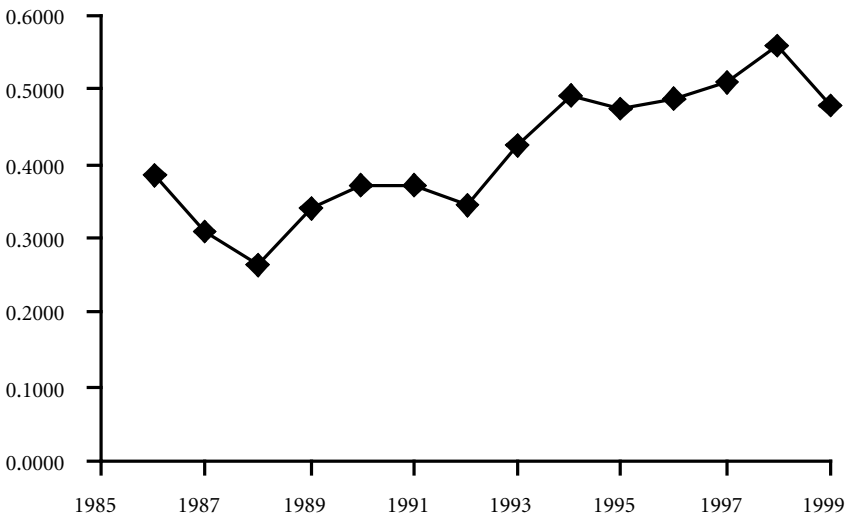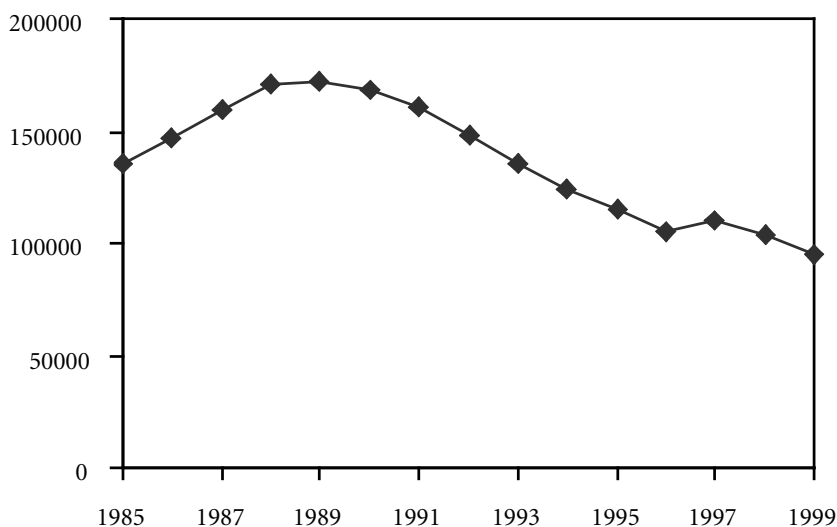

Source: Central Bank of Uruguay.

One of the effects of Mercosur on Uruguayan manufacturing was thus to promote changes in the source of imports and the destination of exports. Countries in the region have become a more convenient market for Uruguayan manufacturing goods while, with a lower common external tariff, imports from the rest of the world have increased sharply, although only after 1994.

The manufacturing sector shrank in the 1990s, and the level of manufacturing employment decreased even more. In 1990, some 168,000 workers were employed in manufacturing, representing 15 percent of total employment, but by 1999 that number had declined to 96,000, or just 8 percent of total employment. Accordingly, wage increases started to decelerate, and a decline began in 1994, as shown in Figures 5.4 and 5.5.

Starting in 1993 there was a significant increase in the previously declining average productivity of the sector, due in part to the restructuring of many manufacturing firms but also to cuts in staff. The manufacturing sector apparently chose to lower the level of employment in order to reduce its wage costs in the context of unfavorable relative prices and increasing competitiveness. Granted,

Figure 5.4. Employment in Manufacturing Industry (number of workers)

Source: National Institute of Statistics.

Figure 5.5. Real Wage Costs in Manufacturing Industry *(1986.1=100)*
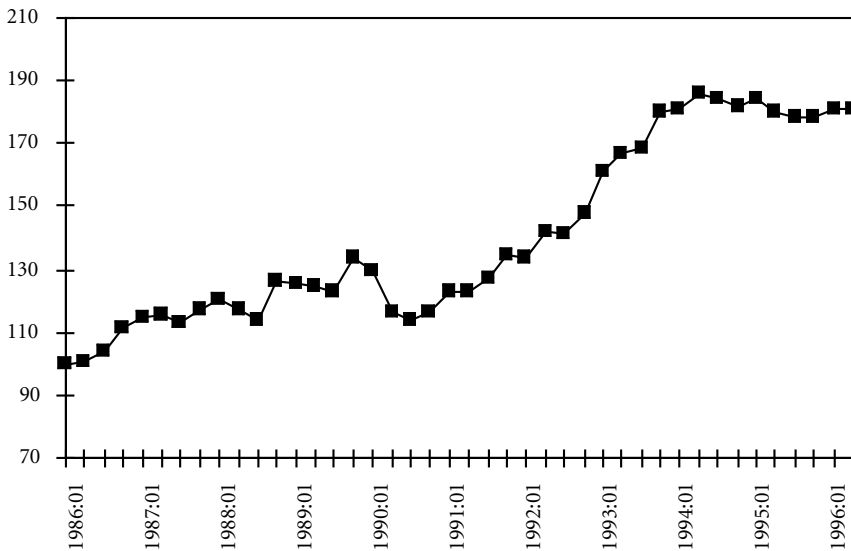
the actual employment numbers only partially take into account the different outsourcing strategies that the sector also developed. The available information on outsourcing refers to 1994-1996 and indicates that, in total, the manufacturing sector outsourced activities that involved 2.2 percent of its staff; larger firms outsourced lower proportions of their personnel.[3] Nonetheless, staff cuts were particularly high among exporting firms, defined as those that export 75 percent or more of their production, but relatively lower among the sub-sample of firms that export to Mercosur. More interesting is the result that non-unionized firms outsourced areas with higher proportions of personnel in the period 1994-1996 than unionized firms, suggesting that unions bargained on employment in that period. Further, the reduction of employees through outsourcing was higher among those firms that had collective agreements only at the industry level than among those with firm-level agreements (5.4 percent versus 2.4 percent). It is

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[3] These calculations were performed using a special-purpose survey on firm performance that was carried out by the Department of Economics at the Social Sciences Faculty of the University of Uruguay.

apparent—and theoretically consistent—that those firms bargaining at a more decentralized level negotiated over employment more than those that did not.

Labor Unions and Labor Relations in Uruguay and its Manufacturing Sector

Uruguayan unions date from the beginning of the twentieth century, but it was only in the early 1940s that they started playing an active role in setting wages, through negotiations in "wage councils." A distinctive characteristic of the Uruguayan wage councils was their tripartite composition, which included representatives of workers, firms and the government. Although the councils' main objective was to set the minimum wage by sector and occupation, they also ensured that their resolutions were effectively followed, and they served as mediators in conflicts. Whatever was settled at the wage council was enforced on all firms within the sector, whether they were at the bargaining table or not.

The first national union, the National Convention of Workers (CNT), was created in 1964. Only two years later, representatives of all workers in the economy were part of the central union, and the union's strong appeal legitimized it as an important social actor. With the advent of the military government in 1973, however, unions and all activities related to them were declared illegal; unionization was completely banned. Only at the beginning of the 1980s did the government, still under military control, authorize the formation of worker associations at the firm level, which smoothed the path towards re-unionization. In 1984, a year before democratic elections were held, the union movement was informally reorganized under the name of PIT-CNT.[4] Wage councils were reinstated in 1985, playing a role very similar to that they performed before the military coup.

Employers' associations, as well as some firms, actually set wages above the minimum level negotiated. Hence the most active opponent to unions' claims at the bargaining table in the 1980s was ultimately the government, which was pursuing an inflation-stabilization policy. The main instrument in this endeavor was the use of governmental approval to extend the result of negotiations to all firms in the sector, regardless of whether they were effectively represented in the council. Given the wage, firms were free to determine the level of employment.

Although bargaining took place at the sector level, the central union generally succeeded in securing consensus among different unions in establishing a common

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[4] PIT is the Spanish acronym for the Workers' Inter-Union Plenary.

percentage of wage increases during the 1985-1992 period. Bargaining could be thus considered quite synchronized during this period. However, since some firms ended up raising wages above the level set in the agreement, the positive effects of coordination finally vanished (Calmfors and Driffill, 1988).

In 1991 the new government publicly announced its intention to abandon the bargaining table in all sectors except construction, health care services and some activities linked to transportation services. It effectively did so in 1992, and by 1993 all collective agreements that had been signed under the previous regime expired. The new institutional setting had two major consequences. On one hand, it acted as an incentive for both firms and workers to negotiate at more decentralized levels, particularly at the firm level. On the other, it meant collective agreements no longer applied to all firms in a sector. As a result, membership in the central union has declined dramatically since then. This, however, does not mean unionization per se diminished at that rate, but that the synchronization, coordination and political bargaining power of the central union deteriorated.

The Nature and Structure of Bargaining

In the early 1990s there were more than 300 trade unions in Uruguay. They represented workers from specific economic activities but sometimes only included those employees belonging to a single firm. These unions were further organized in federations that in turn constituted the central union, and negotiations were largely undertaken by federations or groups of unions in the same economic sector. The role of the central union, apart from its political weight, has been generally one of coordinating the claims of all unions and federations. Employers, for their part, organized in associations in order to bargain with unions.

A distinctive characteristic of Uruguayan trade unions is the lack of any regulation regarding their constitution, the bargaining process itself and the possible channels through which conflicts may be solved. As a consequence, no legal rules refer to any aspect of the agreements, such as length of the contracts, issues over which to negotiate, or schedules for future negotiations. However, bargaining over minimum wages by occupation has always been undertaken at the wage councils. They have generally set which practice will be followed to raise wages, as well as the level of wage increases. In the 1980s, and at the beginning of the 1990s, the indexation of wages to the inflation rate was carried out through a combination of the past and anticipated (according to the government's forecast)

inflation rate.[5] Coordination and synchronization of the negotiations helped keep wage differentials by economic sectors quite stable in the period. Afterwards, as enforceability vanished and bargaining at the firm level became a common practice, negotiated wage increases followed a wide variety of rules, depending on the degree of competition firms and sectors faced and on the evolution of their relative prices, as well as on the bargaining power of the particular trade union.

Analysis of all contracts signed up to 1992 shows that other issues have also been part of the bargaining agenda.[6] Rules related to working conditions, such as length of the working week, paid holidays, job stability, or annual extra premia, were generally found in collective agreements. Some unions also set hourly wages for overtime work higher than the legally stipulated rates. Other clauses that were sometimes included relate to the position at the firm of union leaders and the means of solving conflicts. These clauses, however, do not directly determine the level of employment. Most of them may further be translated into non-wage labor costs. Moreover, although strikes have historically served to discourage employers from firing workers, there are no collective contracts in which the parties explicitly reached an agreement on the number of jobs.

In the mid-1990s, contracts began to include two new types of conditions: those regulating the introduction of new technology—essentially, how to put into practice training programs and mechanisms to reduce the workforce—and those determining premia linked to productivity gains. These clauses reflected two facts. The first was that firms faced increasing foreign competition, which required more capital and skill-intensive technologies. Second, workers were once more concerned about job security. It is therefore not surprising that firm-level negotiations began to include bargaining over employment.[7] Contracts signed at the firm level were often a complement to collective agreements governing the whole sector. That is, they could either modify some clauses of the general agreement or add others, especially those related to employment stability.

Union Membership and Union Density

Once unions were again legally recognized in 1985, membership was around 26 percent for the economy as a whole, with variations by economic sector.

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[5] Anticipated inflation rates were based on government forecasts. For a discussion of the type of contracts signed in the period 1985-1991 and their macroeconomic effects, see Forteza (1992).
[6] See Cassoni, Allen and Labadie (2000b), Ermida, Cedrola, Raso et al. (1998), and Rodríguez, Cozzano, Mazzuchi et al. (1998).
[7] See Rodríguez, Cozzano, Mazzuchi et al. (1998).

Traditionally, public workers have had higher membership rates than private workers, and this remained so in the 1980s and 1990s. Among private activities, those related to the manufacturing and construction industries have shown the highest union density, as shown in Table 5.1.

The evolution of membership rates over time shows the previously mentioned decline of membership in the central union. Membership, as reported at annual congresses, has systematically fallen, so that in the last national congress the number of central union members was only 165,000 (around 15 percent of employment), compared to 250,000 in 1985.[8] Although membership in the central union has steadily declined, unionized workers have by no means vanished. Many unions have simply stopped participating in the national confederation, while continuing to represent workers in an economic sub-sector or even at the firm level.[9]

Table 5.1. Union Membership 1985-1997 *(percentages)*

Union Density	1985	1987	1990	1993	1997
Agriculture and fisheries	18.3	14.3	13.7	6.4	3.9
Manufacturing	32.9	27.3	23.0	25.3	16.6
Electricity, gas and water	79.0	85.4	91.1	91.6	93.7
Construction	28.9	16.4	17.1	10.0	5.2
Commerce	6.5	6.1	4.7	3.1	2.6
Transport and communications	32.3	35.4	32.9	19.9	19.7
Banking and services to firms	26.0	32.4	28.9	20.3	20.1
Social and personal services	20.9	22.3	21.7	20.9	19.1
Private sector	19.4	16.7	14.2	10.0	7.2
Public sector	48.4	42.0	42.3	48.5	47.3
Total	25.8	22.6	20.4	17.3	14.7

Note: Membership is obtained from the National Congresses held in each of the reported years. Union density is defined as the ratio of membership to total employment in each sector.
Sources: Various newspapers, according to data reported by the Central Union (PIT-CNT); Household Surveys, National Institute of Statistics.

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[8] The figures reported in 1985 cannot be taken as exact measures of membership because various unions' representation at the national congress was linked to the reported number of members. This provided an incentive to overestimate the figure reported.
[9] Workers in the frozen meat industry and those at the major beer producer are examples of these two cases, respectively.

While union membership has declined substantially in the private sector, this is not the case in the public sector. Among the former, workers in primary sectors, as well as those in the manufacturing and construction industries, have registered the highest de-unionization rates. A possible explanation for the evolution of membership in the primary and manufacturing sector is that commercial liberalization and increased competitiveness have set a limit on wage increases, since employment stability has been at stake. These factors have further led to a huge restructuring of many firms, and even of whole industries. Jobs have consequently been lost, and workers have found bargaining at a decentralized level more profitable for achieving their goals. This might also be the case for the construction industry, although this may also reflect an increased degree of informality in that industry.

There have been agreements at the firm or plant level since 1985, but their number was negligible until the 1990s. During the period 1985-1989, 94 percent of all contracts were signed at the industry level; this had fallen to 34 percent by 1997. Two percent of contracts, although signed between the trade union and the employers' association, and no longer enforceable, covered only those firms and workers effectively represented at the bargaining table. Thus, while membership fell dramatically, the new structure of bargaining meant an even larger decline in the coverage of collective agreements: coverage in 1997 was only 23 percent, compared to almost 90 percent in 1990, as shown in Table 5.2.[10] Membership and coverage have therefore become very similar concepts since 1997.

Table 5.2. Membership and Coverage, 1990 and 1997 *(percentages)*

| | Membership Coverage | | | |
	1990	1997	1990	1997
Manufacturing	23	17	83	17
Commerce	5	2.5	91	6
Services	26	21	91	25
Total	20	15	88	23

Source: Rodríguez, Cozzano, Mazzuchi et al. (1998).

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[10] The percentages were calculated analyzing contracts that were registered at the Ministry of Labor. As the parties were not obliged by law to register these contracts, the figures cannot be considered definitive. This issue is further discussed in Rodríguez, Cozzano, Mazzuchi et al. (1998).

Unions in Uruguay's Manufacturing Sector

As Table 5.3 indicates, union density has always varied among the different manufacturing industries under study. There are industries, such as textiles and leather or metal products, in which union density fell from very high levels in 1985 (60 percent) to less than 15 percent in 1996. On the other hand, the decline has been less severe in the paper and printing industry, and even less so in oil and chemicals. The latter is an exceptional case, given that it includes a large publicly owned firm, and the decrease in unionization in the public sector has not been as sharp as in the private sector.

The most significant decline started in the 1990s, when the government stopped participating in negotiations and agreements ceased to be enforceable. After the change in the rules of the game, there was an increase in the number of

Table 5.3. Union Density by Manufacturing Industry *(percentages)*

	Food, Bever. & Tobacco	Textiles & Leather	Paper & Printing	Oil & Chemicals	Non-Metallic Minerals	Metal Products
1985	45.13	65.86	46.87	67.22	35.08	68.17
1986	42.71	59.54	43.25	62.45	32.59	59.69
1987	44.35	45.06	36.91	60.52	20.29	33.50
1988	42.72	43.86	34.10	57.32	17.33	26.56
1989	41.74	42.82	34.58	57.44	17.67	27.37
1990	39.70	33.08	27.36	57.36	9.01	28.77
1991	41.00	35.19	29.53	63.24	8.76	29.32
1992	44.02	39.21	29.89	68.33	8.77	31.88
1993	25.75	21.72	27.64	51.18	7.33	25.24
1994	26.26	24.93	32.08	55.98	7.94	28.37
1995	28.03	29.58	33.70	55.86	9.43	30.41
1996	21.48	13.42	24.91	50.22	7.31	9.75
1997	21.50	13.05	27.17	51.69	7.78	9.64
1998	22.06	14.09	28.28	53.41	8.18	10.17
1999	23.48	17.17	29.96	58.95	11.04	10.57

Sources: Various newspapers, according to data reported by the Central Union (PIT-CNT), Household Surveys, National Institute of Statistics.

collective agreements signed at the plant or firm level. This change is illustrated in Table 5.4.

Consistent with the observed decline in unionization, the analysis of the data stemming from the 1996 special purpose survey indicates that half of the manufacturing firms were not bound by any collective agreement in 1996. The percentage, however, decreases with firm size, but rises again for the largest firms (more than 100 workers). That is, de-unionization has left uncovered by collective agreements mostly those workers in small firms, as shown in Table 5.5. The result must be linked to the fact that firm-level agreements are more often found in large than in small firms.

Small firms, with fewer than 30 workers, tend to have agreements at the industry level. This is particularly true in paper and printing, non-metallic minerals and metal products, and it represents a significant trend in firms that export

Table 5.4. Firm-Level Agreements by Industry *(Number of ongoing agreements and percentage workers covered)*

	Food, Bever. & Tobacco		Textiles & Leather		Paper & Printing		Oil & Chemicals		Non-Metallic Minerals		Metal Products	
Year	FLA	%L	FLA	%L	FLA	%L	FLA	%L	FLA	%L	FLA	%L
1985	1	0.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1986	1	0.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1987	2	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1988	3	0.5	0	0.0	0	0.0	1	1.4	1	0.5	0	0.0
1989	3	0.5	0	0.0	0	0.0	1	1.5	2	2.6	0	0.0
1990	3	0.5	0	0.0	0	0.0	1	1.7	2	2.6	0	0.0
1991	4	0.6	2	1.2	1	7.1	1	1.9	2	2.4	0	0.0
1992	6	0.6	3	1.3	2	14.1	1	2.0	2	2.3	0	0.0
1993	8	2.3	4	1.5	2	13.7	1	2.0	2	2.2	2	0.0
1994	15	2.4	4	1.7	2	15.0	1	1.9	2	2.5	2	0.0
1995	15	2.5	4	2.1	2	15.6	1	1.8	2	2.8	2	0.0
1996	22	6.3	6	6.2	4	19.3	2	2.2	2	2.9	4	0.4

Note: FLA is the number of firm-level agreements in the industry; %L is the percentage of workers covered by those agreements.
Source: Database on collective agreements, Industrial Survey, National Institute of Statistics.

Table 5.5. Distribution of Firms by Type of Collective Agreement and Size, 1996 *(percentages)*

Number of workers	No agreement	Firm-level agreement	Industry-level agreement	Both levels
<10	74.1	1.7	24.1	0
10-29	61.7	10.2	25.8	2.3
30-49	56.0	13.3	24.0	6.7
50-99	35.9	17.5	38.8	7.8
100+	45.0	22.9	19.3	12.9
Total	52.4	14.7	26.2	6.7

Source: Firm Strategies and Employment Policy Survey, Department of Economics, University of Uruguay.

between 26 percent and 60 percent of their production. This is not necessarily true, however, in firms that export more than 60 percent. Only 40 percent of the 40 firms that export 75 percent or more of their production report having some kind of collective agreement, while 67 percent of the 88 firms that export less than 25 percent report having collective agreements. This proportion is higher (85.7 percent) for those that export between 26 and 50 percent of their output. Hence, together with the trend of collective agreements at the industry or firm level for those that export between a quarter and two-thirds of their production, there is a trend towards not having collective agreements among those that export most of their production. With slight differences, the situation is similar when only the level of exports to Mercosur is considered.

Finally, employment clauses are more frequently found among agreements signed by firms with 10-30 employees, and among those that export 25-50 percent of their production. This is also the case when only exports to Mercosur are considered.

Theoretical and Empirical Models

The literature has used two models to approximate union behavior. The first is the union monopoly union model, which assumes that unions have the power to impose their preferred wage target on the firm, which then determines employment from its labor demand curve (see Pencavel, 1991). A second approach

is the bargaining model. The conceptual issues that bargaining models raise are related to what parties bargain over (wages, employment, other issues), unions' preferences and objective function, whether bargaining takes place sequentially (that is, first on wages and then on employment), or whether there is "efficient bargaining" over wages and employment at the same time.

When the level of employment is set by the firm once wages have been bargained over, a right-to-manage model must be specified. This model is particularly appealing when negotiations over wages take place at the industry level, since it is obvious that employment cannot be bargained at that level (at least at the same time); this model fits the Uruguayan case for the period until 1993. On the other hand, when bargaining takes place at the firm level, and unions' objective functions seem to be changing, sequential models (of which the "efficient bargaining model" is a particular case), could be more suitable.[11] This could be the case for Uruguay by the mid-1990s, when bargaining ceased to involve all workers simultaneously, while employment emerged as a possible additional target of negotiations. Hence, from a theoretical viewpoint, one could translate the above changes into specifying two different bargaining models depending on the time period.

The dataset includes only four years of observations from each sub-period. Hence, and in spite of the importance of employment, it is preferable to assume that only wages are the result of bargaining, while the determination of employment, investment, productivity and profitability are determined afterwards according to different models and subject to the negotiated wage. However, to avoid ruling out any possible direct effect of unions on these variables, proxies for union power are included in the models, following a methodology similar to that outlined in Boal and Pencavel (1994).

The Model for Wages and Employment

The model presented implies that, in a first stage, employers and workers bargain over the wage at the industry level. Once the wage is set, the firm sets a wage level that might differ from that which is bargained, depending on its specific characteristics.[12] Afterwards, the firm sets the level of employment according to its labor demand function.

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[11] Efficient contracts are a particular case of sequential models, for example, when unions have the same amount of bargaining power in relation to both employment and wages (Manning, 1987).

[12] Before 1992, they were able to set a wage higher than or equal to that negotiated, since government enforced the agreed wage on all firms in the sector. After that date, smaller wage increases relative to negotiated increases were also possible.

The utility function of unions is derived from a median voter framework, assuming that they maximize a surplus over an alternative income w^a, and that union members care about the real wage in terms of the consumer price index. The alternative income is linked to average earnings in the informal sector, average unemployment benefits and wages in other industries in the previous time period.[13] Let the utility functions of the parties be as follows:

$$\text{Unions: } \Gamma(w_t, w^a_t, cp_t, cp_{t-1}, L_t) = [(w/cp)_t - (w^a/cp)_{t-1}]{}^*L_t{}^\phi$$

$$\text{Employers: } \Pi(Q_t, L_t, K_t, p_t, w_t, p_{ct}) = p_t Q_t - w_t L_t - p_{ct} K_t$$

where w/cp is the real wage; w^a/cp is the alternative income in terms of the price of consumption goods; L is employment; p is the product price; Q is production; p_c is the price of capital services and K is the capital level.

Hence, the generalized Nash bargaining problem implies the maximization of the weighted product of the utility function of the players, minus their respective fallback positions. These are assumed to be zero, while the weights are given by the bargaining power of the parties.[14] The resulting expression is as follows:

$$Max \ Y = (\Gamma - \Gamma_0)^\beta \ (\Pi - \Pi_0)^{1-\beta}$$

Subject to the assumption that the capital level is given, once bargaining over wages occurs, the solution to the Nash bargain yields an equation for the wage at the industry level as follows

$$(w/pp)_{j,t} = \eta(\phi,\beta){}^*f[(w^a/cp)_{j,\,t-1}, (pp/cp)_{j,t}]$$

where j indexes industries, t indexes the year, $\eta(\phi,\beta)$ is the mark-up over the alternative income and the functional form for f depends on the production function assumed.[15] Since unions care about the real wage in terms of consumption goods, while firms are interested in the cost of labor relative to the price of their products, the wedge between those two prices also enters the wage equation. The bargaining power of the union cannot be observed. Thus, it is here assumed that it is a function of union density (U) and the structure of bargaining (%FLB). Market conditions, on the other hand, may set a limit to union action. Hence, other

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[13] The relevant measure for the alternative wage refers to the time period prior to bargaining. Thus it has to be deflated by the consumer price index of that same period (cp_{t-1}).

[14] See Binmore, Rubinstein and Wolinsky (1986). In the event of no agreement there would be a strike. Then the firm will have no operating profits and union members will have zero earnings, as there are no legal provisions assuring income to strikers in Uruguay.

[15] See Pencavel (1991, p. 120) and Booth (1995, p. 154).

variables (X) are also considered as determining union power, such as the degree of exposure to competition, the occurrence of external shocks, or the degree of international trade in the industry. The solution of the maximization problem results in a negotiated wage level for each industry j as given by:

$$(w/pp)_{j,t} = \eta(X_{j,t}, \%FLB_{j,t}, U_{j,t})^*f[(w^a/cp)_{j,t-1}, (pp/cp)_{j,t}] \quad (1)$$

If it is further considered that each firm i can set a wage in each time period t that differs from the bargained wage level depending on its individual characteristics, its relative size or market power, and its exposure to foreign competition, the equation for wages at the establishment level can be written as:

$$(w_{i,j}/pp_j)_t = \eta(X_{j,t}, \%FLB_{j,t}, U_{j,t})^*f[(w^a/cp)_{j,t-1}, (pp/cp)_{j,t}] + d(Y_{i,j,t}, X_{j,t}, Z_t) \quad (2)$$

where $d(.,.,.)$ refers to the establishment wage differential, a function of its own specific characteristics ($Y_{i,j,t}$), as well as of industry ($X_{j,t}$) and macroeconomic (Z_t) variables. Unobservable characteristics of the establishments are taken into account using individual fixed effects.

