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## UNION DENSITY CHANGES AND UNION EFFECTS ON FIRM PERFORMANCE IN PERU

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## Abstract\*

The paper documents the sharp reduction in union density in Peru between 1986 and 1998, in a context of large macroeconomic fluctuations, structural reforms and changes in the Collective Bargaining Law in 1993. Using a pseudo panel of household surveys we find which worker and firm characteristics increase the likelihood of unionization in a context in which union density falls sharply. We find that a blue-collar job, a permanent contract, higher education and working in a large firm increase the likelihood of unionization, but only before the legislative change. There is evidence of a breakpoint in the reduction of union density probably related to the 1993 change in the Collective Bargaining Law. Most of the reduction in union density can be explained by within- categories decreases in union density. However, there is a small contribution stemming from the reduction in employment in the highly unionized public sector and from the increase in employment in low union density temporary and small firm employment. Using a panel of firms for the manufacturing sector for the period 1994-1996, we find a negative impact of unions on profits for all firm sizes. Within unionized firms profits are lower the higher the union density within the firm. In the econometric analysis, we find a significant negative effect even after controlling for firm and sector characteristics and firm fixed effects. There is some evidence that this effect diminishes over time, consistent with the reduction in union density during that period, but the reduction is not robust to different specifications. This impact of unions on profits is also negative and significant when we use within-firm union density. Labor productivity is negatively related to having a union in the firm, but the negative effect disappears once we control for firm characteristics.

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## **1. Introduction**

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 the 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, which also enjoyed economic rents due to oligopolistic structures, such as the banking sector.<sup>1</sup> Also, workers in soft budget constraint sectors (i.e., the public administration and, in particular, state-owned enterprises) received salaries and benefits that in most cases went beyond their productivity.

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 Relations Law was enacted. As a result of these changes in labor legislation (fewer restrictions to organizing unions in small firms, decentralization of the collective bargaining process, reduction in red tape in the use of temporary contracts, elimination of job stability, etc.) union bargaining power diminished sharply. These changes also facilitated the continuation of a downward trend

in union density that started by the end of the 1980s, when Peru was in the midst of the most severe economic crises in recent history.

Very little rigorous quantitative analysis has been done regarding the likelihood of unionization, by how much and why union density has changed so dramatically, and regarding the economic effects of unionization in Peru. This paper describes the evolution of unionization, showing a significant reduction in union density and in union membership. The paper 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, in a permanent contract and long tenured, were all factors that increased unionization likelihood until 1992; thereafter, their effects were in many cases significant although very small. 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 they have an effect on firm performance. This raises several questions. Specifically, in a country like Peru, with traditional management practices, even in large firms, and an aversion to co-participation of workers. First, do unions have disparate effects on the level of productivity? Do unions also reduce profits in the Peruvian case as in other countries? Will this effect on profits be correlated with the level of unionization within the firm? Here we present evidence that shows that unions in Peru have a negative effect on profits and also a negative albeit less robust 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.

## **2. Conceptual Issues**

### ***The Unionization Decision***

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

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<sup>1</sup> In other sectors, the associated rise in labor costs generated an increase in employment in the informal sector.

At the individual level, there are two decision levels: to work in a unionized firm and to be affiliated with the union. In both cases, the decision is not in its entirety conditioned 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, increasing, for instance, education or experience requirements or investing more in selecting workers, as higher productivity has to pay for higher labor costs. Alternatively, union firms may prefer younger workers who are less likely to become member of the union. Larger firms are more likely to have a union, both due to 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 (e.g., job security and fringe benefits) more than the costs, then the worker will affiliate. Membership also allows for 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 union fee, 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 modeling the affiliation decision. Some goods and services can only be consumed if the worker is affiliated, like access to fair grievance procedures, more benefits and better pay. 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 both the probability of working in a unionized firm or of becoming member of the union. In the literature, women are less likely to unionize, as they are more likely to interrupt their careers. Also, time in the firm should be positively related to affiliation. The 1992 Law introduced the requirement that workers had to have a tenure of at least one year in order to become member of a union, so 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 membership, as older workers value job stability more, which may be easier 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, as they give more value to 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) concluded that at the general economy-wide level, collective bargaining and unionization have had “few if any” adverse effects on competitiveness. There is, however, strong empirical evidence that although unions do increase wages and benefits, they do not necessarily reduce competitiveness. Mishel and Voos (1992) hypothesized that competition involves quality as well as price. Quality is more likely to be maintained and improved by highly participative systems in which workers are unionized. Moreover, they argued that because most studies show unionized firms to be more productive than nonunion firms, higher union wages are offset in part by higher productivity and in part by the reduction of oligopolistic profits.