Establishments are assumed to use a technology with two inputs, capital and labor. Maximization of profits thus yields a two-equation system of derived demands, given the price of inputs. Employment at the firm level is thus determined according to a standard labor demand equation, so that it is a function of the wage set, the level of capital and market conditions. Further included in the equation, however, are variables accounting for union density and the structure of bargaining in order to allow for the possibility that negotiations on employment may also take place. The inclusion of these variables is tested for only the last three years, once the bargaining regime changed. The estimated model is thus:

$$L_{i,j,t} = f[w_{i,j,t}/pp_{j,t}, K_{i,j,t}, \%FLB_{j,t}, U_{j,t}, Y_{i,j,t}, X_{j,t}, Z_t) \quad (3)$$

The Model for Investment

It is assumed that firms make their investment decisions prior to setting wage and employment levels, either with or without negotiating with unions. Therefore, the firm has to consider that the union will try to capture quasi-rents from capital as well, depending on its bargaining power. This has been generally seen as an effective increase in the price of capital, as if unions were able to tax investment. The known result of under-investment stemming from the fact that a cooperative bargaining

output is unlikely, given the length of contracts in relation to the life of capital (Grout, 1984; Dow, 1993), is not, however, the only possible outcome (Hirsch and Prasad, 1995). Actually, the factor mix in a unionized firm may be identical to that in a non-union setting, as both labor and capital prices can be distorted. As in the case of labor, no definite empirical test can be performed to decide on the correct bargaining model, as both sequential and efficient models are compatible with the same results. Under these circumstances only union variables are included in the specification and the statistical significance of their estimated coefficients is tested for. In order to obtain a simple estimable model for the investment level, a Cobb-Douglas production function is assumed. Given the model for wages and employment determination, and assuming there are adjustment costs, it is possible to specify a model for the level of investment, as in Machin and Wadhani (1991a), of the form:

$$I_{i,j,t} = f(dq_{i,j,t}, \%FLB_{j,t}, U_{j,t}, p_{cj,t}/w_{i,j,t}, Y_{i,j,t}, X_{j,t}, Z_t) \quad (4)$$

where for year t, $I_{i,j,t}$ is the level of investment of the firm; $dq_{i,j,t}$ denotes product growth at the firm level; $\%FLB_{j,t}$ refers to the extent of firm-level bargaining in the industry; $U_{j,t}$ is a measure of union power at the industry level; and $p_{cj}/w_{i,j,t}$ is the price of capital services relative to the firm's labor costs. $Y_{i,j,t}$ refers to variables accounting for firm-specific characteristics; $X_{j,t}$ denotes industry-specific variables; and Z_t is a vector of macroeconomic variables.[16]

As the level of investment is generally related to absolute size of the plant and/or the existence of capital, the same equation is also estimated, but instead using the rate of investment as dependent variable:

$$I_{i,j,t}/K_{i,t-1} = f(dq_{i,j,t}, \%FLB_{j,t}, U_{j,t}, p_{cj,t}/w_{i,j,t}, Y_{i,j,t}, X_{j,t}, Z_t) \quad (4')$$

The Model for Productivity

Unions are generally viewed as rent-seeking agents, but the firm may be willing to accept sharing extraordinary profits in exchange for increasing productivity. Unions can thus also be seen as productivity-enhancing agents. This view can be derived from assuming that the advent of unionism forces management to increase efficiency, or from the notion that unions promote higher morale and cooperation

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[16] Adjustment costs are a function of unionization, investment and specific characteristics of the establishment.

among the working teams (Freeman and Medoff, 1979). These opposite views make the empirical analysis of the effects of unions on productivity even more necessary. Other possible effects are related to the decrease in the turnover rate and hence in associated costs for the firm, and also to all productivity gains derived from increased effort at the workplace.

In order to study how unions affect productivity, an equation of productivity determination is derived from the production function. Assuming a Cobb-Douglas methodology:

$$ln(Q_{i,j,t}/L_{i,j,t}) = c_{i,j} + \alpha ln(K_{i,j,t}/L_{i,j,t}) + \beta ln(M_{i,j,t}/L_{i,j,t}) + \delta Y_{i,j,t} + \gamma X_{j,t} + \lambda Z_t \quad (5)$$

where c_{ij} are firm-specific effects; $K_{i,j,t}$ refers to the capital stock; $L_{i,j,t}$ is employment; and $M_{i,j,t}$ are raw materials. Variables in $Y_{i,j,t}$ refer to firm-specific characteristics; those in $X_{j,t}$ account for industry-specific characteristics, including union density and the structure of bargaining; and those in Z_t capture macroeconomic performance affecting productivity.

Several econometric problems are associated with this model.[17] First, omission of other unobservable variables that affect labor productivity, and that are in turn correlated with the union variable, would bias the estimated effect of unions. This could be avoided by estimating the effects of unions on productivity growth. Unobservable individual characteristics would be considered, but they would disappear in the dynamic version of equation (5). Another strategy is to estimate the model in levels, but transforming all variables to deviations from the sample mean. Second, endogeneity bias could arise from the fact that unions might tend to organize in those establishments where monopoly power is greater and hence extra profits are more likely to be obtained. To account for this effect, variables reflecting monopoly power and the international exposure of the industries are included. Finally, estimates might be subject to simultaneity bias if bargained wages alter the level of inputs in the right-hand side of the equation. This issue can be addressed by estimating the productivity equation as a system including wage and employment equations. Alternatively, variables can be properly instrumented, which is the strategy followed here.

Also estimated are the possible effects of union density on the rate of productivity growth, using an equation analogous to that of the productivity level. If unions originally concentrate in sectors or establishments with the highest rate of profits, which in turn can be the consequence of being the most productive

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[17] Booth (1995) provides a list.

ones, then it might be the case that they are positively correlated with the level of productivity but negatively correlated with its rate of growth. The model analogous to equation (5) is (5'):

$$\ln(Q_{i,j,t}/L_{i,j,t}) - \ln(Q_{i,j,t}-1/L_{i,j,t-1}) = c_{ij} + \alpha[\ln(K_{i,j,t}/L_{i,j,t}) - \ln(K_{i,j,t-1}/L_{i,j,t-1})] +$$
$$\beta[\ln(M_{i,j,t}/L_{i,j,t}) - \ln(M_{i,j,t-1}/L_{i,j,t-1})] + \delta Y_{i,j,t} + \gamma X_{j,t} + \lambda Z_t \quad (5')$$

The Model for Profitability

Given their rent-seeking activity, unions are expected to reduce the profitability of firms. However, the structure of the product market in which firms operate is the main determinant of the existence of any profit. When there is bargaining, whatever the level of supernormal rents, the extent to which owners of the firm or the union can appropriate these rents will depend on their bargaining power. A further determinant of the existence of extra surplus is related to the amount of innovation. Although it is sometimes argued that this surplus is just a normal return to investment in research and development, unions need not share this view. Some authors also argue that unions' share of innovation is captured by higher wages (Van Reenen, 1995), so that it is necessary to estimate the wage equation together with the model for profits. On the other hand, if the effects of unions on productivity are positive, then they might be increasing profitability. The proposed analysis of these issues is carried out by estimating the direct effect of unions on some indicator of profits, taking into account the structure of the market in which the firm operates, the extent to which the firm is subject to binding foreign competition, union density, and the degree of decentralization of bargaining. Adequate instruments for the wage are also included in order to avoid simultaneity biases, since wages and profits are jointly determined. The estimable equation is:

$$Profit_{i,j,t} = g(w_{i,j,t}/p_{j,t}, \%FLB_{j,t}, U_{j,t}, Y_{i,j,t}, X_{j,t}, Z_t) \quad (6)$$

As noted in the case of productivity above, the sectors with the highest union density might be found in those establishments or sectors with the highest level of profits. Following the same strategy as before, also estimated is an equation for the rate of growth of profitability, which is specified analogously to equation (6):

$$Profit_{i,j,t} - Profit_{i,j,t-1} = g[(w_{i,j,t}/p_{j,t})-(w_{i,j,t-1}/p_{j,t-1})], \%FLB_{j,t}, U_{j,t}, Y_{i,j,t}, X_{j,t}, Z_t\} \quad (6')$$

Data and Methodology

In order to answer the questions addressed above, it was necessary to select the data and variables to be used. It was also necessary to specify appropriate models in light of the strengths and limitations of the dataset.

The Sample

The units of observation are the manufacturing establishments surveyed by the National Institute of Statistics on an annual basis during the period 1988-1995. There were 842 establishments in 1988, the base year. Many of them closed permanently during those years, while others, after remaining closed for a year or two, re-opened with another owner. Some firms were created during the period, although many of these establishments did not survive. Consequently, the total number of establishments surveyed in 1995 is 646. Table 5.6 describes the distribution of the establishments in the sample according to their status.[18] Establishments that survived without any change in ownership during the period under analysis represented only 50 percent of the sample. Unsuccessful establishments, that is, those that eventually closed regardless of their original status, account for 27 percent of the sample.

Establishments in the sample belong to 37 different industries at the International Standard Industrial Classification (ISIC) three-digit level, except for food, beverage and tobacco, which is addressed at the four-digit level because of the heterogeneity of its sub-markets. The observations are not expanded, so that the results obtained with the dataset cannot be taken as representative of all establishments in the industry. However, all establishments with more than 50 employees are included in the sample, so that the results must be viewed with particular caution in regard to small establishments.

The Variables

Data on all variables referring to establishment characteristics are obtained from the Annual Industrial Survey, conducted by the National Institute of Statistics. These variables include value added, gross output, value of sales, employment,

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[18] Annex 1 of Cassoni, Allen and Labadie (2000a) reports descriptive statistics for the whole sample, both yearly and according to this classification.

Table 5.6. Distribution of Establishments According to Survival Status, 1988 -1995

	Number of Observations	Number of Establishments	Percentage
Alive during the whole period	3,832	479	50.0
Born in the period and surviving	216	49	5.1
Born in the period and dead	11	5	0.5
Dead in the period	1,058	234	24.4
Alive, dead, rebirth and surviving	700	169	17.6
Alive, dead, rebirth and dead	60	22	2.3
Total	5877	958	100.0

Source: Industrial Survey, National Institute of Statistics.

wages, taxes, exports, value of raw materials, investment, depreciation, and profits. Variables are measured in pesos and are therefore deflated by the appropriate price index when necessary. Product prices, capital prices and export prices are not reported at the establishment level, so that industry-level prices are used instead.

Wages paid are not the relevant variable for firm decision-making, since other costs linked to labor input are also considered. Hence, a cost of labor variable is used instead of wages, adding all non-wage costs to the wage. These costs refer to social security and health insurance contributions, payroll taxes and annual extra payments. The legal cost of labor is further multiplied by a bargained non-wage costs index, stemming from the manufacturing collective agreements signed between 1988 and 1995 following the methodology described in Cassoni, Allen and Labadie (2000).

Time-series data on capital are not available. However, the 1988 Industrial Census did request information on capital stock. There have been various unsuccessful attempts to calculate a time series using the 1988 stock together with annual depreciation, investment and assets sold. The reasons for this are probably linked to firms' accounting policies. Overestimation of the amount of depreciation is avoided by calculating an average depreciation rate by type of asset—building, machinery and others—by industrial sector and by year. The resulting depreciation rate is then used for all firms within each sector annually. Further excluded is the

value of assets sold in the measure of capital, assuming assets have been totally depreciated when sold.[19] The equations for estimating the capital stock in 1988-1995 are thus:

$$K^{c}_{i,j,t} = K^{c}_{i,j,t-1} + I^{c}_{i,j,t} - \delta^{c}_{j,t} * K^{c}_{i,j,t-1} \quad (7)$$

where c represents machinery, buildings, and other assets, i indexes the firm, j is the industrial sector, t is the year; and

$$\delta^{c}_{j,t} = \sum_{i} D^{c}_{i,j,t} / \sum_{i} K^{c}_{i,j,t-1} \quad (8)$$

where K is the capital stock; I refers to the amount of investment; δ is the depreciation rate; and D is the amount of depreciation.

Union density is defined as the industry's membership rate at the ISIC three-digit level. The time series is built by taking the membership figures reported by the central union in each congress and dividing this figure by total employment. It is important to note that, given the data available, measured here are the effects of unionization at the industry level on the performance of establishments in that industry. Nevertheless, since wage bargaining was carried out at the industry level during most of the period, the use of union density at the same level is adequate for the purposes of this chapter. Union effects on the performance of establishments, however, must not be thought of as relative to non-union establishments but as relative to establishments in non-union industries.

The bargaining models to be used assume that unions negotiate a mark-up over an alternative wage. This alternative wage can also be thought of as the opportunity cost of working, or reservation wage, if no bargaining model is assumed. The alternative income for a worker in industry j is defined as the weighted average of what he would earn if hired by a firm in the manufacturing sector; the income the worker would receive if he became unemployed and collected unemployment benefits (50 percent of the last wage received); and the average income of self-employed individuals, under the assumption that if the worker cannot find a job in the formal sector, he would prefer an informal job to remaining unemployed. At the establishment level, however, the exact calculation is not possible, and thus the variables directly defining the reservation wage are included. The weights are a function of the unemployment rate and the average duration of the unemployment spell. Consequently, the variables that have to be included are income in the informal sector and its product with the unemployment

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[19] This methodology is close to that used in Black and Lynch (1997).

rate, as well as duration of unemployment. The relevant measure to be considered when bargaining takes place is not the current alternative income, which is not known at the time of negotiation, but that prevailing in the previous time period.

Using the variables defined above, other indicators are constructed:

1. Investment rate: level of investment in year t divided by capital at the beginning of the year.
2. Productivity: gross output divided by number of workers.
3. Profitability: profits divided by sales.
4. Export share in total sales.
5. Capital per worker: capital in machinery divided by number of workers.
6. Relative size of establishment: gross product of establishment divided by the industry gross product. The indicator can also be taken as a measure of relative monopoly power of the plant.

Market conditions are also considered. First, the degree of concentration of the industry (C4), calculated as the ratio of total sales of the four largest establishments to total sales of the industry. Second, measures of the relative exposure of the industry to foreign competition, both locally and internationally. Five time series are thus constructed to account for trade liberalization:

1. The ratio of imports to total consumption (GDP - exports + imports) in 1988 prices, as an index of import penetration at the industry level, which accounts for sectoral external shocks.
2. The share of exports in total sales in 1988 prices at the industry level, also to proxy for sectoral shocks.
3. The share of regional exports in total exports and the share of regional imports over total imports in order to account for the relative importance in trade of those countries in the region.
4. Relative prices, defined as the local relative price for each sector (producer price index of the industry divided by the price index for non-tradables) divided by international prices.

Finally, the degree of openness of the economy as a whole, which should be a fundamental factor affecting firm performance in the Uruguayan case, is also considered. A variety of indicators have been proxied for openness in the literature.

In general, these can be classified into two groups: those accounting for the effects of trade liberalization on the amount of production subject to trade; and those reflecting the level of price distortion. Among the former group, one criticism that must be addressed is that quantities are not measured in constant prices, since the variations in the relative price of tradables and non-tradables would distort the real index (Low, Olarreaga and Suárez, 1999). Second, the relative size of the tradable sector will also generate biases. Among the indicators of degree of openness based on price distortions, the real exchange rate is one of the most popular. Its use has been extensively criticized, however, because it reflects other phenomena at the same time.[20] Berlinski (1999) proposed an alternative measure based on relative prices between export and import-substitutive sectors in an economy. These in turn depend on the international price and the exchange rate, as well as on local trade policy. Hence, all sources of distortion are included in the indicator. Vaillant (2001) has calculated the time series for Uruguay and shown that its evolution is very similar to the analogous time series based on quantities.[21]

Model Specification and Estimation Methods

All the models described in this section are specified allowing for dynamics, using only one lag of the dependent variable. Given the nature of the dataset used, individual effects (establishment-specific) are also included. In order to avoid the possibility of correlation with predetermined variables, the models are estimated in orthogonal deviations instead of in levels, so that these effects are eliminated from the equations.[22,23]

Many of the predetermined variables included in the models cannot be considered strictly exogenous. Thus, instrumental variables methods have to be used to avoid endogeneity bias. Further, given that there are eight time periods in the panel and lagged endogenous variables, it is also necessary to estimate taking into account the specific form of the variance-covariance matrix. Hence, in order

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[20] See Rodrik and Rodríguez (1999).

[21] Since relative prices in t (rp_t) are defined as $(p^T/p^{NT})_t/(p^{*T}/p^{*NT})_t$, which represents the ratio of local tradable to non-tradables prices divided by international relative prices. This in turn equals the tariff in the base year (τ_0) divided by the tariff in t. The "equivalent" tariff τ_t is equal to $[(1+\tau_0)/rp_t]-1$.

[22] The correlation between individual effects and predetermined variables is expected. As an example, consider the implausibility of having independence between management skills and relative size of the establishment, or export share.

[23] Orthogonal deviations of $x_{i,t}$ are proposed in Arellano (1988) as deviations from average future observations, according to:

$$x^\star_{i,t} = [x_{i,t} - (1/T-t)(x_{i,t+1} - .... + x_{i,T})][/(T-t)/(T-t-1)]^{1/2} \text{ for } t=1,...T-1$$

to achieve consistency and asymptotic efficiency, the estimation method used is the Generalized Method of Moments (GMM), which has been shown to provide the optimal set of instruments.[24] Following Arellano and Bond (1998), the software used is the Dynamic Panel Data package.

Although endogeneity bias can be considerable, also reported is the output of estimation by Generalized Least Squares (GLS), with fixed effects by industry and a time trend. The exercise is intended to further validate the output of the GMM estimation, since it is known that the results when using instrumental variables methods are quite sensitive to the set of instruments chosen. Instruments for the wage are nevertheless retained in those equations where it appears as an independent variable, in order to be consistent with the theoretical models proposed. The estimated effect of unions on the different indicators of firm performance is of the same sign when estimating the models in levels, except for the employment equation. Statistical significance, however, is not always found. Regarding the estimation in orthogonal deviations, effects go in the same direction for the models explaining wages, productivity, productivity growth, and profitability. The opposite is found in the models for investment, employment and profitability growth, but in no case are statistically significant coefficients obtained. The conclusion is thus that the results obtained using the GMM methodology are sufficiently robust.[25]

Since the estimation period is 1988-1995, different bargaining models were not estimated for the sub-periods resulting from the change in the institutional framework that took place in 1992, as temporal observations in the dataset are not enough. Dummy variables were included, however, allowing for a change in the impact of union density and coverage of firm-level agreements on the different dependent variables from 1993 onwards.[26] Recent work at the aggregate level, which has shown the existence of different effects of unions on diverse variables in the 1980s and 1990s, indicates that 1993 is the year in which the institutional changes had an observable effect (Cassoni and Labadie, 2000a).

Apart from the variables entering each equation, observable establishment-specific and industry-specific characteristics were included in the equations for wages, employment, investment, productivity and profitability. The establishment-level variables used are the share of exports in total sales (*xsales*); and the relative size of the establishment (*size*). Industry-specific variables include export share

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[24] See, for example, Arellano and Bover (1990) or Arellano and Bond (1991).

[25] The output of the GLS regressions is reported in Annex 2 of Cassoni, Allen and Labadie (2000a).

[26] Cassoni, Allen and Labadie (2000a) have shown that, according to the available data, 1993 is the first year in which institutional changes are reflected in the evolution of wages and employment.

(*xsalesI*); import penetration (*maconsI*); the share of regional exports in total exports (*%regxI*); the share of regional imports in total imports (*%regmI*); a concentration index (*C4*); the union affiliation rate (*%unionI*); and the percentage of workers in the industry that are covered by firm/establishment agreements (*%flbI*). Finally, the previously defined price indicator of the overall degree of openness in the economy is also included (*etariff*).

The set of instruments used for the control variables at the economy, industry or establishment level is the same for all equations. These are the ratio of domestic to international sectoral prices (*xpriceI*), serving as an instrument for establishment and industry export share, as well as for industry import penetration. The equivalent tariff is considered exogenous and thus included as an instrument. Instruments used for the relative size of the establishment, for the degree of concentration of the market, union density, and the extent of coverage of firm-level agreements are all possible lags of the same variables. When the model includes the lagged dependent variable, all lags starting with the second lag are included as instruments as well. Regarding the variables that are specific to each model, they are all considered endogenous, so that all lags starting with the first are used as instruments in each equation.

Results

Estimated results are summarized in Table 5.7. In the wage equation, the effects of the average income in the informal sector and its product with the duration of the unemployment spell and the unemployment rate have the expected signs, which are positive for the former and negative for the latter two. The wage elasticity of the wedge between production and consumption prices is -0.63, reflecting the fact that product wages fall whenever this wedge increases, as unions bargain over real wages in terms of consumption goods. Larger establishments pay higher wages relative to the rest. Workers in establishments of exporting industries and in those that operate in more concentrated markets also receive higher pay than others, while the reverse holds true in import-substituting industries. If imports come from the region, however, the negative effect on wages vanishes. Interestingly, the more open the economy (the lower the equivalent tariff) the higher the wage level. This result has also been found in other research (see Cassoni and Labadie, 2001) and is linked to the fact that growth in the Uruguayan case is highly dependent on the evolution of exports, so that overall growth and openness are currently almost

synonymous. On the other hand, the level of establishment exports and the share of regional exports in total sales at the industry level have no impact on wages. Finally, union density is positively correlated with wages, so that full unionization in the period would have meant an additional real wage increase of 4.8 percent *ceteris paribus*, evaluated at the mean value of union density (0.365). The extent of coverage of firm-level agreements has no statistically significant effect, and neither do the variables accounting for institutional changes in the 1990s. However, the estimated coefficients have the expected signs: positive in the case of firm-level coverage and negative in the case of those multiplying union density and firm-level coverage since 1993. That is, before 1993, if unions further bargained at the firm level, they could only add to terms agreed upon at the Wage Council. After that date, the union effect on wages diminished to half of its previous estimated level, while firm-level bargaining further reduced wage increases, possibly because of the inclusion of employment in negotiations.

Labor demand depends on the price of labor relative to the product price and on the level of capital in machinery and equipment. Wage and capital elasticities are -0.85 and 0.10, respectively. A more open economy favors employment through growth, while external sectoral shocks, as measured by export share and import penetration, are not statistically significant. Regional exports as a share of total exports are found to have a negative impact on employment levels, while those establishments that increase their share of exports in total sales also increase employment. Larger establishments, as well as those operating in more competitive markets, hire more workers than others. As in the case of wages, the extent of firm-level bargaining has no effect on employment, while no statistically significant change in the estimated coefficients in 1993 is found. The direct effect of unions on labor demand is to increase employment (by 0.1 percent for each 1 percent increase in union density). Given the indirect effect through wages, full unionization in the period would have meant a 14 percent increase in employment.

Investment is modeled according to equations (4) and (4'), taking into account the total amount of investment—that is, investment in machinery and equipment, in buildings and in other assets. The price of capital relative to the wage has the expected negative coefficient in both models while that of output growth is positive (the output elasticity is 0.2 in both models and the price elasticity is -0.9 in the model for investment levels and -0.7 in that for the rate of investment). While establishments with a bigger relative size invest less than the rest, when analyzing the impact in terms of the rate of investment, the effect vanishes. Establishments operating in markets that are more competitive have a

Table 5.7. Estimated Coefficients for the Different Models Estimated

Establishment Variables	Wage	Employment	Investment		Productivity		Profitability Rate	
			Level	Rate	Level	Growth	Level	Growth
Wedge	-0.523 (0.056)							
Wage informal sector	0.349 (0.060)							
Wage informal sector * Unemployment duration	-0.125 (0.015)							
Wage informal sector * Unemployment rate	-0.094 (0.015)							
Wage	-0.264 (0.038)				-0.123 (0.054)			
Capital	0.032 (0.017)							
Price of capital / wage		-0.692 (0.425)	-0.515 (0.164)					
Output rate of growth		0.141 (0.029)	0.186 (0.034)					
Capital / employment				0.237 (0.027)				
Raw materials / employment				0.650 (0.035)				

Continued

Table 5.7. Estimated Coefficients for the Different Models Estimated *(continued)*

Establishment Variables	Wage	Employment	Investment		Productivity		Profitability Rate	
			Level	Rate	Level	Growth	Level	Growth
Capital / employment rate of growth					0.113 (0.041)			
Raw materials / employment rate of growth					0.515 (0.050)			
Price of capital						-0.169 (0.087)		
Wage rate of growth							-0.083 (0.047)	
Price of capital rate of growth							-0.227 (0.138)	
Lagged dependent variable	0.174 (0.032)	0.695 (0.045)	0.222 (0.024)	0.227 (0.020)	0.022 (0.010)	-----	-----	-----
Exports/sales	0.030 (0.187)	0.704 (0.271)	0.038 (1.848)	1.486 (1.687)	-0.005 (0.245)	0.244 (0.290)	0.071 (0.292)	-0.675 (0.583)
Size	0.833 (0.275)	2.202 (0.641)	-6.504 (3.971)	-2.586 (3.641)	5.020 (0.966)	1.579 (0.818)	-0.568 (0.608)	1.793 (1.269)
Industry Variables								
Union density	0.062 (0.024)	0.089 (0.036)	0.596 (0.349)	0.743 (0.365)	0.057 (0.042)	0.147 (0.043)	0.091 (0.045)	-0.090 (0.063)

Continued

Table 5.7. Estimated Coefficients for the Different Models Estimated (continued)

Establishment Variables	Wage	Employment	Investment		Productivity		Profitability Rate	
			Level	Rate	Level	Growth	Level	Growth
Union density *dummy93	-0.031 (0.027)	0.044 (0.037)	0.122 (0.336)	-0.033 (0.331)	-0.013 (0.056)	-0.019 (0.043)	0.109 (0.041)	0.062 (0.065)
% workers covered by firm-level agreements	0.268 (0.221)	0.133 (0.311)	-5.566 (2.775)	-4.929 (2.814)	1.727 (0.505)	-0.581 (0.431)	1.034 (0.479)	0.304 (0.656)
% workers covered by firm-level agreements*dummy93	-0.153 (0.131)	-0.006 (0.166)	1.182 (1.545)	1.050 (1.699)	0.032 (0.279)	0.138 (0.199)	-0.500 (0.229)	-1.319 (0.744)
C4	0.295 (0.103)	-0.324 (0.159)	-3.464 (1.434)	-4.786 (1.429)	-0.036 (0.167)	-0.286 (0.112)	0.279 (0.205)	0.299 (0.365)
Exports/sales	0.169 (0.109)	-0.222 (0.162)	-4.881 1.298	-4.398 (1.341)	0.232 (0.172)	0.506 (0.207)	-0.302 (0.167)	0.170 (0.295)
% regional exports	0.010 (0.035)	-0.129 (0.053)	0.860 (0.509)	0.810 (0.510)	0.016 (0.071)	-0.034 (0.073)	0.043 (0.063)	0.223 (0.118)
Imports/Consumption	-0.053 (0.025)	-0.015 (0.031)	-0.423 (0.282)	-0.450 (0.291)	0.007 (0.046)	-0.053 (0.059)	-0.029 (0.036)	-0.033 (0.057)
% regional Imports	0.091 (0.048)	-0.031 (0.068)	0.463 (0.641)	0.502 (0.650)	0.014 (0.085)	0.110 (0.086)	-0.119 (0.076)	0.204 (0.162)
Equivalent tariff (refers to the whole economy)	-0.166 (0.029)	-0.126 (0.034)	0.416 (0.366)	0.451 (0.366)	-0.135 (0.037)	-0.155 (0.054)	0.082 (0.071)	0.176 (0.086)

Continued

Table 5.7. Estimated Coefficients for the Different Models Estimated *(continued)*

Establishment Variables	Wage	Employment	Investment		Productivity		Profitability Rate	
			Level	Rate	Level	Growth	Level	Growth
Sargan test	0.044	0.015	0.014	0.023	0.017	0.318	0.320	0.629
1st order autocorrelation	0.000	0.000	0.000	0.000	0.001	0.001	0.228	0.191
2nd order autocorrelation	0.207	0.731	0.169	0.183	0.589	0.012	0.640	0.229
N° of observations	4849	4849	4849	4849	4849	3073	4849	3073

Notes: Sargan test is that of over-identifying restrictions. Figures reported for all tests are p-values.

higher rate and level of investment. However, increases in export share and import penetration generate a decline in both the level and rate of investment. This could mean that firms respond to foreign competition through the use of more labor-intensive technologies. The effect is as expected in the case of imports, since they came mainly from the region until 1994, so that imported goods were intensive in unskilled labor. The destination of exports, on the other hand, changed at the beginning of the 1990s, from the rest of the world to the region, so it might be that those firms already had a high level of capital and thus needed to invest less than others in relative terms. If exporting to the region, the effect is thus smoother. No statistically significant effect of the overall degree of openness is found.

Variables accounting for union effects are found to be statistically significant in both models—for the level and rate of investment—although no change in the estimated coefficients is found in 1993. Establishments in industries with higher union density and fewer workers covered by firm-level collective agreements are found to invest more than those in other industries. The estimated elasticities are 0.3 and -0.1, respectively, the total effect of unions being further increased if the positive and indirect effect through wages is also considered, as shown in Table 5.8. That is, since unions increase wages and this promotes substitution between capital and labor, the positive direct effect of unions on investment at the establishment level is reinforced. If bargaining at the firm level, however, the effect is smaller. The result is consistent with the structure of bargaining described in previous sections. Previous work has shown that one of the observed effects of unions has been to promote substitution between blue- and white-collar workers.[27] Hence, the positive effect of unions on the level and rate of investment can be thought of as the result of firms moving to more capital-intensive technologies in order to avoid possible extra costs of union action. If negotiating occurs at the firm level, however, bargaining over employment is also observed, and it is thus likely that the parties would agree to slow down this process.

The estimated equations for productivity and productivity growth also suggest there are positive direct effects of unionization at the industry level. No change in the estimated parameter is found in 1993. The statistical significance of the union variable in the levels equation is weak, while firm level bargaining is highly significant. The positive direct effect of unionism on productivity becomes negative when adding the estimated indirect effects through employment, as shown in Table 5.8. Regarding productivity growth, the estimated impact of unionism is

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[27] See Cassoni and Labadie (2001).

Table 5.8. Estimated Effects of Unions on Firm Performance

	Wage	Employ-ment	Investment		Productivity		Profitability Before 1993		Profitability After 1992	
			Level	Rate	Level	Growth	Level	Growth	Level	Growth
Coefficients (LR)										
Union variable	0.075	0.292	0.766	0.961	0.058	0.147	0.091	-0.090	0.200	-0.090
Other variables										
Wages	-0.865	0.889	0.666		-0.123	-0.083	-0.123	-0.083		
Employment				-0.907	-0.628					
Effects										
Direct	0.027	0.107	0.280	0.351	0.021	0.054	0.033	-0.033	0.073	-0.033
Indirect		-0.024	0.024	0.018	-0.075	-0.052	-0.003	-0.002	-0.003	-0.002
Total	0.027	0.083	0.304	0.369	-0.054	0.002	0.029	-0.035	0.070	-0.035

Note: "LR" means long run.

such that a 10 percent increase in membership, evaluated at the mean value of union density, implies a 0.6 percent rise in the rate of growth of labor productivity. Full unionization thus would have meant an increase of 9 percent in the rate of growth. If the indirect impact through employment is included, however, the total effect is nil.

There are many theoretical explanations for a positive link between unionism and productivity related to increased cooperation and higher morale, as discussed above. Some authors, such as Black and Lynch (1997), have also tried to measure the typical unobservable characteristics by using special surveys. In the Uruguayan case, however, the result could also be linked to the decrease in turnover that takes place in unionized sectors (Cassoni, Allen and Labadie, 2000a). Further, if unions induce substitution of labor by capital and new technologies are more efficient than their predecessors, then labor productivity can be increased. Regarding the effect of firm-level bargaining, the positive direct effect further supports the previous argument; in other words, if bargaining over employment takes place, one should expect that increased job stability would raise productivity.

Other variables explain the firms' productivity performances. The relative size of the establishment and the degree of openness of the economy are variables that have a positive effect both on the level and the rate of growth of labor productivity. Belonging to industries facing more competitive pressure through import penetration lowers productivity, while competing in foreign markets through exports raises productivity growth. The result, again, can be understood if the origin of imports and the destination of exports are taken into account. During most of this period imported goods came mainly from Mercosur countries. Given the common external tariff established by regional agreements, and considering the type of goods imported, it could well be that the regional agreements operated as a subsidy within the region. Hence, products coming from neighboring countries belonged to industries that were not competitive with the rest of the world but that were competitive with local industries, at least until 1994. At the same time those firms that imported the most actually transformed a great deal of their production into distribution, precisely because they were not competitive. Exporting industries, instead, were forced to increase their levels of productivity so as to export to the region. The effect was further reinforced if they were exporting to the rest of the world. Finally, as expected, the more concentrated the market in which the establishment operates, the lower the rate of growth of productivity, while no significant effect is found on the level of labor productivity.

The final equations describing the determinants of the rate of profits and profit growth are econometrically unsatisfactory, and further work needs to be done in this area.[28] Nonetheless, two results are worth discussing. Plants in industries with higher union density and a larger percentage of workers covered by firm-level agreements have higher rates of profits, holding wages constant (direct effect) and also once the indirect effects through wages are considered. However, the direct effect of unionization on the rate of growth of profitability is negative, and firm-level bargaining has no impact on this indicator of firm performance, while the indirect effects through wages are negligible, as Table 5.8 illustrates. This could signal that unions organize in those sectors in which there are more rents to be shared and subsequently prevent further increases in profitability.

The second result worth mentioning is that, starting in 1993, the union direct effect on the level of profitability increases, while that of firm-level bargaining falls. The explanation for the results can again be linked to changes in the structure of bargaining. Surviving unions are still in sectors with the highest level of supernormal rents. If workers and negotiate over employment at the firm level, however, then job stability might be gained and wage inflation and profitability sacrificed in order to face the new economic framework in the 1990s. As a consequence, the negative effect of unions on the rate of profitability growth remains negative, although firm-level bargaining reduces that effect.

Table 5.8 summarizes unions' direct and indirect effects on different dimensions of firm performance. It must be stressed that the table analyzes the effects of industry-level unionization on the performance of the firm. Thus gaps between unionized and non-unionized firms are not calculated, but rather the effects of the extent and structure of bargaining on indicators of firm performance. In other words, in comparison to less unionized industries, firms in unionized sectors pay relatively higher wages, employ more workers, invest more, are relatively more productive, and obtain higher total profits, but at a lower rate, than those in less unionized industries.

Given the theoretically feasible but somewhat surprising positive direct effects of unions on the variables studied, except for profitability growth, and since these results are robust across different estimation techniques, further explored are possible biases in the estimation procedure. These biases could be the result of unobserved variables (such as management quality and practices), the result of

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[28] While first order autocorrelation is not present, as would be expected given the transformation undertaken, this set of instruments is still inadequate for the purposes described.

some exogenous processes taking place that could account for union organization, or even improperly modeled sample biases. In order to shed light on the possible existence of biases, further explored was whether unions had organized in sectors with particularly high productivity, for example, and studied the rank correlations for 1984, the year when unions re-organized after the military regime. Unfortunately no data on investments, concentration or profits are available for that year. With respect to wages, employment and productivity, no significant high-rank correlation was found (the highest Spearman was 0.33).[29] Also used were the 1988 rankings for investments and concentration as proxies for those in 1984, assuming that neither the levels of investment nor of concentration could drastically change between those years. Again, no significant rank correlation could be found using the 37 industries under study. Cross-tabulations for the levels of unionization were also performed, and some relationship was found among concentration, effective rates of protection, and union density in 1985 (based on data from Sapelli, 1986). The relation, however, is not systematic across the different categories defined.[30] These results suggest that these sectors could have been more profitable, and that union density could have increased in such sectors, eventually preventing further increases in profitability in those industries that, nonetheless, were the most exposed to competition by trade liberalization policies.

Biases in the results may also result from the survival, birth and death of firms in the unbalanced panel under consideration, and unions could have an effect on their survival and mortality odds. That is, if unions actually hindered firm performance, they would increase the mortality rate in the industry. In that scenario, those firms that would actually survive "despite" high union levels in their industry would be those that excelled on some other unobservable dimension (such as high-quality management) but not precisely because of the effect of union behavior. In order to explore the issue, a proportional hazard model was calculated using Kaplan-Meier hazard estimates.[31] These models analyze the relative probability of survival for a firm, controlling for the relevant variables (the same used in the models described earlier in this study). The difference between techniques refers to the former assuming a particular density function for the

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[29] Basically, industries are rank-ordered along the different variables, and the cancellation between these variables and unionization is calculated.

[30] For example, although the most concentrated industries are also the most unionized, the relationship cannot be extended to all the other strata, defined according to the degree of concentration.

[31] The results are presented in Annex 3 of Cassoni, Allen and Labadie (2001a).

odds of surviving (Cox), while no distribution is assumed in the latter case. The variables used to explain the survival rates include the degree of unionization of the industry the firm belonged to and the structure of bargaining in that sector. The results indicate that unions have no effect on firm mortality, while firm-level bargaining has a positive significant and effect on firm survival, as expected. Therefore, it is concluded that there is no significant bias in the sample indirectly related to unionization.

As is also true for other models, the survival analysis does not make it possible to control for unobservable variables such as quality of management or current management practices. It is certainly possible that those firms belonging to industries with higher levels of unionization could have better quality of management, particularly given the bias towards large firms in the panel. Despite this fact, it is clear that, given the variables included in the models, the results are not biased, except for the apparent capability of unions to organize in industries with higher levels of profits, and in more concentrated and relatively more protected sectors.

Conclusions

This chapter reaches several main findings on unions. First, unions increase both wages and employment. Second, unions promote investment as firms substitute labor for capital; this occurs as unions organize in plants with higher rates of profits, promoting increases in productivity and preventing profitability increases. The mechanism at work seems to be that, given that the result of union action is wage inflation and labor hoarding, firms have moved to more capital-intensive technologies, hence increasing the rate of growth of labor productivity and reducing that of profitability. The hypothesis is consistent with the notion that unions reduce the share of non-production workers in total employment, as found in Cassoni and Labadie (2001).

Negotiating at the firm level meant different things in different periods. Before 1993, given the mandatory extension of collective agreements, it is possible that bargaining at the firm level further reinforced the previous effects on wages and hence the indirect effects on the other variables. However, no statistically significant effects are found. The change in the structure of bargaining at the beginning of the 1990s, however, introduced another effect of unions that is linked to bargaining at a decentralized level. It can be presumed that, if unions started

caring more about job instability than in the past, then they would be willing to negotiate over employment in exchange for smaller wage increases, and this largely appears to be the case in Uruguay in light of the collective agreements registered at the Ministry of Labor during the period under consideration. Although statistically significant coefficients cannot be found with the dataset used, the signs are the expected ones and other research points in the same direction (Cassoni and Labadie, 2001).[32] Nonetheless, it is found that firm-level bargaining reduces levels and rates of investment, increases productivity and profitability, and has no effect on the rate of growth of profits. Moreover, after 1993, the more workers covered by decentralized bargaining, the lower the increase in profitability. The evidence points to negotiations taking into account the interests of both parties, so that enhanced productivity and probably survival are achieved together with lower rates of substitution of labor by capital and/or lower profits.

Union action is associated with increases in the level of investment. The result can be linked to the decline in the relative price of capital that unions generate when increasing the wages of those workers in unionized firms. It should also be related to firms' interest in overcoming rigidities and transaction costs introduced by union action. As firm-level bargaining becomes more frequent, the positive effect is reduced. No doubt it is easier to bargain over the introduction of new technology at the establishment level, so that union resistance diminishes and, at the same time, union-management cooperation becomes more feasible.

Unions increase productivity and productivity growth, while increased coverage of firm-level agreements further reinforces the effect. This may support arguments derived from the industrial relations literature, such as that unions promote cooperation and high morale among groups of workers. Given the Uruguayan general economic framework, however, especially at the beginning of the 1990s, the fact that unions decrease labor turnover may also have been a cause.

The above results are consistent with unions generating higher rates of profits. If they promoted investment in new technology, they generated increased productivity and productivity growth. So, in spite of rising wage levels, they could consistently allow the firm to obtain higher profits. However, given their negative effect on the rate of growth of profitability, the result also reflects the fact that unions tended to organize and to be stronger in those sectors in which extra rents were higher because of monopoly power.

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[32] This might be the consequence of the small number of years included in the analysis, particularly for the second period.

As a final comment, the results here summarized should be seen in light of the de-unionization process that has been taking place in the country. First, there is no doubt that the affiliation rate diminished in the 1990s, mostly because of the non-enforceability of collective agreements. However, the decline reported in the aggregate statistics overestimates the real magnitude, as it refers to the evolution of membership in industry-level unions that, in turn, belong to the central union. Thus workers organized in unions at the firm and establishment levels are not included. Second, the results suggest that bargaining at the firm level has promoted easier ways of introducing new technology, increases in productivity, higher job stability, more moderate wage inflation and lower increases of profitability. It is therefore sensible to think that cooperation between workers and managers acted as a means of facing the new economic environment. If this is so, then policymakers should evaluate the benefits of supporting bargaining so that the smallest firms can also enjoy the positive effects of unions. The policy, however, need to be well balanced; while setting general rules to protect the parties is necessary, special care has to be taken in order not to introduce rigidities that prevent the process from incorporating the specific characteristics of each unit.

The results indicate that the capital/labor ratio is neutral with respect to the mortality of firms (significant but not different than 1); the size of the firm has a positive effect (lower than 1 and significant), and market concentration (*C4*) increases the probability of survival (lower than 1 and significant). Tariff protection also has a positive effect on the odds of surviving; a higher implicit tariff, or a lower degree of openness, increases an establishment's probability of survival.

Among the union variables, union density at the industry level has a positive effect, but it is not statistically significant, so there are no union effects on survival odds. The change that took place in 1993—here modeled including a dummy variable multiplying union density—has no significant effect using this dataset covering the period up to 1995. If it were to be considered, however, it would lower the probability of survival relative to the previous period but the overall effect (adding the coefficients of union density and union density times dummy 1993) would still be lower than 1, the result thus being that unionization increases the probability of survival. The only significant result is that of firm-level bargaining, which increases the probability of survival even more than does a variable such as size.

The Effects of Unions on Productivity: Evidence from Large Coffee Producers in Guatemala

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The standard view of trade unions is that their purpose is to improve the material welfare of their members, principally by raising wages above the competitive level. There is an enormous body of literature documenting the impact of unionism on wages, and there is also a smaller body of literature examining the impact of unionism on other variables, such as wage dispersion (Freeman, 1986a), productivity (Clark, 1980), investment (Machin and Wadhani, 1991a) and employment (Boal and Pencavel, 1994).

According to several large coffee producers in Guatemala, the general belief is that unions have a negative effect on productivity, and in several cases unions have even been blamed for the bankruptcy of firms. This perception explains the negative attitude of the private sector towards unions. It is nonetheless interesting to point out that, even though this has long been the general assumption, no studies so far seem to have tried to quantify this effect. Until now only several descriptive documents have been published, which present an inconclusive exchange of opinions. Some of those documents mention the pro-union bias of labor legislation and its possible economic effects, but they do not present hard evidence (CIEN, 1999).

This chapter provides an econometric analysis of the impact of unions on a sample of large coffee plantations, specifically the impact of unions on productivity, measured as coffee production per worker. First, an equation is estimated using as independent variables a capital proxy, the proportion of administrative and

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permanent workers, land per worker, total workers, farm elevation above sea level and a union dummy. From this equation it is concluded that unions have a negative effect on productivity.

A similar equation is then estimated, one that includes interaction terms between the regular variables and the union dummy. The union coefficient in this equation, when significant, is positive. When a union is present, however, the effect on productivity of the land and height variables is reduced significantly. Furthermore, the effect of capital on unionized firms' productivity is larger than on the productivity of non-unionized firms. There is also strong evidence that diseconomies of scale are present in large coffee plantations.

Also tested was whether the overall effect of unions was negative in the previous equation. The coefficients of these regressions were used to calculate the predicted level of productivity at the means of all the control variables, and for two alternative values of the union dummy (zero and one). These values are always lower when a union is present.

Historical and Labor Market Background

The role of unions must be considered in light of the historically significant role of coffee in Guatemala's economy, which is in turn part of a very large agricultural sector with extensive informality.

Importance of Coffee Production

Coffee began to be cultivated intensively in Guatemala during the second half of the nineteenth century. Since then, production has expanded continuously, and coffee has become one of the main products of the country's economy. Guatemala's climate, volcanic soil and mountainous terrain, with a wide range of altitudes and microclimates, make the country suitable not only for coffee production in general but also for the development of many varieties, each with a different flavor and aroma (ANACAFE, 1997).

Currently, the coffee sector represents about 7 percent of GDP, and 2.5 percent of the national territory is used for coffee cultivation. The close correlation between general economic growth and the level of international coffee prices illustrates its importance. The economy generally is booming when international coffee prices are high, and growth slackens when prices are low (ANACAFE, 1997).

During the last decade coffee represented between 25 percent and 35 percent of total exports. In 1999 coffee export volume was 268,306,000 kilos, and in 2000 export volume reached 290,384,000 kilos. This represented export earnings of US$561 million in 1999 and US$574 million in 2000. It is important to note that, although export volume increased by 8.2 percent between 1999 and 2000, earnings increased by only 2.2 percent for the same period. This is mainly because international coffee prices declined during this period (BANGUAT, several years).

Another indicator of the importance of the coffee sector in the Guatemalan economy is the amount of manual labor it absorbs. Agriculture as a whole employs 40 percent of the economically active population, of which the coffee sector absorbs approximately 40 percent. This means that about 1.7 million people work in the coffee sector (ANACAFE, 1997). A national survey, however, only accounts for 600,000 persons working in this sector (INE, 2000).[2]

There are almost 7,000 coffee producers in Guatemala, organized through a national association called ANACAFE. This association classifies producers into four main groups: (i) large producers: farms producing more than 2,000 one-hundred pound bags per year; (ii) midsize producers: farms producing 1,000-2,000 one-hundred pound bags per year; (iii) small producers: farms producing 100-1,000 one-hundred pound bags per year; and (iv) cooperatives of very small producers: farms that produce fewer than 100 one-hundred pound bags per year.

About 300 farms are registered as large producers, and this category accounts for almost 80 percent of total coffee production in Guatemala (González, 2001).

Labor Market

Table 6.1 presents some information for the Guatemalan labor market in 1999, taken from the National Survey on Family Income and Expenses 1998-1999, compiled by the National Institute of Statistics (INE), and from the 1999 Bulletin of Labor Statistics of the Labor Ministry, the latest employment statistics available.

According to the Labor Ministry and INE, the unemployment rate for 1999 was less than 2 percent, which is low compared to levels in developed countries. The main reason is probably the absence of unemployment insurance (public or private)

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[2] The discrepancies can be attributed to survey procedures. ANACAFE might count the same workers several times, since many of them travel from farm to farm depending on the labor demand. As for INE, the low number might be that on the date when the census was made there was a low demand for workers because of seasonal variations. In addition, many farms harvest several agricultural products rather than coffee alone, a situation that could be biasing both sources. This explanation, however, is only the authors' opinion.

Table 6.1. General Employment Statistics for Guatemala (1999)

Total population	10.5 million
• Urban population	39.7%
• Rural population	60.3%
Total population of working age (7 years or older)	79.0%
Total economically active population *	50.5%
• Male	66.8%
• Female	35.2%
• Urban	52.7%
• Rural	48.8%
Total inactive working population	49.5%
Annual growth rate of formal employment (1990-98) **	1.5%
Employment by economic activity	
• Agriculture	39.8%
• Commerce	19.8%
• Manufacturing industry	16.6%
Participation of economic activity as percentage of GDP	
• Agriculture	23.0%
• Commerce	24.5%
• Manufacturing industry	13.4%
Wages	
• Average monthly wage (nominal)	US$ 212.15
• Minimum wage per working day, non-agricultural activities	US$ 3.74
• Minimum wage per working day, agricultural activities	US$ 3.39

Sources: INE (1999), Labor Ministry (1999).
*Includes males and females age 7 or older who are working, engaged in productive activities or searching for a job.
** Measured by affiliates of the Instituto Guatemalteco de Seguridad Social (IGSS).

in Guatemala. Another reason is that labor market participation in itself is low (50.5 percent of the total population). Additionally, a large proportion of the population is employed in the agricultural sector, which is characterized by a high degree of informality. About 30 percent of the economically active population contributes to the social security system, but in the agriculture sector this proportion is less than 10 percent. One reason might be that work in this sector is mostly seasonal, so its contribution is not measured in the formal labor sector.

In Guatemala the labor market is characterized by a high degree of informality, which is even higher in agriculture. The agriculture sector employs more than a third of the economically active population but pays lower average wages because it attracts workers with very poor schooling and literacy levels.

Unions in Guatemala

The environment in which Guatemala's unions operate is determined by the overall framework of labor legislation, as well as legislation specifically addressing organized labor. The role of unions is also affected by their overall size and importance.

General Labor Legal Framework

The Political Constitution of the Republic, the Labor Code (Decree 1441), the Civil Service Law, and the international agreements and treaties to which Guatemala is party regulate the country's labor market. Guatemalan labor legislation is inspired by the principle that legal protection must favor workers and therefore grants a minimum and an inalienable set of rights. These principles are established first in the Political Constitution of the Republic and enforced by general norms such as the Labor Code and the Civil Service Law. In addition, workers' rights cannot be diminished, only expanded.

Foremost among the rights guaranteed in this legal framework is the right of private sector workers to a minimum wage that must cover the "material, moral and cultural needs" of the worker and his family. Other minimum rights include a pre-established number of working days per week; maximum working hours per day and month; wage levels depending on when hours are worked (for example, regular weekdays, weekends, after-hours and so on); labor benefits; payment of lost wages for damages caused by dismissal; and freedom to unionize and strike. [3]

The hiring of agricultural workers (laborers, day laborers, cattle drivers, and others) is additionally regulated by the Labor Ministry according to Labor Code

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[3] Benefits include vacations (4.11 percent of the total annual wage), severance payments, thirteenth and fourteenth monthly salary (16.66 percent of the total annual wage), productivity bonuses; and payments to the Guatemalan Social Security Institute (13 percent of the total annual wage), the Workers Recreation Institute and the National Institute of Technology and Qualification (2 percent of the total annual wage).

Articles 138 to 145. The Labor Code allows the improvement of the minimum benefits established in the labor legislation, depending on what other employers usually offer and according to employers' economic capacity. It is important to note that the legislation indicates that the minimum guarantees may only be improved if the employer is (economically) able.

Wages may be paid on the basis of units of time (per month, two weeks, week, day or hour), on unit of work (per piece, task, raised price or piecework) or as a share of sales; the worker does not, however, assume the risks of losses that the employer faces (Articles 88 to 96 of the Labor Code). Generally, the employer initially determines the wage level, and thereafter it may be negotiated with the worker.

The minimum wage is set annually by the National Wage Commission, which is affiliated with the Labor Ministry. The Parity Commission is composed of two employers and two unionized workers, and a Labor Ministry inspector advises this commission. If the National Wage Commission cannot reach an agreement on the minimum wage, the President of the Republic makes a final decision.

Wages can only be paid in legal currency, and it is expressly prohibited to make payment in whole or part in merchandise, bonds, cards, coupons or any other form that may replace currency. However, workers in agricultural activities or cattle-raising activities may obtain a maximum of 30 percent of their total wage payment in food and other articles used for their own immediate personal consumption or for that of their dependent relatives; this payment is to be provided at or below cost by employers.

Legal Framework of Unions

The freedom to organize is a basic right of workers in Guatemala, as guaranteed by Article 34 of the Political Constitution of the Republic (1985) and International Labour Organization (ILO) Convention 87; the right of private-sector workers to organize is further detailed in the Labor Code and its modifications.[4] The enforcement of this right was also an important issue during the peace negotiations between the Guatemalan government and the guerrilla movement in 1996.[5]

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[4] In July 2001 the Labor Code underwent a major reform that strengthened the position of unions. These changes, however, are not included in this chapter.

[5] Guatemala's civil war began in the mid-1960s. The war officially ended in 1996 when the government and the guerrillas signed the peace agreements that, besides ending the war, included an extensive program to improve the social and economic conditions of the population.

According to the Labor Code, union associations require the enrollment of at least 20 workers and are classified as:

a.   Agricultural unions: constituted by agricultural workers or employees of agricultural or cattle-raising companies, or self-employed workers in cattle-raising or agriculture.
b.   Urban unions: all those not included within the activities of agricultural unions.

Unions can also be classified as:

a.   Guild unions: those formed by workers of the same profession or those of the same economic activity.
b.   Company unions: formed by workers of different professions that provide services to the same company or two or more equal companies.

Legal principles that apply to all unions include respect for the will of the majority, secret ballots and one vote per person.

Since freedom of association and the right to unionize are legally recognized, workers cannot be dismissed for participating in the formation of a union or for belonging to one. Under the Labor Code workers enjoy the right of non-dismissal from the moment they notify the General Labor Directorate of the Labor Ministry that they are forming a union, and they enjoy this protection up to 60 days after the official publication of an announcement. However, if during this period the worker commits an act that is defined in the Labor Code as a cause for dismissal, the employer is allowed to initiate, in the labor courts, a procedure to cancel the labor contract and authorize dismissal. The right of non-dismissal extends to union officials as long as they remain in office and until one year after they leave their position in the union leadership.

Unions are the only labor organizations recognized by law, and only unions can negotiate collective agreements and call for strikes. Collective bargaining is carried out only at the establishment level, and collective agreements apply to all workers, unionized and non-unionized. Although all workers benefit from a collective agreement, only unionized workers pay membership fees; these fees, which vary from union to union, are usually a percentage of salary. When a legal strike is held, the employer must continue paying his employees for as long as the

strike lasts, and the employer is not allowed to hire additional workers to replace them. Employers assume indefinitely all costs of a strike, as long as it is legal and fair. For a strike to be declared legal it must comply with all the legal requirements, and for it to be declared fair a labor court must declare that the union is justified in its demands.[6] The only other restriction on the right to strike occurs in the agricultural sector, where a union cannot call a strike during harvest time.

Although unionization is a right guaranteed by the constitution, employers may engage in different strategies to discourage union formation. Many of these are not forbidden by the current legislation, but others can be considered to be outside the legal framework. As the Labor Ministry does not collect statistics on illegal actions by employers against unions, information on these practices comes from interviews with lawyers and union officials. Some of these strategies include the following:

a.   *Firing workers.* It is illegal to dismiss anyone trying to form a union once a formal request is presented at the Labor Ministry. Some employers anticipate this stage and fire union promoters before the official request is made.

b.   *Non-compliance with union requirements.* Employers can look for any violation in the formation of a union. If the procedure is not fully complied with, the Labor Ministry is forced to dissolve the union.

c.   *Promote alternative associations.* Although unions are the only labor organization recognized by law, employers can promote other types of associations. Such is the case of a "*solidarismo*," a non-profit association of employers and employees. The advantage of this association is the perceived goodwill among its members, contrary to the perceived aggressiveness of unions by employers. Moreover, there are no legal prohibitions on the coexistence of a union and other organizations in the same company. This may dilute the power of a union within the company.

d.   *Hiring rules and human resources management.* Employers can hire personnel with the specific purpose of informing management of problems within the workforce or plans of forming a union. Companies may also develop a policy of not contracting anyone who

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[6] A fair strike occurs when the reasons that motivated it are caused by the employer, because of non-compliance with individual contracts or collective agreements, or because the employer unjustly denied the workers a raise or any other benefit when able to grant it (Labor Code, Article 242).

has been a union member or has worked in a company that has or had a union. Another strategy is to hire only temporary personnel.

e.   *Other strategies.* Employers can engage in actions that, although not necessarily illegal, might be considered unethical. One such practice involves bribing workers with money or promotions to prevent them from unionizing. Another is to fragment the establishment so that there are not enough employees in each firm to form a union. Some union members have reported illegal actions such as threats and physical harm, but it is difficult to confirm the veracity of these claims, since most cases never reach the judicial system. Most of these conflicts are resolved privately between the interested parties, often because of the high costs of resolving them in the courts.

Generally, employers will try to stop unions from forming, because unions are viewed as having a strong negative effect on productivity. For example, a union has the legal power to force the employer to accept a collective agreement, which he cannot refuse. Moreover, if the employer still refuses to accept the agreement, unions have the right to call strikes, but they do not bear any of the costs if the strike is declared legal and fair.

Additionally, since the law does not restrict what may be included in collective agreements, union officials tend to make demands that often do not take into account the reality of the firm. Those demands may include additional wages and benefits that are not linked in any way to productivity. Collective agreements may further include restrictions on the contracting of workers and on working practices.[7] In the case of collective agreements on coffee plantations, employees' duties are covered by detailed restrictions. Sometimes they go as far as limiting the number and size of holes for new plants that an employee can dig on a working day. Some agreements also establish how many plants and to what height the employees can prune them during the working day.

These restrictions have several effects. First, they usually keep employee productivity under its optimal level. It is observed that similar workers on the same farm, but hired under agreements that do not impose these restrictions, achieve higher yields. As a result, employers may be forced to hire additional workers to complete tasks on time.[8] These agreements may also reduce productivity by

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[7] See Fernández Molina (1996), González (2001) and Contreras (2001).
[8] See González (2001).

delaying technological improvements. Because of the degree of detail in which the contracts are written, employers introducing technological changes can be brought before labor courts on charges of violating an agreement. Employers are usually unwilling to initiate new negotiations simply to change a few working practices, however, because a new agreement usually implies more benefits for workers. Moreover, employers already face the prospect of frequent negotiations. By law, collective agreements are valid for only one year, although they are renewed automatically for an additional year if neither party chooses to renegotiate.