Regarding profits, evidence for North America show that unions have a negative effect on profits and on shareholders wealth (Addison and Hirsch, 1989 and Machin and Stewart, 1996), while for the United Kingdom, Meneses-Filho (1997) has found similar results.

Eaton and Voos (1992), among others, have shown that union firms are more likely than their nonunion counterparts to be involved in workplace innovation, especially those cooperative arrangements, such as teamwork and production gain sharing, which yield higher productivity. Nonunion 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 U.S. metal and machinery companies, found 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 nonunion branches of those companies using the same technology, paying similar wages, and making the same products.

On the other hand, the literature has several examples of negative effects of unions 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 affect negatively productivity, if it leads to compensation practices that reduce rewards to effort (Kuhn, 1998), if it promotes job stability, reducing efforts as workers do not feel threatened by a layoff or if it reduces flexibility in terms of hours, job description and workplace practices. However, Kuhn (1998) states that a fair summary of industry studies suggest that the effect of unions on productivity tends to be positive, and negative effects are restricted to periods and cases of conflictual 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.

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



A final observation about unions and firm performance is that the 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 had 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 functionless if the parties involved ignore their common interests. High performance unions therefore will give greater weight to cooperation and will stress flexibility and not merely stability through contracts, rules, and regulations. Like the oligopolies and regulated monopolies with which they bargained, unions originated to "take labor out of competition" through rules and regulations. In a competitive global economy, it is difficult, if not impossible, to remove labor from competition by traditional means. As in the case for noncompetitive companies, their best option is to stress competition through productivity and quality, though minimum labor standards remain an important part of high-productivity national economic strategies. Peruvian unions, though, like many other labor organization in Latin America in general, were not characterized as high performance organizations. In general, they maintained constantly a belligerent position against firms, following the idea that profits were a pie that should be shared between firms' owners and workers as part of a political bargaining process. Firm owners, on the other hand, were not able to develop a less adversarial relationship, so it is more likely that the presence of unions in Peru had a negative effect on labor productivity and also on profits.

### **3. The Data**

The main source of data for this paper is the Metropolitan Lima Household Survey from the Ministry of Labor, which is available annually for the period 1986-1998.<sup>2</sup> It is a rich data set that includes all relevant labor market variables, including the presence of a union in the firm the individual works (in which case we consider him "unionized"), and whether the worker belongs to the union (in which case we consider him "affiliated" or "union member"). Table A.1 in the Annex shows the number of observations of salaried workers and how many are unionized workers from each year available. This will allow for the construction of a repeated cross-section dataset pooling all years.

To build the data set for the firm level analysis, three sources of information are used. The first source is the 1994-1997 Payroll Data Summary Sheets (*Hojas de Resumen de Planillas*) 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 (INEI) and the Ministry of Tourism, Industry and International Trade (MITINCI). Finally, information is collected from the Ministry of Labor on number of unions present in each of the economic sectors as well as starting and ending 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.<sup>3</sup> They contain information on the number of workers (blue-collar and white-collar workers), the total wage bill,<sup>4</sup> and the number of workers (blue-collar and white-collar) affiliated with a union. On the other hand, the Manufacturing Sector Survey (Yearly Economic Survey) contains detailed information on 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 the Industry, Tourism, Integration and International Trade Negotiation Ministry (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 4 employees, the second to companies with 5 to 19 employees, and the last one gather information at companies with 20 or more employees. The surveys differ in size according to company size: the survey applied to companies with a maximum of 4 people includes 9 chapters, while that applied to companies with 20 or more workers includes 17 chapters. Specifically, in the case of the of the companies with 20 or more workers the chapters include fundamentally the following information:

- i. Working staff during the year;
- ii. Remunerations and other establishment staff expenditures during the year;
- iii. Establishment expenditure in electric energy;

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<sup>2</sup> Except for 1988, when the survey was not conducted.

<sup>3</sup> The degree of compliance is high among large firms, and the probability of compliance increases with size.

<sup>4</sup> One drawback of this source of information is that it is “official” information used to calculate taxes and contributions. Therefore in some cases the firms may underreport the number of workers and salaries paid in order to reduce the firm’s taxable base.