As can be seen, once a union is created it might be very harmful to a firm. Nonetheless, employers have available many effective ways of stopping unions before they form. Moreover, unions have a limited scope for influence: they can only negotiate a collective agreement for workers in a single firm, rather than an industry or an economic sector. This might help explain the low density of unions in the labor force.

Size and Importance of Unions

In 1999 Guatemala had a population of 10.5 million, of which 50.5 percent constituted the economically active population (EAP). According to Labor Ministry estimates, in May 1999 there were 1,389 union organizations in Guatemala; slightly over a third (35.56 percent) were considered to be active organizations (with their own legal personality and renewal of the executive committees). The average number of workers per union was 68, and the country's unions had 94,878 members, or 1.7 percent of the EAP. Although 1997 Labor Ministry estimates indicate that 76.5 percent of unions operated in the private sector, union membership amounted to

Table 6.2. Enrolled Unions, Number of Members by Sector *(1999)*

Concept	Total	Public Sector	Private Sector
Organizations	1,389	401	988
Affiliated workers	94,878	34,929	59,949

Source: Ministerio de Trabajo, *Boletín Estadístico* 1999.

Table 6.3. Enrolled Unions, Federations and Confederations
(1943 to 1997)

Legal status	Total enrollments	Public Sector	Private Sector
Unions	1,222	293	929
Federations	48	6	42
Confederations	5	0	5
Totals	1,275	299	976

Source: Labor Ministry, Boletín Estadístico 1997.

only 2 percent of private sector workers, and most unions are concentrated in the central and southwestern regions of the country.[9]

Unions are usually associated with national organizations or federations, which in turn belong to larger associations called confederations, as shown in Table 6.3. Besides the fees that affiliated unions pay to federations and confederations, these larger associations usually receive additional support from foreign labor organizations. It is common for unions to change frequently from one federation to another, and it is also common, because of the low density of unionization, for other social organizations such as peasant groups to belong to federations. In general, unions are very rare, especially in the private sector, and they are very decentralized.

In 1997, 50.6 percent of unions were concentrated in the agricultural sector, 21.8 percent in personal services and 13 percent in industrial activity. The largest unions, based on the average number of affiliates, were those in electricity, gas and water (565 members); followed by transport, storage and communications (157 members). The unions with the smallest number of affiliates were those in commerce, restaurants and hotels (44 members) and agriculture (50 members). Several problems limit the organization and operation of unions. These problems include low levels of motivation and awareness of unions, as well as a loss of credibility in the leadership of several unions. Actions taken by employers to avert the formation of unions also limit participation (Morales Modenesi and de León, 1995).

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[9] The central and southwestern regions consist of the departments of Guatemala, Solola, Totonicapan, Quetzaltenango, Retalhuleu, Suchitepequez and San Marcos. In any event, figures on unionization must be used with care. As Morales Modenesi and de León (1995) observe: "it is difficult to establish with certainty how many organizations are active and how many workers are unionized. Very often not even union leaders, independently of the organization size, have this information on hand."

Table 6.4. Number of Unions by Economic Activity *(1943 to 1997)*

Economic activity	Total enrollments by activity	Number of affiliated workers		
		Total	**Females**	**Males**
Totals	1,275	97,523	9,274	88,249
Agriculture	646	32,315	1,492	30,823
Operation of mines and quarries	4	228	0	228
Manufacture industry	167	13,335	1,783	11,552
Electricity, gas and water	6	3,389	104	3,285
Construction	20	2,395	103	2,292
Commerce, restaurants and hotels	38	1,673	622	1,051
Financial activities	30	3,152	689	2,463
Personal services	278	32,568	4,214	28,354
Not specified	40	1,246	103	1,143

Source: Labor Ministry, Boletín Estadístico 1997.

The average number of workers per union in agriculture is low compared to other productive sectors. This is because agricultural activities are mainly seasonal, and the temporary workers who make up the majority of the agricultural workforce do not have the same freedom to organize as permanent employees. It can thus be concluded that union associations in rural areas do not have the same presence as those in urban areas.[10]

In the coffee sector, official information on unions is scant and unreliable. According to the Labor Ministry, between 1947 and 2000, 19 agricultural unions have been authorized, of which five were in the coffee sector. Until March 2001, only two of these unions were legally recognized, and only one had a collective bargaining agreement on working conditions (Rolando, 2001). Members of ANACAFE, however, estimate that the employees are unionized on about 10 percent of the large farms (more than 30 farms), but there are no official or private statistics to support this information.

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[10] More detailed data about the size and importance of unions in Guatemala can be found in Annex 1 of Urízar H. and Lée (2003).

Data

Given the paucity of other sources, the data used for this chapter's analysis of coffee production were collected directly through a survey of 100 coffee producers.[11] The response rate to the survey was 65 percent. Since it was necessary to remove from the sample those producers that did not provide data for four consecutive years between 1992 and 2000, the chapter uses data for 37 producers. Table 6.5 shows the number of firms per year used in this chapter.

Output

This variable was measured in 100-pound bags of *pergamino* coffee per year.[12] Measurement of output in physical units avoids the problem mentioned by Booth (1995) and Clark (1980) when production is measured in value added. In that case observed differences in productivity may result from high prices, overestimating the true productivity differential due to the existence of a union.[13]

Table 6.5. Unbalanced Panel Data Description

Year	Number of Firms
1992	34
1993	34
1994	34
1995	36
1996	36
1997	37
1998	37
1999	37
2000	31
Total Observations	316

[11] For further details, see Annex 4 of Urízar H. and Lée (2003).
[12] *Pergamino* coffee is obtained after the process of seeding (eliminating the fruit and obtaining only the seed).
[13] Although coffee prices are set internationally, it is sold with premiums or discounts because of the quality of the bean, which is established, among other things, by the height of the farm and the variety of the plant.

Employment

This variable measures the number of workers, which are divided into:

a. Temporary workers or *jornaleros*: workers involved in fieldwork, such
    as coffee harvesting and plant maintenance. These workers do not live
    on the plantations and are hired solely for specific activities. According
    to current legislation, the average duration of these contracts must be
    less than 90 days for a worker to be considered temporary; afterwards
    the relationship is considered permanent.
b. Permanent workers or *colonos*: workers who perform the same activities
    as the temporary workers but generally live on the plantation premises
    permanently. This generates additional costs for the producer. These
    types of workers tend to unionize, since they have a long-term labor
    relationship with the employer.
c. Administrative workers: the administrators of the farm and personnel
    (engineers or agronomists), workers in charge of the payroll or *planilleros*,
    teachers and nurses (the latter two when the plantation provides
    primary education and health care to its permanent employees).

It should be noted that there may be a significant bias in the employment
measurement. The economic literature generally considers the labor unit as one
employee, but in the case of Guatemala this is not always the case, especially in
agriculture. While the employer negotiates a labor contract with an employee, the
employee's whole family, including spouse and children, performs agricultural
work. This practice is even recognized in Article 139 of the Labor Code.

Land Input

Land is an indispensable input for all agricultural products, and in this case land
is measured by the area planted with coffee on each farm. It is important to note
that there were several farms that harvested other products, such as sugarcane,
rubber and lumber. The unit of measurement was *manzanas*, a local measurement
equivalent to 0.6988 hectares.

Another relevant feature of the land input is the elevation of the farm. This
has a distinguishing impact on the life cycle of the plant and the quality of the
coffee bean. At higher altitudes, a better coffee quality is expected. This variable

was measured in feet above sea level. Since portions of the same farm may lie at different heights, a simple average of the highest and lowest altitude on each farm is used in the estimations.

Capital

Because of the special characteristics of coffee production, capital investment is not measured by the traditional variables (cost of equipment or machinery), but by planting and maintenance of coffee plants.[14] These activities were measured by the following proxies:

    a.   whether a tree nursery is used or not;
    b.   whether plants are grafted or not;
    c.   number of plants seeded per hole;
    d.   number of times plants are fertilized;
    e.   distance between plants; and
    f.   use of traditional or higher technological methods of fieldwork and harvesting.

These variables represent a very broad definition of capital. Holding land and employment constant, an attempt was made to determine what other variables would yield higher productivity when they increased as well. For the estimations, only statistically significant variables were used: if a tree nursery was used, the number of plants per hole and whether traditional or highly technological methods were used.

Regions

The location of the farms is a variable that makes it possible to identify differences in technology, socio-demographic and cultural characteristics, quality of land and climate. The farms were divided according to their location into five regions.

    1.   East: departments of Zacapa, El Progreso, Jalapa, Chiquimula, Jutiapa and Santa Rosa.
    2.   South coast: departments of Escuintla, Suchitepequez, Retalhuleu, San Marcos and Quetzaltenango.

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[14] See Annex 3 of Urízar H. and Lée (2003) for a more detailed explanation of these characteristics.

3.   North (Coban): departments of Alta Verapaz, Baja Verapaz, Izabal and Petén.

4.   Central Valley: departments of Guatemala, Chimaltenango and Sacatepequez.

5.   Highlands: departments of Huehuetenango, Quiché, Totonicapán and Sololá.

Union Presence

Data on the presence of unions on coffee plantations were obtained directly from the survey, and a dummy variable was constructed to capture this information. Also of interest was information on any previous unionization efforts on the plantations. This is important in determining the percentage of plantations that have previously experienced attempts at union formation, as well in identifying the means producers used to prevent the formation of a union.

A total of eight unionized firms were interviewed. Of these, four had a union throughout the full sample of nine years; one firm had a union from 1993 to 2000; two had a union for only five years (one from 1993 to 1997 and the other from 1992 to 1996); and the last had a union for only two years, from 1999 to 2000. Seven of these firms are located in region two, and the other is in region four.

Theoretical Framework

The coffee data provides measures of output (Q) and four inputs: capital (K), land (L), work days of permanent workers (N_p), work days of temporary workers (N_j) and work days of administrative workers (N_a). This information can be summarized and used to estimate the difference in productivity with and without a union, using the standard analysis of a production function (Chiang, 1984). Therefore, it is assumed that the coffee production function is written in the following way:

$$Q = AQ(N, L, K) \quad (1)$$

where Q denotes output, N is the effective labor input, L is land and K represents capital. It is assumed that there are two types of workers: union workers, denoted by N_u, and non-union workers, N_n. N_n workers include permanent, temporary

and administrative workers, while N_u can only include permanent workers.[15] Furthermore, it is assumed that productivity differs between unionized and non-unionized farms. To control for this possibility, and thus to identify the union/non-union differences that arise from cultural, geographical and idiosyncratic factors, a Cobb-Douglas production function is specified. Equation (1) can therefore be rewritten as the following explicit function of labor and capital:

$$Q = A \cdot L^\alpha \cdot K^\beta (N_p + \sigma \cdot N_a)^\gamma \quad (2)$$

where p stands for permanent workers and a for administrative workers.

Following Clark (1980) and Booth (1995), the production functions for unionized and non-unionized firms, respectively, can be written as:

$$\ln\left(\frac{Q}{N}\right)_u = \ln(A_u) + \alpha_u \ln\left(\frac{L}{N}\right)_u + \beta_u \ln\left(\frac{K}{N}\right)_u + \gamma_u \ln\left(\frac{N_p + \sigma \cdot N_a}{N}\right)_u -$$
$$(1 - \alpha - \beta - \gamma)\ln(N)_u \quad (3)$$

and

$$\ln\left(\frac{Q}{N}\right)_n = \ln(A_n) + \alpha_n \ln\left(\frac{L}{N}\right)_n + \beta_n \ln\left(\frac{K}{N}\right)_n + \gamma_n \ln\left(\frac{N_p + \sigma \cdot N_a}{N}\right)_n -$$
$$(1 - \alpha - \beta - \gamma)\ln(N)_n \quad (4)$$

where u and n indicates union and non-union, respectively. The assumption that the production function has constant returns of scale (CRS) is given by:

$$1 = \alpha + \beta + \gamma \quad (5)$$

where γ is the elasticity of output with respect to labor.

Equations (3) and (4) control for union/non-union differences in the production parameters, but within the two sectors technology and productivity may vary because of regional effects. Dummy variables have been constructed to control for this effect. Still, input ratios might have different effects on productivity in the unionized and non-unionized firms, so that the estimated union effect may depend on parameter differences and the level of the input ratios at which the union/non-union comparison takes place. Because of the limited number of

[15] The legislation recognizes administrative workers as management employees who cannot be part of a union. Temporary workers cannot unionize since they do not have a long-term relationship with their employer, which is also required by union legislation.

observations, the union and non-union parameters will be estimated jointly using interaction terms between the independent variables and the union dummy to obtain a more efficient estimation.[16]

$$
\ln\left(\frac{Q}{N}\right)_i = \ln A_n + bU + (\alpha_u - \alpha_n)\ln\left(\frac{L}{N}\right)_i U + (\beta_u - \beta_n)\ln\left(\frac{K}{N}\right) U +
$$
$$
(\gamma'_u - \gamma'_n)\ln\left(\frac{N_a}{N}\right) U + (\gamma''_u - \gamma''_n)\ln\left(\frac{N_p}{N}\right)_i + (\theta_u - \theta_n)_i \ln N_i U + \alpha_n \ln\left(\frac{K}{N}\right)_i +
$$
$$
\beta_n \ln\left(\frac{K}{N}\right) + \gamma'_n \ln\left(\frac{N_a}{N}\right) + \gamma''_n \ln\left(\frac{N_p}{N}\right) + (\theta_n - 1)\ln N_i + \sum_k^r (\pi_u - \pi_n)_k \quad (6)
$$
$$
REG_k U + \sum_k^r \pi_{nk} REG_k
$$

The coefficients on the interaction terms provide estimates of the difference between union and non-union parameters, while the non-union parameters are given by the coefficients on the regular independent variables.

Empirical Results

In order to evaluate the effects of unions, industry productivity equations are estimated without union interaction terms and then with them. The results are finally estimated with fixed effects.

Results of the Industry Productivity Equations without Union Interaction Terms

As mentioned in the data description, for the industry productivity analysis, an unbalanced panel with data for 37 companies was constructed, consisting of nine years from 1992 to 2000. A regression analysis was used to estimate a labor productivity function, for which the results are shown in Table 6.8. These regressions are the estimation of equation (6) above, but without the union interaction terms.[17]

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[16] In the empirical results, this equation is estimated according to the methodology presented in Clark (1980). Nonetheless, because of the length of the time series in the panel data, when every variable is interacted with unionism the efficiency gains relative to estimating separate regressions for union and nonunion firms are likely to be minor; the only constraint used to improve efficiency is equal error variance in the two equations. Consequently, in the empirical section an equation is first estimated without the union interaction terms.

[17] This was performed in light of the amount of data available, with a view to securing a better understanding of unions' direct and overall effects on the productivity of coffee farms, before complicating the estimation by incorporating the union interaction terms.

Table 6.6. Description of Variables Used

Variable (symbol)	Measurement issues	Characteristics of the data set used	Variable used in regressions
Q	Measuring output	Production is measured in 100-pound bags. To measure the productivity per worker, an additional variable was constructed: total output divided by total workers.	Output Output/ Worker
N	Labor input	Labor is divided into: 1) Jornaleros or temporary workers. 2) Colonos or permanent workers. 3) Administrative workers. 4) Total workers.	1) Temp Workers 2) Perm Workers 3) Adm Workers 4) Total Workers
L	Land input	Land is measured by cultivated area (*manzanas*). Average height of each farm.	Land Height
K	Capital input	Capital is measure by seedtime, renovation and maintenance of coffee plants, through: 1) Number of plants seeded per hole. 2) Number of times plants are fertilized. 3) Use of traditional or highly technical methods of fieldwork and harvesting. 4) Capital investment. [1]	1) Plants per hole 2) Fertilizer 3) Hi-tech methods 4) Capital
A	Vector to control for regional differences	Farms were divided into five regions, depending on location, defined as follows: I. Eastern Region II. Southern Coast III. Northern Region (Cobán) IV. Central Valley V. Highlands	REGi; i=index region
U	Unionization	A dummy variable that is 1 if a firm is unionized and 0 if it is not.	Union

[1] This variable is a linear aggregation of the number of plants seeded per hole, the number of times plants are fertilized each year and whether the farmer uses traditional or highly technical methods of field work and harvesting. For estimation purposes, this variable was used in this form and not on a per-worker basis, since the variable measures only fixed effects (for example, if a farm is considered to be more capital-intensive than another). Dividing this figure by worker would only have been useful if there had also been a better measurement that also indicated changes in slope.

Table 6.7. Variable Means and Standard Deviations*

Variable	All Farms		Non-Unionized farms		Unionized Farms	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Output	4,494.2	3845.8	4,288.6	3,846.5	6,063.6	3,778.6
Output/ worker	35.8	40.1	41.5	42.6	16.3	13.4
Temp. workers	213.2	307.1	146.8	206.9	420.0	461.8
Perm. workers	65.7	76.1	48.7	67.0	150.7	69.2
Adm. workers	6.9	7.2	5.5	6.0	13.9	9.3
Total workers	287.1	345.4	201.1	245.2	584.5	447.2
Land	666.4	2043.0	289.3	229.4	2,098.6	4,084.3
Height	3,733.2	1191.6	3,915.0	1,114.2	3,381.2	1,282.2
Plants per hole	1.6	0.5	1.7	0.5	1.4	0.5
Fertilizer	2.5	0.6	2.6	0.5	2.1	0.6
Hi-tech methods	0.6	0.5	0.6	0.5	0.6	0.5
Capital	4.6	1.1	4.8	1.1	4.1	0.9
Union	0.2	0.4				

* 1992-2000.

The main interest is to estimate the effects of unions on the productivity of coffee farms. The dependent variable is the logarithm of coffee production or output per worker, and the values in parenthesis under the coefficients are the corresponding standard errors.

The estimation method used for the first regression in Table 6.8 was pooled ordinary least squares (OLS). This equation was estimated using data only from Region 2, where most of the unionized firms are located. The purpose of estimating this equation was to establish a benchmark to which results for the whole country could be compared. This group of farms is very similar in elevation,

Table 6.8. Results of Industry Production Equations *(without union interaction terms)*

Dependent variable: Log(Output/ Total Workers)	1 OLS	2 OLS	3 OLS	4 GLS	5 OLS	6 GLS
Constant	-0.217	0.020	-1.289	-1.735	-0.014	-0.014
	(0.868)	(0.054)	(0.842)	(0.565)*	(0.023)	(0.006)*
Log (Capital)	1.178	1.719	0.690	0.702	0.608	0.943
	(0.281)*	(0.325)*	(0.188)*	(0.090)*	(0.184)*	(0.107)*
Log (Adm Workers/ Total Workers)	7.638	6.233	0.813	0.881	0.612	0.901
	(1.506)*	(1.970)*	(0.901)	(0.425)*	(1.060)	(0.586)
Log (Perm Workers/ Total Workers)	-0.244	-0.323	0.008	0.053	0.388	0.246
	(0.422)	(0.451)	(0.186)*	(0.095)	(0.219)**	(0.101)*
Log(Land/ Total Workers)	0.328	0.249	0.398	0.479	0.296	0.556
	(0.058)*	(0.058)*	(0.047)*	(0.042)*	(0.052)*	(0.039)*
Log(Total Workers)	-0.180	-0.198	-0.256	-0.248	-0.353	-0.235
	(0.082)*	(0.069)*	(0.048)*	(0.021)*	(0.044)*	(0.032)*
Log(Height)	0.250	0.129	0.481	0.511	0.376	0.242
	(0.139)**	(0.103)	(0.101)*	(0.069)*	(0.048)*	(0.025)*
Union	-0.459	-0.198	-0.387	-0.235	-0.202	-0.107
	(0.114)*	(0.095)**	(0.099)*	(0.072)*	(0.068)*	(0.062)**
Region2			0.535	0.614	0.699	0.559
			(0.109)*	(0.059)*	(0.120)*	(0.069)*
Region3			0.359	0.443	0.567	0.401
			(0.139)*	(0.063)*	(0.139)*	(0.073)*
Region4			0.844	0.866	0.888	0.878
			(0.128)*	(0.077)*	(0.138)*	(0.080)*
R-squared	0.716	0.888	0.715	0.980	0.950	0.948
F-statistic	47.185	76.147	76.535	148.204	581.186	553.315
Prob(F-statistic)	0.000	0.000	0.000	0.000	0.000	0.000
Durbin-Watson stat.	1.136		0.701	1.005		
Total panel observations	139	139	316	316	316	315

** Denotes significant at 10 percent.
* Denotes significant at 5 percent.
Values in parentheses are standard errors.

coffee variety planted, weather, landscape and socio-demographic characteristics. Although these differences were controlled for using regional dummy variables in further estimations, it was unclear whether they would be sufficient to capture the information related to all of these differences.

The results show that the union dummy has a negative and significant effect on the productivity of coffee farms. As for the capital variable, the proportion of administrative workers to total workers, the amount of land to total workers and the elevation of the farm have a positive and significant effect on productivity. The total workers variable is negative and significant at the 5 percent level. This could indicate the presence of some diseconomies of scale.

An exploratory analysis of the results of equation (1) shows that some of the firms are affected by autocorrelation. Equation (2) basically estimated again the first equation, except that it corrected for this autocorrelation problem. It was corrected with generalized differences using an estimated value of the autocorrelation coefficient of each firm.[18] The results are not significantly different from the previous equation, except that the union coefficient is only significant at the 10 percent level and the elevation variable is no longer significant.

Equation (3) has the same specification as equation (2), except that the sample is expanded to include farms from all over the country. Therefore, dummy variables for each region are also included. The estimation procedure is pooled OLS and the standard errors are White heteroskedasticity-consistent. Equation (4) has the same specification but is estimated using pooled generalized least squares (GLS). Equations (5) and (6) are essentially the same as (3) and (4), but they are corrected for autocorrelation using the generalized differences procedure explained above.

The results do not vary greatly between the first two equations: unionization always has a negative and significant effect on productivity. As for the other variables, capital and farm elevation are positive and significant at the 5 percent level. In equations (3), (5) and (6) the coefficient of permanent workers was positive and significant, while the proportion of administrative workers was no longer significant. Moreover, in all the equations there were diseconomies of scale. The dummy regional variables are also significant at the 5 percent level in all cases. The strongest regional effect on productivity was that of Region 4, which includes the Central Valley.

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[18] Each correlation coefficient, ρ, was obtained from the corresponding Durbin-Watson estimator: DW=2*(1-ρ).

Results of the Industry Productivity Equations with Union Interaction Terms

The results of the full estimation of equation (6) above, including the interaction terms between the union dummy and the other variables, are shown in Table 6.9. The estimation method used in each equation is the same as those shown in Table 6.8. The first and second column only include data for Region 2, equation (1) is estimated using pooled OLS, and equation (2) uses the same methodology, but correcting for autocorrelation. The equations are divided into two parts: the first are the results of the coefficients of the regular variables, which explain the changes in productivity in the non-union farms, and the second set are the same coefficients, but interacting with the union dummy variable. The coefficients on the interaction terms provide estimates of the difference between union and non-union parameters.

The union variable is not significant in equation (1). The interaction terms, however, show some interesting results: administrative workers are more relevant in explaining productivity; unions reduce the productivity of the land factor; and some diseconomies of scale may be present as well.[19] Of the regular variables, only administrative workers, land to total workers and total workers are significant, and the signs of the coefficients are similar to those of equation (1) in Table 6.8.

In equation (2) of Table 6.9 the union coefficient has a highly positive and significant effect on productivity. The interaction terms nonetheless show that the effect of permanent workers, land and elevation is negative in unionized farms, contrary to what is seen in farms where there is no union present. The interaction term with capital is significantly larger than in non-unionized firms, indicating that capital investment has a larger effect on unionized farms' productivity.[20] The interaction term with total workers indicates diseconomies of scale in unionized firms.

Equations (3) and (4) in Table 6.9 are very similar to equation (1), except that they include data for all regions, and regional dummies are included to control for this difference. The estimation method of equation (4) is pooled GLS. Equations (5) and (6) are similar to the previous two, except that they are also corrected for autocorrelation.

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[19] To estimate the economies of scale in unionized firms the coefficient of the interaction term of total workers with the union variable was added to the regular coefficient of total workers, and then added one. If this value was less than one, then diseconomies of scale were present.

[20] Nonetheless, the causality of the capital variable is not quite clear. According to interviews with coffee producers, union promoters specifically directed the unionization efforts toward those farms that already had high levels of technology and capital investment.

Table 6.9. Results of Industry Production Equations

Dependent variable: Log(Output/ Total Workers)	1 OLS	2 OLS	3 OLS	4 GLS	5 OLS	6 GLS
Constant	2.941	-0.060	-2.736	-3.597	-0.024	-0.036
	(1.464)*	(0.087)	(1.091)*	(0.569)*	(0.033)	(0.011)*
Log (Capital)	0.248	1.524	0.904	0.887	0.905	0.823
	(0.367)	(0.555)*	(0.183)*	(0.088)*	(0.181)*	(0.109)*
Log (Adm Workers/ Total Workers)	4.867	-2.520	-0.568	-0.457	-1.190	-0.033
	(2.810)**	(6.955)	(0.695)	(0.348)	(0.707)**	(0.517)
Log (Perm Workers/ Total Workers)	0.122	-0.475	-0.396	-0.153	0.113	0.018
	(0.543)	(1.229)	(0.197)*	(0.082)**	(0.244)	(0.114)
Log(Land/ Total Workers)	0.545	0.995	0.720	0.765	0.660	0.709
	(0.118)*	(0.166)*	(0.056)*	(0.028)*	(0.056)*	(0.036)*
Log(Total Workers)	-0.342	0.424	-0.191	-0.173	-0.272	-0.179
	(0.094)*	(0.106)*	(0.048)*	(0.023)*	(0.042)*	(0.033)*
Log(Height)	0.142	-0.190	0.579	0.671	0.302	0.254
	(0.179)	(0.146)	(0.125)*	(0.067)*	(0.036)*	(0.025)*
Union	7.232	45.604	17.579	30.051	9.808	23.310
	(9.615)	(7.907)*	(15.141)	(10.637)*	(6.273)	(8.747)*
Log (Capital)*Union	6.763	18.391	6.181	9.179	4.379	7.935
	(3.449)	(2.802)*	(4.495)	(3.332)*	(1.830)*	(2.774)*
Log (Adm Workers/ Total Workers)*Union	3.362	3.429	7.591	1.558	6.384	-0.675
	(5.243)**	(9.707)	(3.497)*	(1.580)	(4.193)	(1.539)
Log (Perm Workers/ Total Workers)*Union	-1.751	-7.111	-1.203	-2.627	-1.043	-2.580
	(1.416)	(1.714)*	(1.724)	(1.148)*	(0.810)	(0.885)*
Log(Land/ Total Workers)*Union	-0.487	-1.525	-0.692	-0.969	-0.607	-0.888
	(0.251)*	(0.276)*	(0.242)*	(0.157)*	(0.150)*	(0.139)*
Log(Total Workers)*Union	0.492	-0.801	0.28	-0.136	0.197	-0.339
	(0.227)*	(0.426)**	(0.196)	(0.123)	(0.259)	(0.118)*
Log(Height)*Union	-2.479	-8.139	-2.985	-4.432	-1.796	-3.342
	(1.649)	(1.313)*	(2.147)	(1.616)*	(0.860)*	(1.348)*
Region2*Union			-4.365	-6.050	-3.021	-5.004
			(2.906)	(2.234)*	(1.177)*	(1.866)*

Table 6.9. Results of Industry Production Equations (continued)

Dependent variable: Log(Output/ Total Workers)	1 OLS	2 OLS	3 OLS	4 GLS	5 OLS	6 GLS
Region2			0.572	0.482	0.483	0.442
			(0.106)*	(0.064)*	(0.126)*	(0.072)*
Region3			0.158	0.212	0.106	0.269
			(0.140)	(0.075)*	(0.168)	(0.077)*
Region4			0.835	0.735	0.759	0.750
			(0.120)*	(0.079)*	(0.134)*	(0.083)*
R-squared	0.762	0.788	0.775	0.765	0.943	0.938
F-statistic	30.885	35.845	60.242	57.227	291.006	265.12
Prob(F-statistic)	0	0	0	0	0	0
Durbin-Watson stat	1.278		0.901	0.849		
Total panel observations	139	139	316	316	316	316

** Denotes significant at 10 percent.
* Denotes significant at 5 percent.
Values in parentheses are standard errors.

The union variable is only significant at the 5 percent level in equations (4) and (6). Contrary to what was expected, the result has a positive sign, although the interaction terms show that, when a union is present, the productivity of land per worker and elevation diminishes in comparison to non-unionized firms. The land and height coefficients are always significant and positive in non-unionized firms. Therefore, the more land per worker and the higher the elevation of the farm, the higher the productivity. The presence of a union, though, cancels the positive effect of these inputs.