- iv. Expenditure in raw material and auxiliary materials used up by the establishment during the year;
- v. Expenditure on fuels and lubricants used up during the year;
- vi. Annual establishment production;
- vii. Summary of the movement of the establishment fix assets;
- viii. Maximum and carried out production during the year by main production lines; and
- ix. Establishment net sales and diverse incomes during the year.

The first data set 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 data set, then constructing a balanced panel of all formal manufacturing firms that report data. This data set covers the 1994-1997 period, which will make it possible to measure the impact of the reduction of unionization since the labor reforms. Table A.2 provides some summary statistics of the balanced panel data set.

## **4. Empirical Analysis**

### ***4.1 Changes in Union Density***

Union density is defined here as the proportion of workers in firms where a union exists. As shown in Figure 1, among all wage earners, union density fell from an average of 40 percent during the period 1986-1991 to 30 percent in 1992, year of the sanctioning of the new Collective Bargaining Law, and then it continued falling, reaching 10 percent in 1998. The fall was observed in both the public and private sector. In the private sector there is a clear downward trend since 1988, that is more pronounced since 1992, while in the public sector, there are three years when declines are observed, 1993, 1995 and 1996. In addition, union membership (i.e., the percentage of workers in unionized firms that belong to a union) also fell sharply after 1992 (Figure 2).<sup>5</sup>

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<sup>5</sup> Note that union density as is usually defined, i.e., 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.

The Collective Bargaining Law made it more difficult to bargain at the sector level, as unions involved had to affiliate the majority of workers of the sector and those workers had to work in the majority of firms of the sector. The new law also allowed for the creation of more than one union within a firm and increased the minimum number of workers required to constitute a union to 20 or more. In smaller firms, workers could designate delegates, but the administrative procedures required for the authorization in the Ministry were cumbersome. Also, the new law prohibited workers on probation and in management from belonging to a union. Moreover, 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,<sup>6</sup> it is found that the likelihood of unionization among salaried workers has no statistically significant change between 1986 and 1991, as shown in Figure 3;<sup>7</sup> in 1993, right after the Collective Bargaining Law, this likelihood is 14 points smaller, while in 1997 it is 30 points smaller, differences that are statistically significant at a 95 percent level. This suggests a breakpoint in union density right after the passing of the aforementioned law.

In fact, several authors (e.g., Bernedo, 1993, and Gárate, 1994) had reported a reduction in union density since the mid-1980s. The number of strikes fell from 780 in 1982, to 613 in 1990 and to only 36 in 1999 (Figure 4), suggesting that the ability of unions to exert effective political pressure diminished sharply during the 1990s. The reduction in union activity is also reflected in a reduction in the number of “lists of demands” presented to the labor authorities (*pliego de reclamos*) from 1,164 in 1990 to only 179 in 1999. In 1990, the Confederación General de Trabajadores de Perú (CGTP), probably the most influential union during the 1980s, called upon its members to strike right after the more drastic economic stabilization programs of the recent Latin American history, without any success. This same union called for another strike in 1992, after the Collective Bargaining Law was passed, again without any success.

The reduction in union density is not related to a sector composition effect. As shown in Table 1, most of the changes in unionization rates are within industries and other classifications

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<sup>6</sup> The next section describes the data in detail.

<sup>7</sup> 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, type of contract and a dummy for public sector.

(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, 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 confirmed that the reduction in public employment (a high union density sector) represented almost one third of the total reduction in density. Also, 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 were within categories.

#### ***4.2 Who is (and was) Unionized***

Table 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 nonmembers (among those who work in a unionized firm), the pattern is similar; however, members are more likely to be blue-collar workers. Also, raw earnings are higher for non-members after the labor reforms.

We assume 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 and  $X_2$  is a vector of firm characteristics. To be observed as a wage earning worker, there is a prior decision of

participating as such in the labor market, as opposed to work as 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 for the decision to working 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 latter a period of growth after structural reforms. Results are shown in Table 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. Also, as expected, workers with more potential experience, and workers 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 and in a medium sized firm also increases the likelihood of unionization and the effect also falls clearly after 1993. Having a permanent or temporary job—both formal worker categories—increase the likelihood with respect to workers that do not have any contract, the likelihood being slightly higher for temporary workers. However, after the legislative changes, 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. For employers it was easier to deter temporary workers from forming a union. Even if they have the legal right to do so, the employer had the possibility of just not renewing the contract if the worker chose to affiliate with a union. In fact, the use of temporary fixed-term contracts increased sharply in Peru during the 1990s.

The previous results were replicated using similar regressions estimated year by year. The two panels in Figure 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 subperiods.