Among the interaction terms, the capital estimation is almost always significant at the 5 percent level, and it is positive. In addition, its value is significantly higher than that of the regular variable. This implies that unionized firms rely relatively more on capital for productivity than do non-unionized firms. Hence it can be expected that unionized firms might choose more capital-intensive technologies to raise their productivity.

When the proportion of permanent workers is significant, the effect is negative in both unionized and non-unionized firms. In both types of firms, permanent workers cause a reduction in productivity. This may explain the general trend in the coffee sector of replacing permanent with temporary workers; hired on the basis of productivity, they also allow for greater flexibility in hiring.[21] The results for administrative workers, on the other hand, are much less clear. They are rarely significant, and in the case of non-unionized firms the sign is not stable; when this coefficient is significant, it has a positive sign for unionized firms. This result might be capturing the importance of administrative workers in managing and complying with the collective agreement with the union. As for the value of the coefficient of total workers, it is negative for both unionized and non-unionized firms, indicating that diseconomies of scale may be present.[22]

Of the regional dummies, Region 4 still has the largest positive effect on productivity, followed by Region 2. As for Region 3, when the effect is positive it has a smaller effect on productivity than Region 2. It is interesting to note, however, that the value of the regular coefficient of Region 2 changed from positive to negative when interacted with the union variable. Although this is a very productive coffee region, the regional effect becomes highly negative when a union is present.

Table 6.10. Estimated Value of Productivity at the Means of All Control Variables

Dependent variable: Log(Output/Total Workers)	1 OLS	2 OLS	3 OLS	4 GLS	5 OLS	6 GLS
A) UNION =0	2.888	3.212	3.131	3.128	3.158	3.184
B) UNION =1	2.337	2.237	2.747	2.815	2.762	2.780

[21] Permanent workers are those hired through a long-term contract. They usually live on the same farm, and sometimes the same family has lived on the farm for several generations. By law, they have a right to additional benefits and severance payments.

[22] An additional explanation of why the coefficient of permanent workers is so negative is that they usually help to solve a coordination problem within the firm, since they are the real experts in coffee harvesting. In other words, they act as field managers for the landlord. When a union is present they do not contribute to solving this problem, since they have tenure as friends of the union leaders. This could explain why administrative workers are more important in unionized firms. The absence of this explanation for non-unionized firms may result from the need to control for administrative practices, for which information is not available.

To further understand the effect of unions on the productivity of coffee farms the productivity level (output per worker) was estimated at the means of the control variables, for the alternative values of the union dummy (zero for non-unionized firms and one for unionized firms). The coefficients shown in Table 6.9 were multiplied by the corresponding observed means (Table 6.7), for firms with and without unions. Line A) of Table 6.10 shows the estimated value for productivity when the union dummy variable is zero and line B) when the union dummy variable is one. The values of these estimations when the union variable is zero are always higher than those when it is one. In other words, when a union is present, overall productivity is lower. This reinforces the results seen in Table 6.8, where the effect of unions is negative.

Results of the Industry Productivity Equations with Fixed Effects

Although there is some evidence that unionized establishments are less productive than non-unionized establishments, this conclusion rests on an important assumption, namely, that the union coefficient is the measure of the productivity effect of unionization, assuming the absence of individual firm effects that are independent of union status and other determinants. Without better information, when other determinants of productivity are allowed for, it is difficult to separate whether this is an effect of unions or of selection into union status of the less-productive firms. It was therefore necessary to estimate another regression, holding constant firm-specific effects for those firms where a union was present, as shown in equation (1) of Table 6.11.

In equation (1) of Table 6.9, GLS with fixed effects are used to estimate the effect of unions on a panel data of eight unionized firms during nine years (1992-2000); five of those firms changed union status during this period. The estimation method of equations (2) and (3) is the same as for equation (1), and the difference in equation two is that all firms (union or non-union) in Region 2 are included, and in equation three all firms (union or non-union) of all regions are included.

The results show that the union coefficient is not significant in all three equations. Compared to the previous equations, however, it must be noted that the specification of this equation includes other changes besides controlling for fixed effects. It is possible only to establish a relationship between productivity and labor (administrative and permanent workers), land per worker and total number of workers. Other production factors such as capital investment, height or regional dummies cannot be included, because they are constant over time, and including

Table 6.11. Results of Industry Production Equations

Dependent variable: Log(Output/Total Workers)	1	2	3
	GLS-FE	GLS-FE	GLS-FE
Union	0.035	0.025	0.034
	(0.108)	(0.091)	(0.090)
Log (Adm Workers/Total Workers)	-1.565	-0.265	0.693
	(0.715)*	(0.080)*	(0.608)
Log (Perm Workers/Total Workers)	-4.112	-0.735	-0.466
	(0.227)*	(0.166)*	(0.259)**
Log (Land/Total Workers)		-5.822	-0.714
		(9.502)	(8.427)
Log (Total Workers)		-6.644	-1.579
		(9.507)	(8.432)
R-squared	0.792	0.881	0.888
Durbin-Watson stat.	2.292	2.411	1.759
Total panel observations	63	139	316

** Significant at 10 percent.
* Significant at 5 percent.
Values in parentheses are standard errors.

them would have perfect collinearity with the constant terms. Still, the sign of the proportion of permanent workers coefficient is consistent with that of Table 6.9.

When an attempt is made to estimate the effect of unionization on productivity using fixed effects, the same conclusions as before cannot be obtained. This suggests that there might be additional effects that are not being taken into account in the analysis, such as administrative practices. Still, the specification of the equation is not the same.

Conclusions

Although several previous studies have analyzed the effects of unions on the Guatemalan economy, they are mainly descriptive in nature. This chapter represents a first attempt to quantify the effect of unions on a specific industry, namely coffee production. Because of the lack of public information on coffee

production, the data for this chapter were obtained only for large coffee producers. Some of the conclusions may therefore apply only to this type of business.

The empirical analysis provides strong evidence that unions have a negative effect on the productivity of large coffee plantations. First a productivity function was calculated, using as independent variables a capital proxy, the proportion of administrative and permanent workers, land per worker, total workers, farm elevation above sea level and a union dummy. Using different estimation methodologies, the union variable had a consistently negative effect on productivity. As for the other variables, when significant, they had a positive effect. The only exception was total workers, which may indicate some diseconomies of scale.

A second estimation included interaction terms between the regular independent variables with the union dummy. As for the coefficients of the regular variables, the signs did not change significantly from the previous estimations except now that, when significant, the union coefficient was positive. Nonetheless, the productivity of variables such as land and elevation is reduced significantly when there is presence of a union within the firm. Also, capital has a greater effect on productivity per worker in unionized firms than in non-unionized firms.

The effect of permanent workers on productivity, when significant, was negative in both unionized and non-unionized firms. This appears to result from a legal framework that does not take into account productivity considerations; this finding largely explains the trend of replacing permanent workers with temporary workers hired on the basis of productivity. Although some firms have retained a largely permanent workforce longer than others, this may reflect the high cost of severance payments, which can consume firms' capital. Additional evidence indicates that there are increasing returns to scale in large, non-unionized coffee plantations, but there is not enough evidence to say the same about unionized firms.

The coefficients of these regressions were also used to calculate the predicted level of productivity at the means of all the control variables, and for two alternative values of the union dummy (zero and one). The results of these calculations when the union variable is absent are always higher than those when a union is present.

Teacher Unionization and the Quality of Education in Peru: An Empirical Evaluation Using Survey Data

Eduardo Zegarra
Renato Ravina[1]

Peruvian public education is characterized by high coverage, at levels comparable to those of developed countries, but extremely low expenditures per student. This raises serious concerns about the quality of the educational services that Peruvian children are receiving. Recent efforts by the government of Peru to address this problem have been geared to increasing public spending on education infrastructure, inputs and teacher training, especially through a program focused on increasing the quality of education called *Mejoramiento de la Calidad de la Educación Peruana* (MECEP). The program has increased inputs and training to teachers, although without significant changes in the institutional context of the educational system, and there are concerns that the effectiveness of this policy may be limited because of adverse institutional factors.

One such important institutional factor is the presence of an important teachers' union, the *Sindicato Unico de Trabajadores de la Educacion del Perú* (SUTEP) in Peru's public education sector. The union might play a role in the provision of educational services if it affects the allocation of public resources to education and/or members' incentives to provide services. This chapter attempts to evaluate empirically whether teacher unionism plays such a role in Peru.

Surprisingly, given that SUTEP is the country's only teachers' union, no previous work has considered the effects of the teachers' union on education in Peru. Founded in the 1970s, SUTEP has had an important role in the last three decades because of the mobilization of teachers, especially during the 1970s and 1980s. Its political clout and economic importance declined during the 1990s, but since 2000 the union has regained some influence by responding to the Ministry

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of Education's controversial practice of appointing temporary teachers. Since the union is still one of the largest in Peru's public sector, questions about its effect on the quantity and quality of educational services clearly remain important for policymakers and researchers.

In particular, this chapter addresses four questions: (i) how has the rate of teacher unionization evolved during the last three decades? (ii) is the profile of unionized teachers different from that of non-unionized teachers? (iii) is there empirical evidence that teachers affiliated with SUTEP have better access to educational resources than non-unionized teachers? and (iv) is there empirical evidence that unionized teachers perform differently, either better or worse, in the provision of public educational services?

Recent program evaluations and case studies have made available data that allow for an empirical treatment of these issues. A growing body of evaluations and studies has created a critical mass of information permitting a more rigorous exploration of which institutional and economic factors may affect the quality and provision of education services to Peruvian children (Instituto APOYO 1999a, 1999b and 2000). In particular, this study uses data taken from a recent evaluation of the MECEP Program (Instituto APOYO, 1999b) and from a national household survey (ENAHO, 1999) in which there is a large sub-sample of teachers.

Unionization and the Peruvian Education System

In contrast with the United States and other Latin American countries (Hoxby, 1996), the public education system in Peru is fairly centralized, and most if not all allocation decisions are made by a central authority, the Ministry of Education (MOE). Likewise, the teachers' union, SUTEP, is a consolidated and centralized body that seeks to influence general policies as well as sector-level decisions. Founded in 1973 through a merger of four autonomous unions, SUTEP has since been the sole teacher's union in Peru, currently representing about 145,000 of the country's 265,000 public teachers.

Most analysts agree that the union's influence on policy and wage bargaining reached its peak in the mid 1970s; in 1975-1977 the union organized one of the longest strikes against the military government. After 1977 about 10,000 teachers (especially those involved in union leadership) were laid off by the military government, seriously weakening the union's power. In those years the leftist party

Patria Roja gained control over the union leadership and has since then remained in control.

During the 1980s SUTEP concentrated on organizing national strikes, which were less and less effective as the country's economic conditions deteriorated. In 1984, however, the union was finally recognized by the Belaúnde government (1980-1985) after several years of union pressure and mobilization.

Individuals interviewed for this chapter noted that unionization in SUTEP's early years, the 1970s and early 1980s, was essentially related to the political convictions of university students. In those years, students in teacher training programs were easily attracted to the ideology of *Patria Roja*, and after graduation they became union members as an expected next step. Also worth considering is the proposition that *Patria Roja* pursued a strategy of recruiting union members who would work in rural areas in order to gain and maintain control of the union. Since representation in the union leadership is related to the number of political districts rather than to the number of students in schools, which is higher in urban areas, the countryside remains important for party advocates and union work. This remains true in spite of the growing trend, discussed below, of placing non-union teachers on temporary contracts in rural schools.

Each year SUTEP approves a document called the "*Pliego de Reclamos*" listing all its demands to the government in terms of working conditions, wage increases and educational goals, among other general political issues. Although the document has lost importance over the years, it remains one of the main tools that SUTEP leaders use in their union activities.

Another very important tool of union operation is the DERRAMA fund, which is managed by the SUTEP Executive Committee and used to provide some services (including loans) to union members.[2] The fund was started with teacher salaries confiscated during the 1977 strike, and is maintained by monthly contributions from members. A further significant change in the institutional context of the Peruvian educational system was the approval in 1990, at the end of the Alan García administration, of the *Ley del Profesorado*. This law stated that only those persons who have studied to be a teacher can be hired to teach in the public sector. According to the law, teachers in the public sector are public servants with full duties and privileges. A teacher who is tenured (who occupies a formal position in the public cadre of personnel, or CAP) has job security and receives social security benefits upon retiring. The *Ley del Profesorado* is generally considered one of SUTEP's most important achievements.

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[2] Perhaps not coincidentally, the fund's acronym is a form of a Spanish verb meaning "to pour."

Since the impact of any salary adjustment for teachers on the public budget is generally very large, the last three governments (1980-1985, 1985-1990, 1990-2000) have been totally opposed to any significant increase in teachers' wages in real terms. After the severe economic crisis of 1990, in which inflation reached four digits, the new Fujimori government froze the size of the educational CAP in order to avoid increasing pressure on the budget from nearly 40,000 retired teachers. Nonetheless, the demand for teachers remained high in a country where most children attend public schools. Thus, after 1993, the authorities allowed the hiring of "temporary" teachers, and it is currently estimated that about 25 percent of teachers have non-tenured status in the public sector.[3] This dual structure for teachers is not linked to any significant wage differences, since wages are equally low for all teachers. There is, however, an important distinction: non-tenured teachers do not enjoy job security and can be fired at any time without compensation. In addition, they do not receive any pension benefits, since they are hired under a contract in which they figure as service providers without any of the considerations of a stable labor relationship. Clearly this option was used to avoid increasing pressure for social benefits among teachers while accommodating the demand for an greater number of teachers.

In the 1990s, SUTEP did not play a direct role in wage bargaining or even policy decisions. After the collapse of wages at the beginning of the 1990s, teachers' real wages did not recover during the whole decade under Fujimori's rule, and at the end of the decade they were a mere 70 percent of real wages in 1990 (Figure 7.1).

With teacher salaries at low levels, the Fujimori government increased public spending on other aspects of education, and since 1996 the Peruvian education system has enjoyed higher levels of investment in inputs, training and infrastructure.[4] Although SUTEP was not significant in these decisions, at least at the central level, it may have influenced the impacts on educational outputs. Because of the massive coverage and network structure of the union, SUTEP may play a role in the efficiency of resource allocation.

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[3] The Toledo administration has recently begun to grant tenure to temporary teachers on the basis of an evaluation, a process still contested by SUTEP. This process may ultimately lead to unexpected changes in SUTEP's role in the education sector, however, as tenured teachers are more likely to enroll in the union.

[4] This occurred basically through the MECEP program and other government investments in school infrastructure.

Figure 7.1. Index of Teachers' Real Salaries (July 1990 = 100)
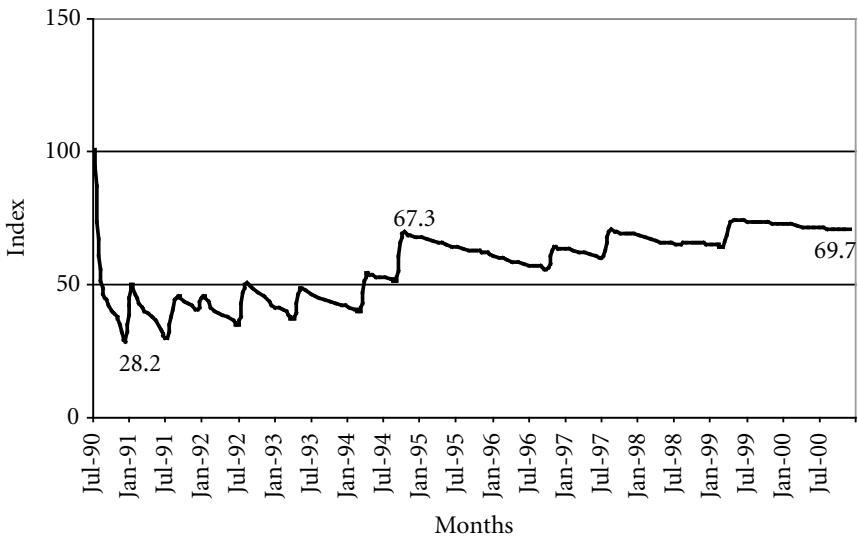
Another important avenue through which the union may influence educational output is in the process of teacher allocation between rural and urban areas, or among different types of schools. In general, according to experts interviewed for this chapter, allocation is not linked to performance or training, and teachers are assigned to rural and urban areas without major planning, evaluation or incentives by the MOE. In recent years, temporary teachers have been much more likely to be assigned to less favorably located schools in rural areas. It is thus plausible that SUTEP may have ways to influence this allocation process in order to place unionized teachers in more desirable urban locations, thereby affecting the final output of the education process. This circumstance might have policy implications if unionized teachers are really different in the provision of educational services.

Unionization, Teacher Profile and Access to Educational Infrastructure

Several aspects of the institutional and social environment must be taken into account when analyzing the role of teachers' unions. These features include the

unionization rate of public school teachers, the characteristics of unionized and non-unionized teachers, and teachers' differential access to educational resources.

Unionization of Teachers in Public Schools

This chapter uses two sources of data on teacher unionization: (i) the 1999 ENAHO survey, which is a representative sample of all Peruvian households in which there is a sub-sample of 574 teachers; and (ii) the 2000 MECEP evaluation survey, which is based on a stratified sample of 700 schools nationwide, with about 1,400 teachers surveyed.

Table 7.1 relates teachers' experience to current unionization status in the 1999 ENAHO survey. The rate of unionization among surveyed teachers is 45 percent, and teachers with more experience are more likely to be unionized. The data are also compatible with a declining rate of unionization in the last three decades. For the purpose of relating these figures to rates of unionization, however, it is necessary to accept the assumption that exit rates and changes in union status among teachers do not have a significant impact on the average rate of unionization.

If it is accepted that the rate of unionization in the public education system has been dropping in the last three decades, the data suggest that this phenomenon was more dramatic in the 1990s, essentially associated with the entry of non-tenured teachers who are less likely to be unionized.

It should be mentioned that the ENAHO sample is not necessarily representative of teachers. Nonetheless, given the importance of teachers in the total number of households (about 12 percent of households include a teacher), it may be a good approximation.

Table 7.1. Experience and Unionization

	No	Teachers	Unionized
Year became teacher			
less 1980	40	28	70%
1980-85	103	61	59%
1986-90	171	99	58%
1991-99	260	72	28%
Total	574	260	45%

Source: ENAHO 1999.

Figure 7.2 shows the total number of teachers in the ENAHO sample by four categories in terms of unionization and labor contract. The horizontal axis displays the year in which teachers in the sample began teaching.

The figure supports the idea that lower unionization in the 1990s could be associated with the increasing importance of non-tenured teachers in that decade, especially after 1995. If temporary teachers are excluded from the sample, the proportion of unionization is 57 percent instead of 45 percent. Thus, the average rate of SUTEP affiliation may be about 60 percent among tenured teachers.

As shown in Figure 7.2, the sample of teachers from the MECEP evaluation shows the same pattern observed in Table 7.1. Union membership is much more prevalent among teachers with more than 10 years of experience than teachers who have recently entered the profession. The presence of temporarily hired teachers in recent years is clearly one of the reasons for this difference.
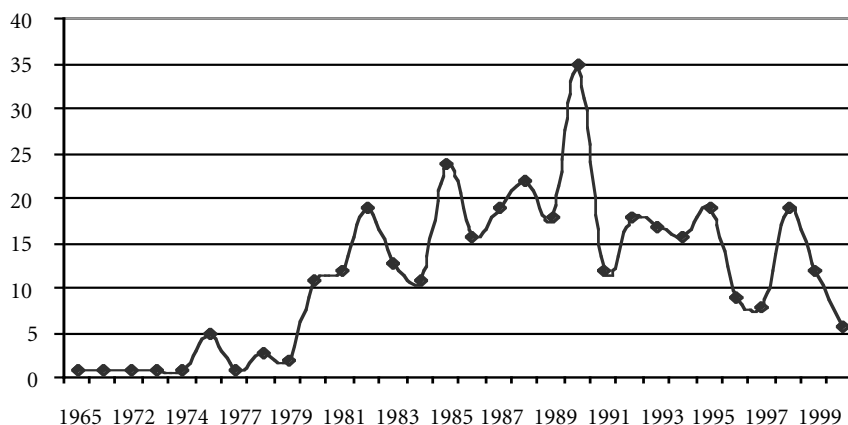
Teacher Profile and Union Status

Table 7.2 presents the distribution of teachers taken from the ENAHO sample of teachers at the national level by type of location. As can be seen, unionization is

Figure 7.2. Teachers Classified by Unionization and Type of Contract
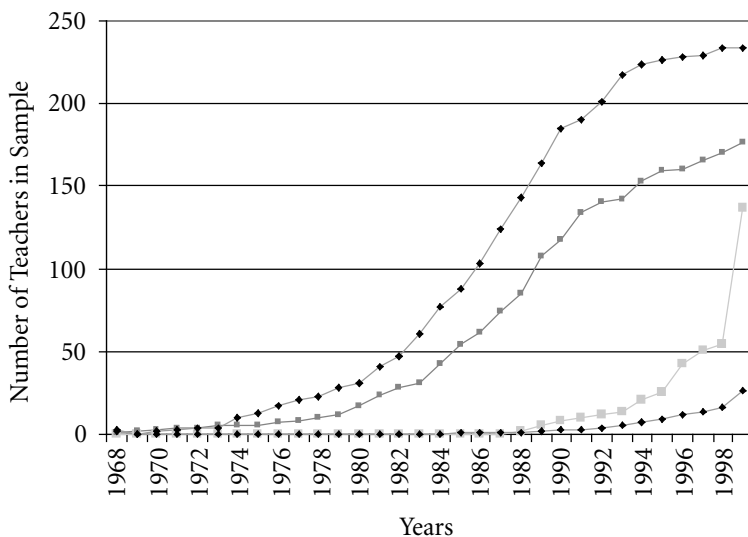
Source: ENAHO 1999.

Figure 7.3. Number of Union Affiliations per Year *(in the sample)*

Source: MECEP evaluation survey, MOE and Instituto APOYO.

greater in rural areas (49 percent) than in urban areas (44 percent), a difference that is statistically significant at the 95 percent confidence level. This result is consistent with interviews with SUTEP members, who state that the union has a strong presence in rural areas.

Table 7.3 displays a similar breakdown for teachers' tenure status. As can be seen, non-tenured teachers are more likely to be assigned to rural areas than

Table 7.2. Unionization of Teachers and Location

	Non Unionized	Unionized	Rate of Union
Capital cities	81	52	39%
Big cities	58	68	54%
With more than 2,000 inh.	88	57	39%
Total urban	227	177	44%
500-2000 inhabitants	35	43	55%
Disperse	52	40	43%
Total rural	87	83	49%
Total	314	260	45%

Source: ENAHO 1999.

tenured teachers, which reflects the increasing presence of temporary teachers in rural areas. This factor may negatively affect the rate of unionization in rural areas, as temporary teachers are less likely to join, although it still does not have the effect of making unionization less prevalent in rural than in urban areas. In general, as mentioned before, temporary teachers are currently being assigned to the poorest schools, which are generally in the countryside.

Table 7.4 presents the proportion of teachers who have a secondary activity besides teaching, ordered by location. It can be seen that unionized teachers are more likely to have a secondary activity, but this may be the case because teachers with secondary activities join the union in order to have some extra protection from being fired. Unionized and tenured teachers have a slightly higher presence of secondary activities than non-unionized, but the difference is not significant in statistical terms.

Looking at other characteristics of teachers and their union status in the ENAHO sample of teachers, a probit estimation was made of the probability of being unionized in relation to several other characteristics. As shown in Table 7.3, both rural location (although at a 10 percent level of significance) and tenure status (a tenured teacher is 32 percent more likely to be unionized than a non-tenured teacher) are clearly related to union status, confirming the statistical validity of the previous analysis of differences. In terms of the other features in the regression, years of experience as a teacher is an important variable associated with unionization. Even when tenured status and location are controlled for, the

Table 7.3. Tenure Status of Teachers and Location

	Non-Tenured	Tenured	Rate of Tenure
Capital cities	26	107	80%
Big cities	36	90	71%
With more than 2,000 inh.	46	99	68%
Total urban	108	296	73%
500-2000 inhabitants	22	56	72%
Disperse	33	59	64%
Total rural	55	115	68%
Total	163	411	72%

Source: ENAHO 1999.

Table 7.4. Secondary Activity by Teachers

	Non-Unionized			Unionized		
	Non-Tenure	Tenure	Total	Non-Tenure	Tenure	Total
Have secondary activity (%)						
Capital cities	38%	40%	40%	80%	40%	44%
Big cities	35%	52%	43%	80%	33%	37%
With more than 2,000 inh.	41%	39%	40%	57%	58%	58%
Rural 500-2000 inhabitants	53%	39%	46%	60%	55%	56%
Rural disperse	52%	65%	58%	25%	61%	57%
Total	43%	45%	44%	62%	48%	49%

Source: ENAHO 1999.

experience variable appears significant, implying that unionization is more likely among teachers with more experience. Another important result is that male teachers are much more likely (13 percent) to be unionized than female teachers. Marital status and age appear as non-significant at the 10 percent level.

The data from the MECEP evaluation survey provides similar results in terms of the variables analyzed with the ENAHO survey. However, the MECEP data provide somewhat more information about teachers. For instance, Table 7.5 presents the level of education and the institution from which teachers graduated. It can be seen that hired (non-tenured) teachers are more likely to come from an institute than from a university. They are also more likely than tenured teachers to come from a private institute.

This sample shows that 9 percent of teachers lack a degree, a proportion that is greater among unionized teachers (10 percent versus 6 percent among the non-unionized). In the non-unionized group, teachers without a degree are found exclusively among temporarily hired teachers, whereas in the unionized group the non-degreed percentage is the same for hired and tenured teachers.

Table 7.5. Teachers' Levels of Education

	Non-SUTEP			SUTEP			
	Hired	Tenure	Total	Hired	Tenure	Total	TOTAL
Level of education							
Only secondary	0	0	0	0	I	I	I
Institute	88	291	379	12	238	250	629
University	18	93	III	3	80	83	194
Other	2	35	37	I	18	19	56
Institution							
Public Institute	71	301	372	II	237	248	620
Private Institute	15	15	30	I	10	II	41
Public University	16	78	94	I	72	73	167
Private University	2	12	14	I	II	12	26
Other	4	13	17	2	5	7	24
Total	108	419	527	16	335	351	878

Percentages by column							
	Non-SUTEP			SUTEP			
	Hired	Tenure	Total	Hired	Tenure	Total	TOTAL
Level of education							
Only secondary	0.0	0.0	0.0	0.0	0.3	0.3	0.1
Institute	81.5	69.5	71.9	75.0	71.0	71.2	71.6
University	16.7	22.2	21.1	18.8	23.9	23.6	22.1
Other	1.3	8.4	7.0	6.3	5.4	5.	6.4
Institution							
Public Institute	65.7	71.8	70.6	68.8	70.7	70.7	70.6
Private Institute	13.9	3.6	5.8	6.3	3.0	6.1	4.7
Public University	14.8	18.6	17.8	6.3	21.5	20.8	19.0
Private University	1.9	2.9	2.7	6.3	3.3	3.4	3.0
Other	3.7	3.1	3.2	12.5	1.5	2.0	2.7

Source: MECEP Evaluation Survey, MOE, Instituto APOYO.

Access to Educational Resources

Teachers may have differentiated access to educational resources according to different characteristics and the decisions made by the MOE. This sub-section therefore analyzes teachers access to various educational resources using data from the MECEP evaluation study.

Table 7.6 presents data related to educational infrastructure by teachers according to their tenure and unionization status. As can be seen, tenured teachers are more likely to be located at bigger and better schools (*polidocentes*) than non-tenured teachers. In other words, non-tenured teachers are more likely to be present in *unidocente* (that is, rural) schools.

This pattern clearly affects access to educational and local infrastructure. *Polidocente* schools are more likely to have electricity and drinkable water. They are more common in urban areas and thus have better local services. This analysis suggests that, in comparing access to educational resources by unionized or non-unionized teachers, it is necessary to control for type of school. The table shows that when the surveyed teacher is affiliated with SUTEP the principal of the school is also more likely to be a member of the union. This seems to be related to the fact that in *multigrado* and *unidocente* schools the interviewed teacher is generally the principal of the school as well.

In order to make the analysis easier and to incorporate other variables associated with teachers, an index of access to educational infrastructure was constructed in which school features have a weight of 75 percent and local services 25 percent.[5] This index gives a good idea of differences in school quality—that is, in teachers' access to educational infrastructure.

Two regressions were run, one for *polidocente* schools and the other for *multigrado* schools, in order to see whether there are some differences in teachers' access to educational resources controlling by type of school (problems were encountered with teachers' data for *unidocente* schools). The results are presented in Table 7.7. As the table shows, in the case of *polidocente* schools union and tenure status do not seem to play a role in differential access. However, all other variables are significant at 10 percent, implying that female and older teachers have better

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[5] The index was built as follows. There were 17 items of access to infrastructure, 11 for local services and 6 for school services, so there are two vectors with 11 and 6 components, respectively. The ratio of existing services was taken in each vector (a value between 0 and 1). Local services were weighted by 0.25, and school services by 0.75, thus obtaining the total index for infrastructure.

Table 7.6. Infrastructure and Teachers' Union and Tenure Status

	Non-Union		Union		
	Non-Tenure	Tenure	Non-tenure	Tenure	Total
Teachers	188	419	46	454	1107
School features					
Polidocente	22%	57%	17%	62%	52%
Multigrado	37%	43%	20%	36%	38%
Unidocente	42%	0%	63%	2%	11%
Drinkable water	52%	73%	50%	78%	71%
Electricity	23%	54%	22%	61%	50%
Sewerage	17%	44%	11%	53%	42%
Director in Sutep	20%	28%	93%	43%	36%
Local features					
Drinkable water	58%	73%	59%	81%	73%
Electricity	28%	56%	26%	64%	54%
Sewerage	16%	42%	9%	52%	40%
Health center	33%	66%	33%	69%	60%
Hospital	4%	18%	2%	20%	16%
Telephone	18%	45%	11%	54%	42%
Paved road	29%	48%	20%	64%	50%
Bank	3%	17%	2%	25%	17%
Police station	10%	29%	11%	38%	29%
Secondary school	18%	49%	17%	60%	47%
Spanish	61%	79%	76%	84%	78%

Source: MECEP Evaluation Survey, MOE, Instituto APOYO.

access. As expected, moreover, the number of classrooms (school size) is clearly associated with the quality of infrastructure.

In the case of *multigrado* schools, which are smaller than *polidocentes* and much more likely to be in rural areas (in the MECEP evaluation , defined rural-urban location was not available), union status seems to play a role in improving access to infrastructure. This is also true for the number of classrooms or school size (in this case the variation is only within the *multigrado* schools). Tenure, age and gender do not have statistically significant coefficients in the regression.

Table 7.7. Effects of Unionization on Access to Infrastructure

Regression of Infrastructure index on teacher features

Polidocente schools

Number of obs	482.0
F(5,476)	53.2
Prob > f	0.00
R-squared	0.36
Adj R-squared	0.35
Root MSE	0.19

	Coef.	Std. Err.	t	P>t	[95% conf. Interval]	
Union	0.011	0.018	0.603	0.547	-0.025	0.046
Tenured	0.049	0.031	1.583	0.114	-0.012	0.109
Number classrooms	0.022	0.001	15.289	0.000	0.019	0.024
Male	-0.038	0.018	-2.043	0.042	-0.074	-0.001
Age (years)	0.022	0.013	1.734	0.084	-0.003	0.046
Constant	0.200	0.039	5.182	0.000	0.124	0.276

Regression of Infrastructure index on teacher features

Multigrade schools

Number of obs	382
F(5,476)	8.28
Prob > f	0.00
R-squared	0.10
Adj R-squared	0.09
Root MSE	0.21

	Coef.	Std. Err.	t	P>t	[95% conf. Interval]	
Union	0.049	0.023	2.135	0.033	0.004	0.094
Tenured	0.001	0.028	0.052	0.959	-0.053	0.056
Number classrooms	0.043	0.007	5.913	0.000	0.029	0.058
Male	-0.001	0.001	0.537	0.592	-0.004	0.002
Age (years)	-0.001	0.001	-1.001	0.317	-0.003	0.001
Constant	0.084	0.035	2.377	0.018	0.015	0.154

These regression assume causality from unionization to access, an assumption that can be challenged, because teachers with better access may have greater incentives to become unionized. The use of panel data (with teachers changing union status through time) or finding a good instrumental variable linked to unionization but not to access may help to solve this problem, but those types of data were not available. In this case the only conclusion that can be drawn is that there is a positive correlation between unionization and access to infrastructure, but only for *multigrado* schools, which are smaller and more rural. This relationship, however, requires further investigation using more appropriate data.

A Production Function Model for Assessing the Impact of Unionization

In order to consider the potential impact of unionization on the quality of educational services, a production function approach like that of Hoxby (1996) will be used to analyze the impact of teacher unionization on educational services in the United States. The "classroom" will be used as the unit of analysis for the specification. Furthermore, each classroom is mainly associated with one teacher, since the focus is on primary education.

A generic production function for educational services in a given classroom is defined as:

$$y = f(\underline{e}, r; h) \quad (1)$$

where $f(.)$ is a well defined function; y is a measure of student achievement; $\underline{e}$ represents the effort level supplied by the classroom's teacher; r represents physical inputs used by the teacher and students (books, instructional materials, and so on); and h is a vector representing other geographic, school, teacher and student characteristics. As usual, it is assumed that $f'_e > 0; f''_e < 0; f'_r > 0; f''_r < 0; f'_{er} > 0$. Thus e and r are inputs with decreasing returns given any fixed input and are complementary in the production of educational services.

Departing from Hoxby's model for the United States (where teachers have influence on budget decisions and input allocation), a model is here specified in which the only variable that teachers control is effort level:

$$e = g(w; u, t, v) \quad (2)$$

where *w* is the implicit cost or disutility of effort for the teacher, *u* is union status, *t* is tenure status, and *v* represents specific teacher characteristics.

Equations (1) and (2) take the form of a production function in which effort enters as an input in the production equation, and in which effort depends on prices and institutional variables. Since effort generally cannot be directly measured, most studies estimate a reduced form, plugging (2) into (1).

In the present case, however, alternative direct measures of effort will be used in the estimation of equation (1). The output measure is taken from math and language tests applied to a sample of students in the MECEP evaluation.

This MECEP evaluation includes in-class observation data, from which three variables have been taken to approximate teachers' effort: (i) use of time in class, (ii) good control of the classroom and (iii) students' opinions about the teacher. [6] Students' opinions of their teachers' ability and behavior are drawn from the student survey. The mean of these variables for unionized and non-unionized teachers are shown in Table 7.8.[7]

The means among the two groups (unionized and non-unionized) are statistically different for most variables. However, there are some variables in which differences are not significant, mostly in students' opinions about their teachers.

The use of time appears to differ somewhat between the two groups. The duration of daily sessions seems to be smaller for unionized teachers, who have a total of 203 minutes per day against 213 minutes per day for non-unionized teachers. On average, the sessions amount to 79 percent of the total required time, but unionized teachers use only 77 percent of the required time compared to 82 percent for non-unionized. This may imply that unionized teachers devote less time to teaching.

Despite the absolute time devoted to daily sessions, it is important to consider the use of that time. According to what trained observers report, teachers use about one hour daily for teacher activity as such (lecturing and talking with students). The use of that time is different by unionization status: unionized teachers spend less time lecturing and more time talking with students than non-unionized teachers. It is not clear whether these differences may be important in terms of the quality of teaching, although it seems that unionized teachers seem to involve students more in class activity.

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[6] See Annex 1 of Zegarra and Ravina (2003) for a brief description of the MECEP evaluation dataset.
[7] There were no non-tenured teachers in the sub-sample of 90 classes used for in-class observation, so the tenure variable cannot be used in the analysis.

Table 7.8. Teacher Behavior in Class

	Non-Union	Union	Total
Use of time in class (minutes)			
Time required	261	266	263**
Time observed	213	203	208**
Lecturing	38	29	33**
Dialog	27	34	31**
Students reading	16	25	21**
Students writing	66	69	68*
Individual work	52	50	51
Group work	47	54	51**
No attention	23	21	22**
Good control of class			
Good Knowledge (1 to 4)	3.12	3.20	3.16**
Clarity (1 to 4)	3.06	3.18	3.12**
Conduct control (1 to 4)	2.80	3.11	2.96**
Students' opinion about the teacher			
Answers my questions	90%	90%	90%
Is concerned about my learning	91%	87%	89%
He/she hits me when I misbehave	51%	40%	45%
Does not show up in class often	15%	15%	15%
Is late often	21%	18%	19%*
Is good explaining	91%	935	92%
Asks for questions in class	86%	85%	86%
Asks us to use books from the library	77%	76%	76%

Source: In-class observation and student survey, MECEP Evaluation Survey, sample size: 90 classrooms.
** Means are different at 95 percent; * Means are different at 90 percent.

In terms of the second variable, good class control, observers rate teachers' behavior on a scale from 1 to 4 in terms of knowledge of the matter taught; clarity of explanations and conduct control in class. In all areas unionized teachers demonstrated better class management.

Students do not express major differences in their opinions of unionized and non-unionized teachers, with the notable exception of teachers' tendency to hit students in class. Among children surveyed, 45 percent stated that teachers

sometimes hit them in class, a percentage that is greater for non-unionized teachers (51 percent compared to 40 percent). This is consistent with observers' reports of better class control by unionized teachers. In all other areas, students do not perceive significant differences.

This information suggests that the variables associated with class management are a possible measure of teacher effort in class. The use of this variable as a proxy for effort has two limitations. First, it is possible that some specific factors related to the children in the classrooms, such as a small number of disruptive children, may affect and distort the measure; there might be a low level of control despite a high level of teacher effort. Second, observation of teachers in class can in some way alter teacher behavior. Even considering these two limitations, this variable appears to be the best alternative available from the MECEP evaluation. The observation distortion, also, should not affect the variation between unionized and non-unionized teachers, which is the variation needed for this estimation. In the empirical analysis that follows, the sum of the three class control variables will be used as a proxy for teacher effort in class.

Production Function Analysis

The dataset used for the estimation consists of 90 classrooms in which math and language test scores were applied to students, and in which teacher practices and their use of inputs were observed during three days by specialized observers. This dataset has most of the variables used in equation (1) from the model.

This dataset, however, has some limitations given its relatively small size. Moreover, evaluators asked about unionization in only 65 classrooms. Within this sample, 15 teachers did not respond to this question, which leaves a total of only 50 classrooms for analysis with the union variable.

An additional feature of the data was that all the teachers in the 90 classrooms sampled were tenured. This is useful for purposes of estimation, as it prevents confusing union and tenure status effects. Moreover, using a dataset in which all teachers are tenured makes it possible to check for pure union impacts. Another important feature of this dataset is that it did not include *unidocente* (mostly rural) schools, so that dimension is excluded from the analysis.

Still, as complete information is available for 90 classrooms and teachers when the union variable is not considered, the estimation process will begin by abstracting for a moment from the union variable. The union question will be

introduced after estimating the production function for the whole 90-classroom dataset.

Production Function without Union Status

Based on equation (1) of the model the following equation is estimated:

$$Y = \alpha + \beta_1 N + \beta_2 C + \beta_3 T + \beta_4 r + \beta_5 e + u \quad (3)$$

where Y is the log of average student achievement or result (standardized test scores) for the classroom, N and C are vectors of student and community characteristics, T represents teacher characteristics (gender, experience) r is input use by teacher (textbooks), and e is effort in teaching measured as the sum of the three class control variables of class control described above.

Because the sampling scheme used for the MECEP evaluation implies that what are selected are classrooms, the standard errors of the estimation are corrected for by using the software package *Stata©* Version 5.0 with an option for sample design in running regressions (the routine is called svyreg). This provides estimations with standard errors that consider the fact that students are clustered in the 90 classrooms. The regression results are presented in Table 7.9.

As can be seen, most variables are statistically significant and have the expected sign. In particular, teachers' effort, measured as the sum of the three class control variables, has a positive coefficient at the 8.2 percent significance level for the math test, and at the 2.4 percent significance level for the language test, implying that what teachers do in class has a clear impact on student achievement. Textbook use appears to be positive for student achievement in math, but negative for the language test; according to these estimations, it therefore seems that the math textbook is having a better impact on students than the language textbooks.

Among other variables, the fact that a student works has a negative impact on student achievement, both in math and language, whereas the index of school quality favors student achievement in both cases. Teacher experience appears with a coefficient not significantly different from zero, whereas male teachers display lower performance in math and language tests.

Production Function with Union Analysis

First estimated is a regression of effort on union status and other teacher and school characteristics, corrected for clustering. Table 7.10 presents the results, indicating

Table 7.9. Production Function Regression

Math test

Number of obs	2270
Number of strata	1
Number of PSUs	88
Population size	2270
F(8,80)	10.58
Prob > F	0
R-squared	0.1636

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Effort	0.0772	0.0439	1.7590	0.0520	-0.0100	0.1644
Use of text	0.0344	0.0190	1.8080	0.0740	-0.0034	0.0722
Urban area	0.0394	0.0296	1.3320	0.1860	-0.0194	0.0981
Student works	-0.0522	0.0118	-4.4250	0.0000	-0.0757	-0.0288
School index	0.1967	0.0621	3.1690	0.0020	0.0733	0.3200
Sixth grade	0.0022	0.0201	0.1070	0.9150	-0.0378	0.0422
Experience	-0.0096	0.0103	-0.9340	0.3530	-0.0300	0.0108
Teacher male	-0.0517	0.0256	-2.0200	0.0460	-0.1026	-0.0008
Constant	5.4073	0.1007	53.6820	0.0000	5.2071	5.6075

Language test

Number of obs	2309
Number of strata	1
Number of PSUs	88
Population size	2309
F(8,80)	17.09
Prob > F	0
R-squared	0.186

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Effort	0.0901	0.0391	2.3020	0.0240	0.0123	0.1678
Use of text	-0.0653	0.0303	-2.1540	0.0340	-0.1256	-0.0050
Urban	0.0973	0.0291	3.3400	0.0010	0.0394	0.1552
Student works	-0.0456	0.0165	-2.7550	0.0070	-0.0785	-0.0127
School index	0.1360	0.0484	2.8100	0.0060	0.0398	0.2323
Sixth grade	0.0117	0.0197	0.5940	0.5540	-0.0275	0.0509
Experience	0.0000	0.0111	-0.0020	0.9980	-0.0220	0.0220
Teacher male	-0.0488	0.0225	-2.1650	0.0330	-0.0936	-0.0040
Constant	5.3629	0.0874	61.353	0.0000	5.1892	5.5366

that union status does not play a role in the effort made by teachers. School quality and experience appear as variables with a positive impact on effort.

For testing the direct role of unionization on student achievement, a regression was run on test scores, including union as an independent variable but excluding effort. As can be seen in Table 7.11, for both math and language, the unionization coefficient does not appear statistically different from zero at the 10 percent significance level. In the case of math scores, the coefficient is positive and significant at 13.2 percent, whereas for language scores the coefficient is negative. The other coefficients display similar behavior to that found in the larger dataset of 90 classrooms, suggesting that the production function specification was not altered by the smaller sample taken (of 50 classrooms).

Conclusions

This chapter has combined two sources of quantitative information in order to answer questions about the extent, profile and role of teachers' unionization on the quality of public education in Peru. An analysis of the cross-section data taken

Table 7.10. Regression of Unionization on Effort

Number of obs	1329
Number of strata	1
Number of PSUs	50
Population size	1329
F(5,45)	2.18
Prob > F	0.0734
R-squared	0.1697

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Union	0.0428	0.0461	0.9280	0.3580	-0.0499	0.1354
Urban	-0.0389	0.0596	-0.6530	0.5170	-0.1587	0.0809
School index	0.2661	0.1394	1.9090	0.0620	-0.0141	0.5462
Experience	0.0725	0.0352	2.0630	0.0440	0.0019	0.1432
Male	0.0272	0.0470	0.5780	0.5660	-0.0673	0.1216
Constant	1.8673	0.1124	16.6170	0.0000	1.6414	2.0931

Table 7.11. Production Function Regression with Union Variable

Math test

Number of obs	1283
Number of strata	1
Number of PSUs	50
Population size	1283
F(8,42)	5.53
Prob > F	0.0001
R-squared	0.1487

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Union	0.0352	0.0230	1.5330	0.1320	-0.0109	0.0814
Use of text	0.0488	0.240	2.0340	0.0470	0.0006	0.0970
Urban	0.0266	0.0485	0.5480	0.5860	-0.0709	0.1241
Student works	-0.0458	0.0169	-2.7130	0.0090	-0.0798	-0.0119
School index	0.1778	0.0907	1.9600	0.0560	-0.0045	0.3601
Sixth grade	0.0188	0.0296	0.6310	0.5310	-0.0411	0.0787
Experience	0.0024	0.0141	0.1700	0.8660	-0.0259	0.0307
Teacher male	-0.0728	0.0338	-2.1530	0.0360	-0.1407	-0.0049
Constant	5.5539	0.0588	94.4060	0.0000	5.4356	5.6721

Language test

Number of obs	1292
Number of strata	1
Number of PSUs	50
Population size	1292
F(8,42)	6.6
Prob > F	0
R-squared	0.1714

	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Union	-0.0029	0.0306	-0.0860	0.9320	-0.0641	0.0589
Use of text	-0.0959	0.0418	-2.2930	0.0260	-0.1799	-0.0188
Urban	0.0819	0.0521	1.5710	0.1230	-0.0229	0.1867
Student works	-0.0305	0.0236	-1.2890	0.2030	-0.0780	0.0170
School index	0.2167	0.0750	2.8880	0.0060	0.0659	0.3674
Sixth grade	0.0306	0.0312	0.9820	0.3310	-0.0321	0.0934
Experience	0.0179	0.0165	1.0610	0.2940	-0.0157	0.508
Teacher male	-0.0724	0.0315	-2.3000	0.0260	-0.1356	-0.0091
Constant	5.4752	0.0717	76.3560	0.0000	5.3311	5.6193

from ENAHO 1999 and the MECEP evaluation study finds evidence compatible with the hypothesis that unionization has been declining in the last three decades, especially during the 1990s, because of the hiring of temporary teachers. From rates of 70 percent to 80 percent for teachers who started working in the 1970s, the rate of unionization currently is less than half the teacher population. It is not clear if this trend will continue in the near future, as the current government has begun a process of eliminating temporary teaching positions from public education.

In general, unionized teachers tend to be older and more experienced, and they are more likely to be male. Most unionized teachers are tenured, although there is a small set of non-tenured teachers who are members of the union. The presence of the union in rural areas is still important, and is related to the electoral mechanisms for union representation.

In term of access to educational infrastructure, the MECEP evaluation data indicate that unionized teachers do not enjoy access to better infrastructure at the *polidocente* schools, but that they have better access to *multigrado* schools (which are an intermediate between *polidocente* and *unidocente* or rural schools). This may imply that unionized teachers are more successful in improving their position at this intermediate level, but with no ability to do so at larger schools.

This chapter has identified variables directly linked to teacher effort, facilitating the estimation of a reduced form of the traditional production function. The estimation of the production function for a sample of 90 classrooms without a union indicates that the effort variable works well and that, despite the dataset's small size, the expected signs are found for most of the independent variables. Using the smaller dataset with the union variable, the analysis indicates that unionization does not play a role either in the supply of effort by teachers or in math and language test scores. Thus, in the Peruvian case, this preliminary evidence suggests that unionization may not affect the provision of public education in a definite way.

The Economic Effects of Unions in Latin America: Teachers' Unions and Education in Argentina

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Education is one of the main instruments for fostering human capabilities and overall freedoms so that individuals can lead worthwhile and satisfying lives. Education is also essential in building democratic values, improving human development and contributing to economic growth (Sen, 1999). When an education system is not performing well, therefore, the consequences are dire.

In the case of Argentina, several studies have pointed out that education reinforces rather than reduces inequalities due to deficits in the Argentine education system (IDB, 1996; Fiszbein, 1999). Low-income people do not have access to high-quality education, and they generally fail to complete secondary education. Furthermore, educational achievement in Argentina is poor compared to other countries that invest similar amounts in education. Consequently, although Argentina's net enrollment ratios for primary and lower secondary education are high, there is a perception of poor quality.

There is a consensus in Latin America that good teaching is key to improving education. As a result, more attention is being paid to teachers' incentives and their impact on performance. In particular, there is a great deal of interest in career regulations and mechanisms for the recruitment, selection and promotion of teachers.[2] Reforms in these areas, however, have been hard to undertake. Among

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[2] For more details see the series of Inter-American Development Bank (IDB) studies in the project "Teachers in Latin America: Careers and Incentives," which can be downloaded at www.iadb.org/res.

other reasons, this is because of the opposition of teachers' unions to policies perceived as harmful to their members' interests.[3]

The aim of this chapter is to provide empirical evidence of the effects of teachers' unions on the quality of education in Argentina. Of particular interest are "education production functions" and the impact of teachers' unions on variables that influence the learning experience of elementary students: days of class, teachers' tenure status, class size, budget allocations, and teachers' satisfaction.[4] Also considered are other factors, such as the special laws and rules that regulate teachers' careers and work environment, and their possible connection to the (political) role of unions.

This chapter provides new descriptive statistics on teachers' unions in Argentina and presents several empirical findings on the link between unions and student performance. First, higher union density combined with union fragmentation and adversarial political alignments tends to decrease the effective number of class days, with an indirect negative effect on student performance. Second, there is a negative relation between union membership and job satisfaction, and students who have a more satisfied teacher perform better. Third, teacher tenure, a persistent union demand, has a positive effect on student performance. Fourth, unions have a positive effect on employment and thus a negative effect on class size. Finally, education budgets and teachers' wages are mainly determined by fiscal variables; provincial unions are basically irrelevant except that they increase the share of salaries in the education budget. These empirical findings provide mixed conclusions regarding the effect of unions on educational outcomes, but they provide a first picture of union influence in the learning process.

Background Information

Argentina has relatively high schooling rates. Although enrollment in secondary education stands only 67 percent, the enrollment rate in primary education is 97

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[3] Corrales (1998) notes that "The magnetism and high levels of organization of teachers' unions, together with a union leadership that has a long-term horizon, no alternative career plan, no aversion to conflict, and a discriminating weapon against the government, explain why teachers' unions are to be expected to be intensely active in resisting reforms." See Murillo (1997) and Murillo and Maceira (2000) for further discussion of the political economy of reform in the social sectors and the role of unions.

[4] This paper uses "tenure status" (henceforth tenure), to refer to whether the teacher has a permanent assignment to that position, as opposed to a "temporary" assignment. (In Spanish, *titular* as opposed to *suplente*.)

percent, and literacy is 96 percent. The system has a total of 9.7 million students (70 percent in primary education), 650,000 teachers (540,000 teaching positions) and 52,177 schools. Some 76 percent of the total roll attends public institutions. Average spending per student is around $900 ($740 in the case of primary education), although there are large variations across provinces.

Table 8.1. Public Expenditure on Education, 1997

Province	Millions of US$	% of total expenditure	US$ per student	Personnel expenditure/ total expenditure
City of Buenos Aires	924	29.4%	1,391	72.7%
Buenos Aires	3,230	30.7%	881	78.7%
Catamarca	135	28.2%	1,435	92.5%
Córdoba	739	26.1%	969	73.3%
Corrientes	209	23.0%	752	93.8%
Chaco	251	22.8%	912	90.3%
Chubut	145	20.9%	1,202	88.9%
Entre Rios	297	21.4%	947	83.4%
Formosa	135	16.6%	875	91.4%
Jujuy	166	30.9%	869	92.2%
La Pampa	113	22.5%	1,575	81.6%
La Rioja	110	25.5%	1,312	92.8%
Mendoza	362	30.0%	894	83.7%
Misiones	193	19.9%	672	97.8%
Neuquen	250	25.5%	1,687	86.3%
Rio Negro	182	25.9%	1,061	86.3%
Salta	202	23.1%	629	92.0%
San Juan	160	23.6%	1,001	88.1%
San Luis	95	25.5%	1,014	76.2%
Santa Cruz	141	20.4%	2,341	86.5%
Santa Fe	771	29.1%	961	74.9%
Sgo. del Estero	204	31.5%	962	98.5%
Tierra del Fuego	79	21.4%	2,566	78.4%
Tucumán	277	29.9%	829	86.4%
Total	9,370	27.2%	966	81.6%

Over 80 percent of spending is devoted to teachers' salaries but there is substantial inter-provincial variation, and this level is high relative to other countries, as shown in Table 8.2. This high percentage could result from unions' ability to defend the salary share of the education budget in a context of fiscal restraint. This view is supported by the priority given to wage demands, as shown by an analysis of the demands of the main teachers' union in Argentina.[5]

Responsibility for primary and secondary education has been decentralized at the provincial level (primary since 1978 and secondary in 1993). Indeed, even at the peak of centralization in 1952, only 43 percent of elementary schools, as opposed to 75 percent of secondary schools and 83 percent of vocational schools, were national. Federal Education Law No. 24,049 of 1993 regulates the distribution of responsibilities between the nation and the provinces, and the provinces now play the leading role in financial, pedagogical and administrative matters, as well as in labor relations and teachers' career paths. The national government

Table 8.2. Expenditure on Education: International Comparison *(1997)*

Country	Public expenditure on education (as % of GNP)	Expenditure on teachers wages as a % of total current education expenditure	Student / Teacher ratio	Duration
Argentina	3.5	84.1	17	10
Australia	5.4	54.2	12	10
Brazil	5.1	-	23	8
Canada	6.9	62	16	10
Chile	3.6	-	30	8
Colombia	4.1	81.9	25	5
South Korea	3.7	-	31	9
Mexico	4.9	-	28	6
Peru	2.9	40.1	28	6
Uruguay	3.3	41.5	20	6

Source: World Development Indicators, World Bank.

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[5] Low salaries and payment delay account for almost half of the concerns expressed by teachers' unions. See Table 8.7.

sets the national curriculum, evaluates the system, implements compensatory programs and promotes, along with the provinces, teacher education programs.[6] The involvement of the province in the administration of Argentina's education system—as opposed to the school, municipality or central government—is high in international terms. The crucial role of the provincial level, as well as very limited school autonomy, is illustrated by the international comparison in Figure 8.1.

Because almost all schools depend on the provincial government, public education budgets, teachers' salaries, and working conditions and regulations (*Estatutos Docentes* and *Convenios Colectivos*) are mainly decided in the subnational arena. Hence, because educational administration is concentrated at the provincial level, and most unions are organized at the provincial level as well, the province affords the most appropriate level of analysis for the political and the labor-relations effects of unions.[7]

The Influence of Unions on Education: A Sketch of the Empirical Strategy

Several institutional features of the education system and of teachers' unions in Argentina differentiate it from the American system in ways that make it virtually impossible to replicate the groundbreaking study by Hoxby (1996).[8] Education is "decentralized" at the provincial level, and most unions are organized at the provincial level as well. Budgets, teachers' salaries, working conditions and regulations (*Estatutos Docentes* and *Convenios Colectivos*) are negotiated between the provincial government and teachers' unions and apply to all teachers and schools irrespective of their union membership status, or their participation in the negotiation process or election of union leaders. Consequently, all schools located in the same province are affected by teachers' unions, even those whose teachers

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[6] There is, however still an important element of centralization of political conflict over teachers' wages. The main federation CTERA has called several national strikes and mobilizations. The most salient recent episode was the so-called "*carpa blanca*," a tent with teachers hunger-striking in front of the National Congress, which led to the approval of a special national tax on automobiles to finance wage increases for teachers throughout the country (the so-called *incentivo docente* or "teaching incentive").

[7] As described below, a micro-level relationship can also be traced between unions and teachers' job satisfaction, which can have a direct impact on the learning process of individual students.

[8] One additional feature not emphasized in the text is that both unions' rules and the law, particularly the *Ley de Asociaciones Sindicales*, do not require unions to operate under democratic rules. Under such circumstances it might be inappropriate to assume that the union's objective function represents the preference of the "median" member.

are not unionized. This institutional feature complicates the possibility of school-level cross-sectional analysis.[9] Hence, in order to look for the potential effect of unions on education, the most disaggregated level possible is that of the province in both the provincial political and labor-relations arena.[10]

Of ultimate interest, however, are education outcomes such as student learning. This depends not only on variables that are decided at the provincial level, but also on the socioeconomic characteristics of the student's family, as well as on school and classroom factors. Hence the analysis requires different levels of aggregation. The analytical and empirical strategy undertaken in relation to these levels can best be understood by reference to Figure 8.2.

Within this approach, this chapter uses a dataset that contains seventh-grade test scores in mathematics and language from a number of schools throughout the country. These can be matched to student questionnaires, teacher questionnaires and school-principal questionnaires to provide useful information about "inputs" to the education production function. In a simplified manner, it can be postulated (as in the right side of Figure 8.2) that student achievement is a function:

$$Y_{ij} = f(X_j; e_j; Z_i) \quad (1)$$

where Y_{ij} is the score of student i in school/classroom j; X_j is a vector of school/classroom variables (inputs), e_j is a vector of (possibly unmeasured) "teacher" variables (such as effort, or "quality of the match") that are supposed to affect student learning, and Z_i is a vector of socioeconomic characteristics of the student's family. Presumably unions can affect some of the components of X or e, and hence, indirectly, educational outcomes.

Moving towards the left in Figure 8.2, it can be seen that unions operate mostly at the political level and to some extent at the labor-relations level, and hence they can directly affect some provincial-level variables which themselves are either some of the Xs, or determinants of some Xs or es. For instance, they

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[9] That is, even if information were available on whether particular teachers in a particular school are unionized, it is not clear whether that should be expected to have any impact on the relevant variables (such as student learning). Even if the empirical analysis showed an impact it is unclear, given the institutional features of the Argentine case, whether that should be attributed to "union effects" or to personal characteristics of the teacher that are correlated with the decision as to whether to join a union. This caveat thus qualifies the analysis of the unionization-job satisfaction link with the micro-level data mentioned in footnote 7 above.

[10] Of course, it is also quite likely that in the Argentine case one of the most important channels of union influence is in the national political arena, a hypothesis that will be addressed more indirectly because of obvious empirical limitations.

Figure 8.1. Level of Decision-Making in Education
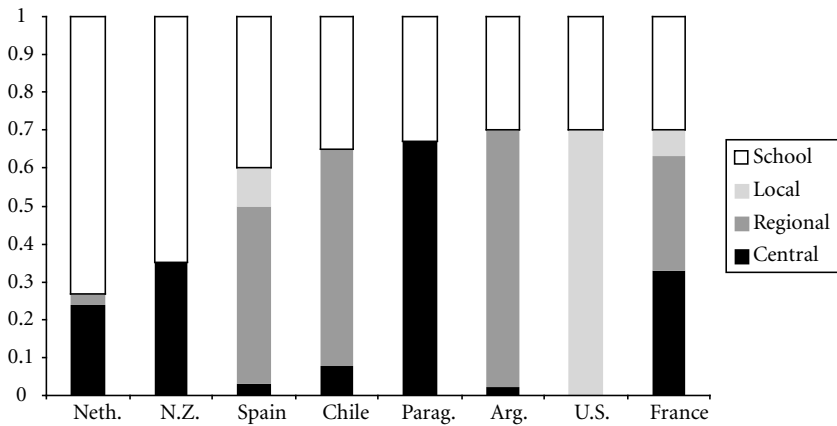
Source: OECD, 1998.

Figure 8.2. Empirical Strategy Framework
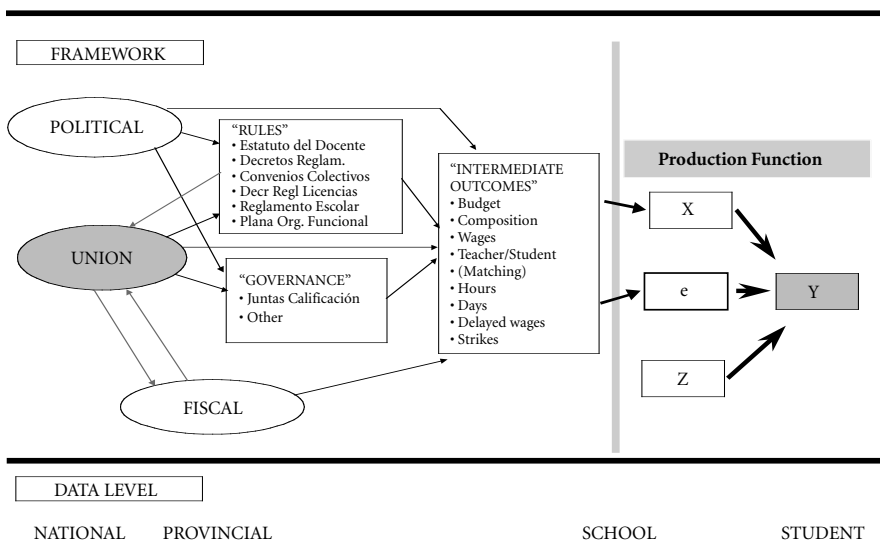
can have an impact on provincial education budgets, on budget composition, on teachers' wages, on teacher/student ratios, on the quality of the match between teacher and school, on the number of hours of instruction, on the number of days of class, on strikes (and hence days of class lost, low morale and so forth) and on whether wages to public teachers are paid on time.[11]

There are several possible mechanisms whereby unions can affect those "intermediate" variables, although these mechanisms are somewhat different from those usually assumed in the "standard" empirical literature on unions. One important difference is that, in most provinces, collective bargaining has not been a practice in the education sector because of legal limitations on public sector collective bargaining, which lasted until 1990. As a result, unions have sometimes chosen a political strategy of taking part in the discussion of legislation and administrative rules affecting teachers, including rules on working conditions or representation in governance institutions, such as qualification boards, which affect promotion and tenure.[12] Indeed, in addition to strikes, unions also use expressive protests to make their demands more effective. The political character of labor relations in the education sector is further reinforced by the attitudes of the employers (provincial governments) and the fiscal considerations emerging from the complicated relationship between provincial and national governments in a federal country. In particular, the interactions between presidents, governors, and unions, which are sometimes of different political affiliation and have different incentives regarding budget allocation and political unrest, complicate the context in which the educational process is taking place. Hence some are codetermined by more general political and even fiscal variables, as shown on the left side of Figure 8.2. For example, days of class are affected by strikes, which in turn may sometimes come as a response to delays in wage payments, and whether that delay occurs and whether it leads to strikes will depend on the provincial fiscal situation, as well as on the nature of the relationship between the provincial government and teachers' unions. More generally, the nature of the relationship between political authorities

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[11] Occasionally, provincial sector employees, including teachers, are paid several months late. This has been one important source of labor conflict in the education sector.

[12] The decisions on the professional career of teachers are handled by the teaching profession through Qualification Boards (*Juntas de Calificaciones*). These boards use a system of points in which diplomas, tenure and courses constitute the main factors. Those applicants with the highest scores have the first right to select among open positions, and school authorities and parents have no voice in the selection process. Teachers' unions presumably play an important role in some of the *Juntas*.

and unions can explain some of the rigidities in teacher labor laws (such as the *Estatutos Docentes*).[13]

It can be postulated that the "intermediate variables" are a function of:

$$X_{jp} = g\,(U_p\,;\,W_p)\quad(2)$$

where X_{jp} are those inputs that affect student performance and are presumably affected by the union's behavior. (For example X_{jp} could be the number of class days in school *j* located in province *p*). U_p is a vector of provincial teacher union characteristics, and W_p is a vector of control variables (for instance, the provincial fiscal situation).

In order to explore the effect that teachers' unions have on students' performance given the data constraints, two steps were taken. The first was to estimate the education production function from equation (1) with individual and school-level microdata. The second was to run separate cross-province regressions for each *X* presumably affected by teacher unions.[14] This approach does not make it possible to claim a conclusive result on the overall impact that unions have on education, but it provides evidence of the effect that unions have on some specific variables that affect student performance (class days, teacher's job satisfaction, tenure and class size). In view of the characteristics of the data available, this is the most informative approach.[15]

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[13] See Spiller and Tommasi (2000) for a framework that explains overregulation as the outcome of the inability to strike efficient intertemporal political transactions.

[14] The system of equations (1) and (2) is recursive. Thus, as long as the error terms in the two equations are independent, each can be estimated separately.

[15] There are at least two other approaches to computing the impact that unions have on students' performance. The first is to estimate the reduced form of equations (1) and (2). While this strategy has the advantage of providing an estimate of the full effect of unions on education outcomes, it also has several disadvantages. First, all heterogeneity is lost across families, and to some extent across schools, since means within provinces must be used. Second, it is not possible to identify the partial effects of unions. From a theoretical perspective, unions affect education through several channels. For example, unions call for strikes and hence students have fewer class days and presumably perform worse; on the other hand, unions could also pressure the government for a higher education budget, leading to better performance. Lastly, another disadvantage of the reduced form estimation is the omitted variables problem. Since information is not available on provincial variables that might have important (direct or indirect) influence on student performance, this might induce biases in the coefficients of the union variables.

The second approach consists of two steps. The first is to estimate the education production function including provincial dummies. The second is to regress provincial dummies' coefficients on the union variables and controls. This approach has disadvantages similar to those of the first approach, but it also reduces significantly the number of observations (in the second regression only 24 observations are used).

Education Production Function Estimation

Most economic studies of school effectiveness follow the Educational Production Function (EPF) approach, asking which policy inputs can increase outputs. Personal, family and other factors are treated as inputs, and student performance as the output of this EPF.[16] EPF studies classify the factors that influence students' performance as:

    a)   personal factors such as sex, race and so on;

    b)   family factors such as socioeconomic level, family size and parents' education;

    c)   factors related to place of residence; and

    d)   school and teacher factors, such as school structure, number of school days, teacher experience and teacher dedication.

In order to analyze school production it is essential to use adequate measures of outcomes. This is not an easy task, since education has multiple objectives and many of them are hard to measure. A majority of studies in the EPF tradition measure output by standardized achievement test scores, although others have employed measures such as student attitudes, school attendance rate, and high school retention or dropout rates. This chapter uses test scores.[17]

The problem in statistical terms is to describe the relationships between test scores, school and teacher processes and characteristics of the pupil intake. The econometric model that is estimated assumes a linear relationship between test scores and the factors included in the regression.

Since 1993, the Ministry of Education has implemented a National Evaluation System in order to quantify students' knowledge in a variety of subjects and reveal complementary information to analyze its determinants. The observational units are the student, the student's family, the student's teachers and the school. Different grades have been tested in different years, as shown below.

Only data corresponding to seventh-grade students attending public schools in 1997 and 1999 are used in this chapter. These years were chosen because there are reliable data on union variables for the period 1997-1999 (see next section). All

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[16] There are several critiques of this approach. An excellent survey is Scheerens (1999).

[17] It is worth pointing out that an overall reading of the use of EPF throughout the world provides an ambiguous picture, where results are sometime inconsistent and not very robust (Hanushek, 1986, Hanushek, Kain and Rivkin, 1998, and Scheerens, 1999). This is particularly the case when the dependent variables are test scores. Still, the findings are constrained by data availability.

private school observations are dropped because there is only one national private teachers' union, which makes it virtually impossible to explore how private teacher unionism affects outcomes through a cross-province analysis.

The regression includes student and family factors such as parents' education, kindergarten attendance and family wealth; classroom factors such as class size, peer effects and classroom structure; and teacher factors such as teacher experience, education, tenure, dedication, and job satisfaction. Finally considered are school factors such as class days, principal's tenure and experience.

Among the variables listed above, four factors deserve special consideration since they are potentially affected by teacher union behavior. These are class days, class size, teacher tenure and job satisfaction. The relation between class days and students' scores is straightforward; it is expected that more class days improve student performance. More complex are the relations between performance and class size, teachers' tenure, and teachers' job satisfaction. One might expect a negative relation between class size and student learning. This is a well-studied relationship, however, and to date there is no conclusive evidence.[18]

The provincial teachers' labor codes (*Estatutos Docentes*) are very complex and protectionist, particularly for tenured teachers. Firing tenured teachers is extremely difficult and absence regulations are very lenient.[19] Thus it could be argued that tenured teachers do not have the incentive to dedicate much effort to their work. It is also possible, nonetheless, that the restrictions specified in the *Estatutos* prevent political discretion and provide a feeling of security to the tenured teacher, leading to better teaching quality.

Finally, it is reasonable to expect that more satisfied teachers devote more effort to their duties, improving teaching quality.[20] Nevertheless, because job

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[18] For example, see Hanushek, Kain and Rivkin (1998). In addition, many econometric studies show an insignificant effect. Also, as Hanushek observes (as cited by Bracey, 1998) "Japanese class sizes are much larger than US class sizes. Japanese students' performance is, on average, much better than US students' performance." On the other hand, in the United States a series of experiments undertaken in recent years have proven quite the contrary (such as the California initiative and the Tennessee experiment). Some of these approximations state that the effects differ by level of the class size variable, and therefore equal effects should not be expected for class sizes of 20 students and class sizes of 15 or fewer (Nye, Hedges and Konstantopoulos, 1999). Additionally, Gursky (1998) indicates that reducing class size can improve student achievement, particularly in earlier grades and low-achieving and low-income students.

[19] There are jurisdictions, such as the City of Buenos Aires or the province of Chaco, where tenured teachers can take, on average, more than one hundred days of absence in one year.

[20] Hammermesh (1999) argues that a more satisfied worker is more likely to invest in firm-specific human capital and increase his commitment. Locke (1976) suggests that job satisfaction could be used as a proxy to capture aspects of the workplace, such as mode of supervision, physical working conditions and so forth that are not generally measured on data files, and that could have an impact on outcomes such as workers' productivity. He also suggests that job satisfaction could affect workers' mental health and hence affect their productivity.

satisfaction reflects both objective and subjective factors, such as the teacher's psychological state, it is more complex to interpret than standard economic variables.[21]

Table 8.4 presents the results for the 1997 math test score.[22] The findings indicate that students perform better when they have more class days and when their teacher is more satisfied with the job. The coefficients are highly significant in the four regressions (math and language, 1997 and 1999). One additional day of class results in an improvement of approximately 0.4 percent in student performance.[23] There is no clear relation, however, between student performance and class size. While the coefficients for the 1997 language and math evaluations (shown above) are positive, there is a negative and statistically significant relation for the 1999 tests.[24]

In contrast, higher scores were found among those students who have a tenured teacher (even after controlling for teacher experience), although there are three reasons to interpret this result with caution. First, the coefficient is not statistically significant in any of the four evaluations. Second, it could be that tenure improves teacher performance, or it could just be that better teachers are awarded tenure. Finally, it is important to note that the National Evaluation Survey only includes those teachers who are actually teaching on the day the evaluation is conducted; teachers on leave of absence were not surveyed.

Table 8.3. SINEC Surveys

	Year						
Grade	1993	1994	1995	1996	1997	1998	1999
3rd		Lang.	Math	L & M	L & M	Math	L & M
6th				L & M	L & M		L & M
7th	L & M	L & M	L & M	L & M	L & M		L & M

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[21] There is also the possibility of reverse causation: a teacher assigned to intelligent, well-behaved students may become more satisfied.

[22] A summary of the other three regressions, variable descriptions and basic statistics appear in Appendix 1 of Murillo et al. (2002).

[23] In Argentina, the average number of class days per year was 157 days in 1997, almost 20 percent less than in OECD counties.

[24] See Appendix 1 of Murillo et al. (2002).

Table 8.4. Regression Result

Dependent Variable: log of 1997 mathematics test score (OLS clustered by school)

	Variable	Coefficient	t-value
School Factors	**Class Days**	0.004	4.076
	Principal tenure (yes=1, no=0)	0.029	1.076
	Principal experience	0.012	0.849
Teacher's Factors	**Job Satisfaction**	0.041	2.246
	Tenure (yes=1, no=0)	0.018	0.761
	Teacher dedication	0.020	0.919
	Teacher experience	0.013	1.776
	Teacher education	0.011	0.831
Student and Family	Gender (female=1)	-0.019	2.051
	Father education	-0.002	0.076
	Mother education	0.012	3.400
	Kindergarten	0.043	2.871
	Family size	-0.012	2.708
	Repeated grade	-0.158	12.714
	Wealth	0.00002	2.700
Classroom Factors	**Students/Teacher**	0.004	1.859
	Positive peer effect	0.046	6.211
	Negative peer effect (-)	-0.015	1.256
	Classroom structure	0.008	1.816
	Observations	11791	
	R2	0.14	

Additionally, the sample might have a severe bias. The analysis of the *Estatutos Docentes* shows that tenured teachers have an impressive number of leave days they can take during the year compared to teachers hired on a "temporary" basis. Thus it can be presumed that being tenured increases a teacher's likelihood of being on leave.[25] Consequently, while there is evidence that students who have an active tenured teacher perform better than those who have an active non-tenured

[25] Regrettably, it is impossible to compare the ratio (active tenure teachers / total active teachers) relative to (tenured teachers/total teachers) using census data. The last national survey, conducted in 1994, shows that 57 percent of teachers are tenured. The 1997 and 1999 samples of active teachers show that 61 percent and 53 percent, respectively, of active teachers are tenured.

teacher, it cannot be claimed with a high level of confidence that "tenuring" teachers is an appropriate policy for improving education quality.

Teachers' Unions

The analysis of the impact of teachers' unions in Argentina is based on an understanding of several factors. These include the historical background of teachers' unions, the data used, and methods of estimating union influence on the educational process.

Background

Argentine teachers' unions, organized mainly at the provincial level, have taken a very militant stance toward educational administration. Approximately 350,000 teachers are unionized, or 55 percent, representing one of the highest occupational unionization rates in the country.[26] Additionally, teachers' unions have not only been active in the development of the education system, but have also organized more demonstrations and strikes than most other sectors.[27]

The origins of teachers' unions can be traced to the end of the nineteenth century. In 1892 the *Liga de Maestros*, Argentina's first teachers' association, was established in the province of San Juan. Other provincial teacher associations followed in Buenos Aires, Córdoba, Tucumán, Mendoza, Corrientes, Santiago del Estero, Misiones, Entre Rios, Catarmarca and Río Negro; these provincial groups failed several times to organize a national federation. The first national organization, the Union of the Argentine Teacher, was created in 1950 under the influence of the Peronist government and later became the UDA (Union of Argentine Teachers).[28] Hence most teachers' organizations created thereafter emerged in a decentralized fashion with some exceptions, such as UDA and AMET (Association of Teachers of Technical Schools), which affiliate teachers under national jurisdiction and had

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[26] The unionization rate for the whole workforce has been estimated in 28 percent.

[27] Among them, the *marcha blanca* and the *carpa blanca* had a significant impact. The *marcha blanca* took place in 1988, and was the major historical teachers mobilization. The *carpa blanca* was set up by teachers in front of Congress in 1997 to demand a higher public education budget. The *carpa blanca* influenced political discourse and finally enabled the teachers' union to participate in the design and congressional approval of an extremely controversial financial law aimed at increasing teachers' salaries. For a detailed analysis see Behrend (1999).

[28] See Vásquez and Balduzzi (2000).

Table 8.5. Sectoral Union Participation in Total Conflicts

Sector	1996-97	Sector	1990	Sector	1988
Civil Service	25%	Teachers	29%	Civil Service	26%
Teachers	23%	Civil Service	14%	Teachers	15%
Transport workers	7%	Steelworkers	6%	Physicians	4%
Municipal employees	5%	Mechanics	4%	Municipal employees	4%
Energy	5%	Railway carmen	4%	Railway carmen	3%
Steelworkers	4%	Banking	3%	Banking	3%
Aeronautics	3%	Physicians	3%	Health	2%
Banking	3%	Paper mill workers	2%	Oil workers	2%
Oil workers	3%	Port workers	1%	Postmen	2%
Mechanics	3%	Meat-cutters	1%	Port workers	2%

Source: Centro de Estudios para la Nueva Mayoría.

a national coverage from the start. A group of 147 provincial unions was founded in 1973, the Confederation CTERA (*Central de Trabajadores de la Educación de la República Argentina*). CTERA is the largest teacher organization in Argentina, with 200,000 members nationwide. Because CTERA was founded in an attempt to reduce the fragmentation of the sector, successive mergers reduced the component unions to a single union per province. This confederation of provincial unions, which often had different partisan sympathies, opposed the education policies of both Menem administrations and the Federal Education Law.[29] Additionally, the national leadership has sought collective centralization of demands to negotiate with the central government and further attempted to implement national collective bargaining after the approval of new labor relations regulations for the public sector in 1990.

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[29] CTERA joined the Peronist CGT (General Confederation of Labor) in the mid 1980s after Mary Sánchez, a Peronist leader, won the national elections of the union. However, in 1989, after President Menem abandoned his populist campaign promises, CTERA first joined the anti-government CGT Azopardo and later founded, with other public sector unions, the Congress of Argentine Workers (CTA) with a clear opposition stance. Mary Sánchez left the Peronists and joined a new opposition party.

CTERA, however, competes with other unions in almost every province. Rival provincial unions, together with SADOP (the private teacher's union), UDA and AMET have opposed some of CTERA's strategies. The fragmentation of the sector was therefore not remedied by CTERA and, at the provincial level, there are currently more than 150 unions operating in primary and public education. In addition to political diversity, teachers' unions present significant differences across provinces in their density, legal recognition, and political ideology. Table 8.6 presents information on teachers' unions in the provinces.

Data

This section reviews the principal data sources used in this study to analyze the impact of teachers' unions on education in Argentina.[30] Of particular interest is that, despite the limitations of the data, this is the first database of its kind for the empirical study of teachers' unions in Argentina. Two sources have been used. The first is the official record of unions and affiliates provided by the Ministry of Labor, and the second is the *Encuesta de Desarrollo Social*, administered by the Ministry of Social Development.

In the Ministry of Labor's dataset, the unit of analysis is the union. The information includes the number of union members, the union's legal status, and its jurisdictional coverage. The dataset also provides some information about how these variables have changed during the last decade. The Ministry of Social Development's dataset is drawn from the *Encuesta de Desarrollo Social*. In this 1997 national household survey, which included more than 70,000 observations, approximately 1,600 people reported that their occupation was teaching. This survey makes it possible to determine several characteristics of teachers, including labor union participation and province of residence. These two datasets, along with interview-derived information, are used to construct indexes of the characteristics of teacher unionism in each province.

In order to know teachers' unions' objectives and demands, two sources are used. The first is a review of the corresponding literature on public sector unionism. The second consists of interviews and unions' internal documents in which demands and goals are reported. From those documents it is evident that their main concern is wages. Low salaries and delays in payment are the most important issues for teachers' unions. All of the 15 provincial unions surveyed are

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[30] Appendix 2 of Murillo et al. (2002) contains additional details.

Table 8.6. Teachers' Unions *(Primary and Public Education, 1999)*

	Number of unions	Unions with *personería gremial*	Affiliates*	Jurisdictional coverage
Buenos Aires	96	14	100,965	(P, L)
Catamarca	2	0	2540	(P)
Chaco	9	1	13,856	(P, L)
Chubut	1	1	4,178	P
City of Buenos Aires	8	1	21,299	P
Córdoba	5	2	27,874	(P,L)
Corrientes	4	1	9,075	(P,L)
Entre Rios	1	1	17,651	P
Formosa	6	0	1,718	(P,L)
Jujuy	1	1	3,478	P
La Pampa	1	0	2,785	P
La Rioja	1	0	3,735	P
Mendoza	1	1	11,835	P
Misiones	1	1	6,370	P
Neuquen	1	1	7,492	P
Rio Negro	1	1	8,214	P
Salta	3	1	15,025	P
San Juan	1	1	5,621	P
San Luis	1	0	1,510	P
Santa Cruz	1	1	3,535	P
Santa Fe	1	1	29,344	P
Santiago del Estero	4	1	4,646	P
Tierra del Fuego	1	0	790	P
Tucumán	1	1	8,988	P

Note: P for the province and L for local. (*See note 30 regarding affiliates).
Source: Authors' calculations based on data from Dirección Nacional de Asociaciones Sindicales.

Table 8.7. Reported Concerns of Union Members

Demand	Percentage of provincial unions demanding	Percentage of total demands reported
Salaries	100 %	41 %
Tenuring-absence days	47 %	21 %
Job security	33 %	11 %
Employment	33 %	9 %
Health insurance	20 %	7 %
Unions participation*	33 %	7 %
Teacher training	13 %	5 %

Source: Authors' calculations based on CTERA (2000), *Informe de la Situación en todas las Provincias*, which covers 15 provinces.
* Includes demands for a higher union participation in the education system, such as collective bargaining and *Juntas de Clasificación*.

concerned about salaries, which represent almost half of total demands reported by unions. Tenure and job security are also important issues.

Estimating Union Influence

As explained above, a number of institutional features of the education system and of teacher unionization in Argentina prevent the type of analysis disaggregated at the level of, say, school or school district, such as has been provided in the United States. For that reason most of the analysis of the impact of unions is performed at the provincial level.

The "intermediate variables" that this paper attempts to relate to (provincial level) union characteristics are variables that: (a) are significant predictors (or possible determinants of significant predictors) of educational outcomes in the education production function estimation; and (b) could be related to the theories on union effects. These include days of class, teacher's tenure status, class size, and budget size and composition. Additionally, there is one variable found to be significant in the education production function, which is teacher satisfaction, for which a more disaggregated analysis is provided, using a complementary data set.[31]

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[31] There are other channels for union effects such as the *Estatutos Docentes* and of *Juntas de Clasificaciones*. *Estatutos Docentes* are the by-laws ruling labor relations, which define job stability, leaves of absence and so on. These rules are believed to have a large impact on teachers' incentives, and teachers' unions report concern about them. The *Junta de Calificaciones*, where unions have representatives, are the boards in charge of teachers' evaluation and promotion. These issues are left for further work.

Union Variables

Most of the "intermediate" variables under consideration (days lost, tenure, budget allocation) are linked to the interaction between unions and their employers—in the Argentine case, provincial governments. Hence these variables are affected by characteristics of the unions and by their political relationship to the provincial government. This chapter considers the impact of union strength, coordination, legal recognition and political alignment on the (intermediate) dependent variables under study.

Strength. Measures of both union density (percentage of union members in the occupational workforce) and of union participation (responses indicating that teachers have union membership) are considered. Membership or density is a traditional measure of union strength, which increases not only the effect of work stoppages but also provides financial resources for the organization (Golden, 1997; Olson, 1971).

The relationship between union strength and the propensity to strike is not obvious. Following the Hicks paradox on the impossibility of explaining strikes when there is complete information, strikes are usually explained as a result of asymmetric information (Kennan, 1986). In that case, strikes can result from the search for information by one of two parties. For instance, the union wants to know how much the employer would give or the employer wants to know the concession threshold of the union (Hayes, 1984). Tsebelis and Lange (1995) thus model strikes as "bluffing" from unions that try to secure better conditions from employers than their real strength would allow. This interpretation also follows Hicks's view that the striking union may be trying to maintain a "reputation for toughness" (Kennan, 1986). In this case, strikes occur when employers try to probe the union's real strength. This argument also predicts that the propensity for strikes should be lower for strong unions, which do not need to bluff, or for weak unions, which cannot bluff, but higher for those in between. In particular, those unions whose density is decreasing and whose strength is unclear, but which still have a reputation for toughness, should be more prone to strike. The alternative view of strikes is that union strength facilitates collective action and increases the propensity of the union to strike by increasing its ability to secure concessions by striking (Franzosi, 1995).

As regards the other dependent variables, the relation between union density and union demands (such as tenure, budget allocation, and employment) is more

straightforward; these are traditional goals of unions. Stronger unions are in a better position to bargain with the government over these issues, controlling for other fiscal and legal factors (Freeman and Medoff, 1986).

Fragmentation/Coordination. It can be assumed that coordination is more complicated when more than a single union has to bargain with the provincial government. Coordination problems tend to increase the propensity to strike because they make bargaining more difficult, especially if at least one of the unions is belligerent (Golden, 1993; Murillo and Maceira, 2000). In this case, although each union is weak, they are more likely to go on strike because of difficulties in coordinating negotiations and because they have incentives to appear as more effective than their rivals in a sector where employees are discontented with salaries and working conditions. The presence of several unions thus makes coordination more difficult and weakens their bargaining power. Hence, other things being equal (such as density, sector, laws), a monopolistic union is stronger than multiple competing unions in the same sector. For that reason, the demands of monopolistic unions on tenure, budget allocation, employment and even policy preferences are more likely to be met. However, their demands or policy preference can be the result of coordination problems that, combined with different political alignments, can radicalize the positions of teachers' unions on policy issues and make bargaining more difficult.[32]

Recognition. Also considered is the legal status of the union (if the union is *inscripta* or if it has *personería gremial*). In Argentina, those unions with personería gremial have several exclusive rights, such as representing all workers in collective negotiations, enforcing labor legislation and social security regulations, and cooperating with the government in dealing with problems that affect workers.[33] It is therefore presumed that in those provinces where the main teacher union has *personería gremial,* the union is more likely to see its demands met.

Political Alignment. The political alignment of teachers' unions can induce a propensity to strike by providing national coverage; according to Golden (1997),

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[32] In the case of very large provinces, unions are discarded that include less than 10 percent of affiliated teachers, because those unions are assumed to be either too small or specialized to guide a coordinated action against the provincial government.

[33] Unions that are only *inscriptas* do not have any of the rights mentioned. They are, however, also allowed to call for strikes and collect contributions from their members.

this makes unions more "strike-prone." Alternatively, it can influence the union attitude towards provincial government, on the basis of provincial and national political dynamics, because of channels of communication and trust based on a long-term relationship in which previous iterations were beneficial for both parties (Murillo and Maceira, 2000). This second argument follows the literature on "power resources" (Korpi, 1978) and the "political exchange" (Pizzorno, 1978)—that is, the idea that when unions lack political access to an allied government they are more likely to use measures such as strikes. Hence it can be expected that a positive political alignment with the government increases trust and communication between the teachers' union and the government, facilitating bargaining rather than striking. It can also influence the attitudes of union leaders and the formation of preferences regarding policies of uncertain effect, on the basis of the politically created trust. The opposite is true for the lack of positive political alignments.

In Argentina, membership of CTERA (which rejected President Menem's policies at the national level) interacting with a Peronist or conservative government should increase a union's propensity to strike. Also explored will be the combination of political alignment and union fragmentation, following the argument that when political alignment facilitates trust between the provincial government and the union, union monopoly induces restraint and negotiation. However, union fragmentation helps increase conflict even when some of the unions have a good relationship with the provincial government, because they are afraid of being labeled as "sell-outs" by rival unions in the eyes of teachers (Murillo and Maceira, 2000). Additionally, the construction of the index of political alignment considered the diversity in partisan affiliations in CTERA unions across provinces, as well as the presence of alternative unions and their own political alignments.

Operationalizing the Variables

To summarize, four key features describe the characteristics of teacher unionism in each province: the number of members, the number of unions, their legal status and their political relation with the government. Table 8.8 provides a description of the variables used in the empirical estimation.

Lost Days. The section on EPF estimation describes the impact of class days on student performance. The relationship between union influence and lost days is relatively straightforward, as the number of effective class days is affected by strikes. Although unions organize strikes, they must have a reason to do so. Hence

Table 8.8. Union Variables Description

Variable	Description	Source
Participation	Percentage of teachers who report participation in a labor union.	Encuesta Desarrollo Social
Membership*	Affiliates/Teachers ratio	Ministry of Labor
Fragmentation	Number of unions per province with more than 10% of affiliated teachers.	Ministry of Labor
Fragmentation II	Unions per 10,000 teachers.	Ministry of Labor
Recognition	Legal status. Is a dummy variable, where 1 means that the union has legal monopoly (*personería gremial*).	Ministry of Labor
Political Alignment**	Political alignment between the main union and the governor. Values range from to 0 to 1, where 0 means a highly contentious relationship.	Interviews with union leaders and experts, and press information

See Appendix 2 of Murillo et al. (2002) for more details.

Note: For all the variables the province is the unit of analysis.

* One natural measure of union density would have been the members/teachers ratio (membership). However, the official record of members provided by the Ministry of Labor presents several problems: For some unions there is no information about membership; there are also some cases where a single provincial union lists a number of members higher than the total number of provincial teachers. Thus, "participation" is used as a proxy of union density instead of "membership" in the regressions.

** In most provinces, there is only one teachers' union. In those where there are more than one, only the most important union (determined by density and legal status) is considered. Finally, in those provinces where any union could be defined as the main one (such as in Buenos Aires, where two unions have almost equal membership), "Political Alignment" is computed by taking the average political relationship between the governor and the unions.

A value of 1 is assigned to those provinces where the main union is affiliated with CTERA (a founding member of the left wing FREPASO party) and the governor is Peronist or right wing, with the exception of provinces where the union leaders were politically close to the local Peronist party. Conversely, those cases where the governor's party is center-left (UCR or ALIANZA) and the union is affiliated with CTERA, were assigned lower values ranging from 0.33 to 0.66, depending on how specialists have characterized union leaders local strategy. Finally, a value of 0 is assigned to those provinces where the main union is not affiliated with CTERA and has a historically close relationship with the ruling local party. Teacher union experts confirmed the coding.

the employer, in this case provincial governments, also has an impact on the emergence of conflicts in the education sector. For instance, delay in the payment of salaries provoked the reaction of public sector workers and teachers in many cases, following the argument that it is not low salaries, but rather the absence of income that is a source of mobilization (Scott, 1976). Hence the loss of class days results from the interaction between provincial governments and teachers' unions; this effect will be controlled for with variables such as delay in payments. Additionally,

other variables affect the cost of striking and thus the capacity of unions to call for work stoppages. In particular, attendance bonuses have an impact on the cost for individual teachers and will be used as control variables.[34]

Teacher Tenure. According to the results of the EPF, teachers' tenure has a positive effect on student performance. Unions generally demand tenure for teachers and, in fact, "*titularización*" or "tenuring" is, after wages, the demand most mentioned by CTERA.[35] Unions demand tenure for their members because temporary employees' rights are more precarious and there is a difference in the risks they are willing to run in collective action. Tenure not only benefits temporary teachers; it also increases homogeneity among union members and reduces the risks of striking, because it is usually associated with job stability, thus making collective action easier for unions.

Class Size. Public sector unions have a preference for a larger workforce. Growth in employment entails a larger constituency to be represented, which can increase the strength of the union. This is particularly true in a sector characterized by job stability where salaries are defined in fiscal and political terms rather than according to productivity, as they are for tradable sectors. Additionally, teachers' unions have traditionally demanded a low student-teacher ratio to improve the working conditions of their affiliates. Of present concern is the impact of their demand for enlarging employment in the education sector, and whether larger employment results in a smaller student-teacher ratio. That is, if they demand greater employment but also secure easier conditions for leave or new employment (which leads to an expansion of administrative positions), the student-teacher ratio may remains unchanged. The effect of unions on the student-teacher ratio is therefore tested.

Education Budget. It is not possible to derive a direct effect from the budget allocation to the education function defined above. The education budget, however,

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[34] There are significant differences among provinces in this regard. For instance, the attendance bonus in Santa Cruz represents one third of the basic salary, but in Neuquen the bonus does not exist.

[35] For example, SUTEBA (one of the main teacher's union in Buenos Aires) claims: "The Ley de Titularización was finally approved. We obtain job security for more than 40,000 teachers in Buenos Aires. It is a triumph for SUTEBA, thanks to the unity and organization of our union. To pass the law we had to confront the government and the provincial legislature, but also the Federación Sarmiento [the other main teacher union in Buenos Aires] who were against the interests of the teachers." (Authors' translation from SUTEBA's web page, www.suteba.org.ar)

should have an indirect effect on the learning process. Hoxby (1996) argues that whether unions perform a rent-seeking role or a collective voice role, they are always expected to increase the overall budget. Teachers' unions also affect the budget composition, pressing for higher wages. Thus, strong unions should lead to higher education budgets and salaries, or at least to a higher allocation of salaries in the education budget. Of particular interest is the effect of the present measures of union characteristics on the expenditures per student in each province, with a view to assessing their indirect impact on student performance.

Job Satisfaction. According to the results of the education production function, teachers' satisfaction has a positive effect on student performance. But what is the impact of unions on job satisfaction? Unions are supposed to improve the working conditions of the workers covered, who should therefore express greater satisfaction with their jobs than do otherwise comparable non-union workers. However, most empirical studies have found a negative relation between unionized workers and job satisfaction.[36] There might be several reasons for this result. It is important to note that job satisfaction is a subjective variable, so it is not necessarily related to the "objective" conditions of each employee relative to others (such as lower wages or poorer working conditions).[37] Freeman and Medoff (1986) argue that unions galvanize worker discontent in order to make a strong case in negotiations with management. It is also possible, however, that unionized workers report less satisfaction because they are truly worse off. As mentioned earlier, these measures of "unionization" at the individual level might be capturing personal characteristics of the worker. For instance, teachers who are more prone to conflict and dissatisfaction may also be more likely to join an organization such as a union.

Expected Results

- More strikes (and fewer class days) are expected in the cases in which union density is high, in combination with legal recognition and the

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[36] Freeman (1977), Freeman and Medoff (1986).

[37] According to Locke (1976), job satisfaction depends not only on the objective circumstances in which an individual finds himself but also on his psychological state and thus on aspirations, willingness to voice discontent, the hypothetical alternatives to which the current job is compared, and so forth. Kalleberg (1977) provides a similar definition from the sociological perspective. He argues that job satisfaction depends on the personality of the worker and on the nature of the job he performs (which includes wages, fringe benefits, hours of work, degree of control, promotional opportunities and so forth).

lack of political alignment between teachers' union and the provincial governor. More strikes are also expected in those provinces where unionism is fragmented. Membership provides unions with the ability to call strikes (Franzosi, 1995), whereas union fragmentation and the lack of political alignment increase incentives for conflict because of the lack of trust and coordination problems that make negotiation more difficult.

- As teachers' unions demand tenure, it is expected that stronger unions (in terms of density, union monopoly and legal recognition) will be more effective in achieving tenure for their members.

- Stronger unions are expected to be more able to increase employment and therefore to reduce class size.

- It is expected that stronger unions in terms of density, union monopoly and legal recognition have the ability to obtain higher allocations of the education budget for salaries and higher education budgets. Positive political alignments should enhance the bargaining power of monopolistic unions. In contrast, union fragmentation and lower density are expected to result in lower education budgets and wages.

- There is no particular expectation of the relationship between union membership and job satisfaction. While unions are supposed to improve teachers' working conditions and hence improve their satisfaction, there are several reasons to expect a negative correlation.

Empirical Results

As discussed above, students' scores are higher when they have more class days, when teachers are satisfied with their job, and when teachers have tenure. This section attempts to provide some new evidence on the relation between teacher union characteristics and these intermediate outcomes.

Unfortunately there is no dataset containing information on both students' performance and teachers' unions in Argentina, but there are also certain characteristics in the labor relations in education that require a more aggregate analysis. Therefore an indirect approach, as explained above, is the most appropriate methodology for exploring the relationship between student performance and unionism.

In addition, factors such as education budgets and teachers' salaries merit analysis. These are among the most reported concerns of union members, and it is presumed that they could have an impact on student performance.[38]

Lost Days and Strikes

More strikes (and thus fewer class days) are expected in those provinces where teacher unions are fragmented, and where unions have legal recognition, higher density, and a contentious relationship with the provincial government. In addition, attendance bonuses are expected to have a negative effect on strikes, and payment delays are expected to have a positive effect.

Complete information about teacher strikes in Argentina was not available before the work for this chapter was begun. On the basis of searching and merging different sources of information, however, the variable *STRIKES* was constructed for the period 1997-1999.[39] $STRIKES_{it}$ measures the number of lost days by province, and by year, as a result of strikes. The variable exhibits high variation across provinces; in the province of Neuquen, for example, an average of 20 days per year were lost because of strikes, while in Santa Cruz there were almost no strikes. Variation over time of provincial averages is lower: the average number of class days lost as a result of strikes per province was 5.0 during 1997, 4.7 in 1998 and 8.7 in 1999.

Table 8.9 groups the provinces according to the annual average number of class days lost because of strikes during the period 1997-1999. Higher union density and a more hostile political relationship with the government is observed in those provinces with more class days lost.

While the previous table illustrates the potential link between teacher's union characteristics and strikes, it is necessary to control the results for other, presumably important factors such as attendance bonus and payment delays (*Delays*).[40] Table 8.10 reports the results of pooled provincial regressions.[41]

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[38] The last link is an issue that needs further work. Intuitively, it seems obvious that higher expenditure per pupil should improve performance, but if the quality of education is inadequate, increasing expenditures should not necessarily improve performance (IDB, 1996). In Argentina, it is also not obvious that higher wages would improve teachers' effort and productivity, since there are several barriers that restrict the selection of teachers.

[39] For more details, see Appendix 2 of Murillo et al. (2002).

[40] Regrettably, there are no data on wage payment delays for public sector teachers. On the basis of discussions with union leaders and public officials, the number of provincial civil service strikes is used as a proxy for payment delays.

[41] Panel data specifications are discarded since most of the explanatory variables do not change over time.

Table 8.9. Class Days Lost from Strikes

Provinces grouped by number of class days lost from strikes	Average number of days lost	Teachers participation rate	Union fragmentation	Political alignment
Less than 3 days	1.2	3.1	1.3	0.44
Between 3 and 10	4.8	4.3	1.6	0.39
More than 10 days	17.6	7.2	1.4	0.18

Source: CEDI.

Table 8.10. Regression Result

Dependent variable: STRIKES. OLS robust

Variable	Coefficient	t-value
Participation	0.40	2.53
Union Fragmentation	1.24	2.79
Recognition	0.54	0.45
Political alignment	-4.12	-2.96
Delay	0.77	8.92
Attendance bonus	-0.22	-3.58
Constant	-1.74	-0.99
R-adjusted	0.90	
Observations	24	

There is evidence suggesting that higher density, union fragmentation and a hostile political relation with the government result in more strikes.[42] A 10 percentage-point increase in union density results in a reduction of 4 class days. In those provinces where there are two unions, students have 1.2 fewer class days compared to those provinces with only one union. Finally, in those provinces where there is a highly hostile political relationship between the governor and teachers' unions, there are 4.1 fewer class days than in those provinces with no conflict.

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[42] The coefficient for "recognition" is positive but not significant.

Taking into account the positive effect that class days have on student performance, there is reason to criticize the role unions play. Union leaders nonetheless argue that strikes are an instrument for improving teachers' working conditions and increasing the education budget, and consequently could lead to a better education system. While the validity of this claim could not be determined, the results show that the *means* unions use to obtain their demands have negative effects on students learning.

There is also evidence that attendance bonus and payment delays are significant factors in explaining strikes. The variable "Delay" is clearly the most important explanatory variable in the regression, since most of the variation in strikes across provinces is explained by payment delays.[43] Thus the government could reduce the number of class days lost by paying wages on time.

Tenure[44]

Unions report an important concern with "tenuring" and therefore a higher proportion of tenured teachers (compared to *suplentes* and *interinos*) is expected in those provinces where unionism is "stronger" (higher density, lower fragmentation and legal recognition). As to the link between tenure and union political alignment, governors who have a more contentious political relationship with unions are considered to be less likely to accept unions' demands, leading to a lower number of tenured teachers.

Regrettably, reliable data on teacher tenure is available only for 1994, so strong evidence cannot be provided on the relation between union characteristics and

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[43] When "delay" is taken out of the regression, the R-adjusted reduces to 0.54.

[44] In Argentina, teacher's tenuring is regulated by the Estatutos Docentes and undertaken on an individual basis. The procedure is quite similar across provinces. Only those teachers who satisfy certain conditions, such as age, education, and training courses—and in some cases only those who pass an examination—can be tenured. In some provinces, the Junta de Calificaciones (where unions have representatives) are the boards in charge of the evaluation. However, this mechanism is usually delayed as a consequence of bureaucratic procedures or political convenience. As a matter of fact, a significant proportion of teachers have been tenured through a different mechanism: Leyes de Titularización ("Tenuring Laws"). These laws apply to hundreds or even thousands of teachers at the same time and do not require teachers to fulfill any condition (such as age or education) in order to be tenured. Tenuring laws are usually a consequence of the pressure exercised by teacher unions on the provincial government (see note 33). It is presumed that those teachers who have been awarded tenure through the first mechanism might be the best teachers, but that might not be the case for those teachers who have been tenured through the "tenuring laws." In order to analyze the impact that unions have on the "tenuring" process, it is necessary to consider their effect on both the Juntas de Clasificación and the legislative process (Tenuring Laws). This issue is left for further work.

tenure.[45] Table 8.11 correlates the variable *TENURE* with different characteristics of unions.[46]

The results are neither robust nor clear. Political Alignment and Legal Recognition are positively associated with *TENURE* as expected, but only the last coefficient is clearly different from zero. Union fragmentation and density are negatively or positively correlated with *TENURE* depending upon the proxy used.

Class Size

Teacher unions bargain for higher employment and therefore a lower number of students per teacher is expected in those provinces where unions have higher density and lower fragmentation. These expectations seem to be borne out by the data, as shown in Table 8.12. Teacher union characteristics are probably important in explaining the student-teacher ratio but other variables should be considered, such as the provincial fiscal situation or regional per capita GDP.

With respect to the econometric specification, the same methodology is applied as that used in the STRIKES regression (pooling the original panel across provinces). All the coefficients have the expected sign, but none of the union variables is significant at a 90 percent level of confidence. In fact, only union fragmentation is significant at an 85 percent level of confidence: provinces where

Table 8.11. Tenure and Unions Characteristics

Correlation Coefficient

Unions Characteristics	TENURE
Membership	0.11
Participation	-0.26
Fragmentation	0.15
Fragmentation II	-0.45
Recognition	0.49
Political alignment	0.07

[45] See Table 21 in Appendix 2 of Murillo, Tommasi, Ronconi and Sanguinetti (2002).
[46] TENURE is defined as the percentage of tenured teachers over the total number of teachers in each province.

Table 8.12. Class Size and Unions Characteristics

Provinces grouped according to the students per teacher ratio	Average number of students per teacher	Union Density (participation)	Union Fragmentation
Less than 15 students per teacher	13.4	6.5%	1.2
Between 15 and 18	16.6	3.2%	1.1
More than 18	19.4	3.7%	1.9

Note: Provinces are grouped according to the average number of students per teacher during the period 1997-1999.
Source: CEDI.

there is only one union have a lower number of students per teacher. Most of the variation across provinces is explained by GDP per capita: richer provinces have more teachers per student.

In brief, there is only weak evidence to support the proposition that those provinces where teacher unions are "stronger" also tend to have a lower number of students per teacher. Since a previous section explored the relation between class size and student performance and did not find any clear pattern, no effect of unions on performance through this channel can be claimed.

Budget, Composition and Wages

It is expected that stronger unions in terms of density, legal recognition and monopoly have the ability to secure higher education budgets and a higher allocation of the budget to salaries. Provincial education budgets also depend on local revenues, but as Sanguinetti, Sanguinetti and Nicolini (2000) argue, national transfers to the provinces are also important, since the federal co-participation regime is highly redistributive.

Three regressions are run in order to explore these issues. In the first, the dependent variable is the log of public expenditure on education per student. The second looks at the share of public education spent on wages, and the third explores variation in teachers' wages (relative to the average provincial income) across provinces. The first and third regressions use means from panel data for the period 1997-1999. The second regression is based on information for a single year (1997).

Table 8.13. Regression Results

*Dependent Variable: Students/Teachers. OLS robust**

Variable	Coefficient	t-value
Participation	-0.08	-0.62
Fragmentation	0.89	1.52
Recognition	-0.06	-0.06
Political alignment	1.46	0.95
GDP per capita	-0.001	-4.47
Public Expenditure p/c	-322.5	-0.32
Constant	20.3	8.15
R2	0.42	
Observations	24	

*Variables description and basic statistics are in Appendix 2 of Murillo et al. (2002).

Table 8.14. Regression Results

Dependent Variable: Educational Expenditure and Wages. OLS Robust (t-statistics in parentheses)

Variable	Public expenditure on education per student	Share of public education spent on wages	Teachers' Wages (relative to average income)
Participation	-0.001	0.003	-0.484
	(-0.18)	(1.07)	(-0.46)
Fragmentation	0.038	0.014	2.296
	(0.71)	(0.85)	(0.25)
Recognition	-0.185	0.058	21.74
	(-1.68)	(1.89)	(1.22)
Political Alignment	-0.071	0.011	-2.448
	(-0.45)	(0.28)	(-0.84)
Local Revenues	0.417	-0.052	3.600
	(8.38)	(-4.33)	(0.56)
National Transfers	0.193	0.070	43.13
	(1.92)	(2.84)	(3.06)
Constant	3.603	0.618	-194.8
	(4.28)	(2.82)	(-1.49)
R2	0.85	0.61	0.45
Observations	24	24	24

The findings show that public education expenditure per student is higher in those provinces where local revenues and national transfers are higher. None of the teachers' unions variables is statistically significant, and they have the opposite sign of those expected. As expected, however, those provinces where teacher unions have higher density and legal recognition have a higher share of the education budget allocated to wages; only "Recognition" is significant at a 90 percent level. Regarding the fiscal variables, national transfers have a positive and significant coefficient, but local revenues have a negative effect.

Finally, there is no statistically significant relation between teachers' unions and teacher wages (relative to the average provincial income). The only significant factor is national transfers, which have a positive effect. This leads to the following interpretation. Provinces that are more fiscally responsible (collect more taxes) tend to have higher expenditures per student, and a smaller share of that money goes to salaries. Provinces that are more generously treated by the federal government have higher expenditure per student, but more of this money goes to salaries, as those provinces have higher teacher wages. Provincial teacher unions are basically irrelevant, except that they increase the share of salaries in the education budget.[47]

Job Satisfaction

The results of the education production function estimation indicate that the more satisfied the teacher is, the better students perform. There is also the presumption that teachers' job satisfaction and union membership are related, so it could be argued that unions affect students performance through their impact on teachers' job satisfaction. From a theoretical perspective, however, the relation between unions and satisfaction is unclear. Since the aim of this study is to provide new evidence of the relation between unions and student performance, empirical analysis rather than theoretical discussion will be emphasized.

The *Encuesta de Desarrollo Social* (EDS) provides a useful micro dataset to explore these issues. It contains information for 1,534 teachers spread across all the provinces. The data include whether a teacher participates in a labor union, whether the teacher is satisfied with his or her job, and other important characteristics such as gender, age, income and education. As shown in Table 8.15,

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[47] This does not mean that teachers' unions have no impact. Actually, they exert strong pressure for higher wages and budgets, but they have done so in a centralized fashion.

job satisfaction and union participation appear to be negatively correlated. While 12.7 percent of the "dissatisfied" teachers participate in a labor union, only 7.6 percent of the satisfied teachers are union members.

Regrettably, there is not enough information available to determine the temporal relation between job satisfaction and participation. In other words, it could not be discerned whether job dissatisfaction was a consequence of union participation or whether dissatisfaction preceded the decision to participate in a union. Consequently, the data are not well suited to analyze what this negative correlation means. As mentioned, there are at least three possible explanations for this pattern. The first is the "voice" argument provided by Freeman and Medoff (1986). The second is that unions worsen teachers' working conditions. The third possibility is that a negative relation between job satisfaction and union participation might be capturing unobserved personal characteristics of the teacher. For instance, teachers who are more prone to conflict and dissatisfaction may also be more likely to join an organization such as a labor union.

From the evidence available, it seems that that the second hypothesis should be discarded (as shown, unions seem to increase teachers' wages and

Table 8.15. Job Satisfaction and Union Participation

| | Are you satisfied with your job? | |
	YES (JS=1)	NO (JS=0)
Union Member	7.6 %	12.7 %
Non-Member	93.4 %	87.3 %

Source: EDS.

Table 8.16. Job Satisfaction and Participation in Ecological or Human Rights Groups

| | Are you satisfied with your job? | |
	YES (JS=1)	NO (JS=0)
Participates	2.1 %	1.4 %
Does not participate	97.9 %	98.6 %

Source: EDS.

Table 8.17. Partial Correlation Coefficients of Job Satisfaction

Variables	Column 1		Column 2	
	Correlation	**Significance**	**Correlation**	**Significance**
Union Participation	-0.05	0.04	-0.05	0.03
Participation in ecological or human rights groups			0.02	0.54
Age	0.07	0.01	0.07	0.01
Gender (female=0)	-0.02	0.54	-0.02	0.53
Teacher's Education	0.01	0.95	0.01	0.97
Teacher's Income	0.07	0.00	0.07	0.00
N° Observations	1,517		1517	

Source: Authors' calculations.

employment).[48] The validity of the third hypothesis is explored by analyzing the relation between union participation and satisfaction, controlling for participation in other organizations such as ecological or human rights groups.[49] A very low rate of participation in these organizations is found, with a slightly higher rate among satisfied teachers. Hence the third hypothesis might not be an appropriate explanation for the negative relation found between satisfaction and union participation. Since it is not possible to solve the endogeneity problem between "participation" and job satisfaction (JS), the partial correlation between JS and union participation is examined, "controlling" for age, gender, the teacher's education, income and participation in ecological or human rights groups.

There is a negative and significant relation between job satisfaction and union participation. It is also observed that the negative relation found in column 1 does not disappear after controlling for participation in ecological or human rights groups (column 2). This result is interpreted as evidence against the third hypothesis. As a very first approximation, therefore, it is concluded that the "voice"

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[48] Although that might possibly come at the expense of dissatisfaction along other dimensions; alternatively, unions might raise expectations and demand levels, widening the gap between expectations and actual working conditions.

[49] Perhaps a better control would be how happy the person is overall, or outside of work. Regrettably, this information is not available. People who join organizations such as ecological or human rights groups, however, may also be more prone to express discontent, and this could provide a good control to explore the validity of the third hypothesis.

hypothesis presented by Freeman is possibly the best argument to explain the negative relation found between job satisfaction and union membership.

Conclusion

This paper constitutes a first look at the effects of trade unions on the education sector in Argentina, providing new information and preliminary results on some of the channels of union influence on the performance of this crucial sector.[50] The next few paragraphs highlight some of these main channels.

First, union characteristics have an important effect on days of class lost to strikes. Days lost are also related to fiscal problems and delayed payment of wages by provincial authorities. Furthermore, the nature of the political relationship between unions and provincial authorities is a factor influencing strike activity. As the number of class days is one of the stronger explanatory variables for student learning, there is reason to criticize unions in this regard. However, union leaders argue that strikes are an instrument for improving teachers' working conditions, increasing education budgets and consequently improving education outcomes. While the present results do not confirm or refute this claim, they show that the *means* unions use to ensure their demands are met have strong and negative effects on student learning.

It is also found that unions report a great deal of concern with tenuring teachers, since student learning improves when the teacher in front of the class is tenured. Since tenuring also seems to increase absenteeism, however, it might reduce the actual number of tenured teachers in front of the class, with an uncertain net effect on student learning. As to public expenditure on education and teachers' salaries, there is not a strong union effect, except that they increase the share of salaries in the education budget. Budgets and salaries are mainly determined by fiscal variables. Finally, there is evidence that union strength is positively correlated with lower student-teacher ratios, and that union participation and job satisfaction are negatively correlated.

In summary, the impact of unions on students' performance depends on the channel and kind of political market in which unions operate, but not on the presence of unions *per se*. There are, however, some limitations to this analysis.

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[50] It is worth noting at this point that there appear to be broader "political" factors not considered in this analysis, which might have a bigger impact than union activity on the quality of education in Argentina.

Only the effect of cross-provincial union characteristics on education outcomes has been considered, and this may understate the total effects of teachers' unions, since much of their activity operates at the national level, by influencing national legislation, overall budgets and other outcomes. Additionally, there is an "intercept" of union influence in the weakest-union province, which is not estimated; only the marginal effect of additional union strength in cross-provincial comparisons is considered. This "lower bound" in turn is also related to national level factors. For example, legislation such as the Estatutos Docentes (which is uniformly supported by teacher unions throughout the country) has its historical origin in national legislation and is believed to have strong negative incentive effects. Exploration of these issues is left for future work.

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