Among those who work in a unionized firm, not all are members of the union. As mentioned above, membership may give workers certain benefits, such as protection of their rights, better working conditions and more benefits and a group reputation derived from

complying with the group norm. However, membership is voluntary, and collective bargaining agreements apply to all workers independently of whether they are unionized. Table 4 shows the result of a probit estimation to analyze the characteristics that drive union affiliation, conditional on working in a unionized firm. Again, blue-collar workers are more likely to be affiliated. However, there seems to be a clear negative effect of education on the likelihood of union membership. Among these workers, everyone has some type of contract, as unionized firms are all formal firms,<sup>8</sup> but the likelihood of affiliation is higher for those with permanent contracts. Workers with more experience and tenure are also more likely to be affiliated with a union.

Summarizing, 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.

### ***4.3. Impact of Unions on Firm Performance***

Following Clark (1980), Machin and Wadhani (1991) and Black and Lynch (1997), this paper 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 impact a firm's performance negatively. Based on a group of performance measures, the empirical approach consists of two stages. The first stage consists of a simple statistical analysis to study the performance changes of the firms with and without unions. The second stage involves a regression analysis in which the differences between firms, the sectors to which they belong, and the competition structure that they face are controlled for.

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

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<sup>8</sup> 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).

$$\Delta \bar{P} = [\bar{P}^{unionized} - \bar{P}^{non-unionized}] \quad (1)$$

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,

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

Coefficients in this specification are likely to be biased for two reasons. First, the two types of firms may have different characteristics and, thus, different performance behavior unrelated to their union status. Second, differences between unionized and non-unionized firms may be simply 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 try to capture these shocks. Further included is a variable to measure the intensity of unionization (percentage of workers) as a way to capture 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 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  $S_{jt}$  are 4-digit level SIIC 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 allows to control for unobserved time-invariant characteristics and  $Y_t$  are year effects. An alternative specification uses



$$P_{i,t} = f(X_{it}, \text{Union Density}_{it}, S_{j,t}, Y_t, D_i) \quad (4)$$

where Union Density is the percentage of firm workers that are members of the union,<sup>9</sup> a figure that may vary over time. Equations (3) and (4) are estimated using OLS on the 1994-1996 panel of manufacturing firms described in the data section. The empirical results are presented below.

Table 5 shows raw means for performance indicators and other firm-level variables. It suggests that nonunion 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 which are clearly higher among union firms irrespective of its size. Consistently, these firms consume more electricity per worker and also have a higher use of installed capacity. Finally, raw differences in wages show that salaries are 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, will be carried out below.

### ***Effects on Labor Productivity***

As mentioned above, the first difference analysis shows that labor productivity is higher among larger union firms. Figure 6 further explores this issue, using instead the within-firm unionization rate in order to capture the possible effect of heterogeneity in union intensity may have.<sup>10</sup> 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 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 small firms, of 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 bigger 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

<sup>9</sup> Note that for the period of analysis, 1995-1997, industry level bargaining was not possible, so membership was limited to unions established at the firm level.

<sup>10</sup> The 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% or more employees unionized, respectively. Only firms with a union are included in this analysis.

positive effect on labor productivity as the rate of unionization increases. In the last two cases, there is a homogeneous distribution of companies along the different rates of unionization. This differs from what happens in the small firms, as most of them have high unionization rates.

Table 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 where 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 7 shows the results of using specification (4), including instead of a union dummy the within-firm unionization rate. 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 keeps its significance in all of the six models presented. There is a negative relationship between union intensity and labor productivity,<sup>11</sup> 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. 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, it 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 intensity might also be endogenous, as firms with higher union densities may choose more capital-intensive techniques. In fact, as shown in Table 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,

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<sup>11</sup> On the other hand is clear that input ratios will have for each sector different effects on productivity, so that the estimated union effect may also depend on parameter differences and the level of the input ratios at which the union/nonunion comparison takes place.

Figure 7 shows a clear positive relation between union intensity and capital intensity regardless 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 from U.S. research has been that unionization is associated with markedly lower profitability (see Belman, 1992 for a summary of 11 U.S. studies). A similar pattern has been found for United Kingdom. The main explanation to this result is that the effect of unions on wages exceeds the possible positive effect of unions on productivity. A case in which the opposite result is found is the study of Morishima (1991) for Japanese firms.

As previously mentioned, a simple first difference analysis (see Table 5) suggests a negative impact of unions on profits. Figure 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 8 and 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 8 suggests a 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. However, in the specification where firm fixed effects are introduced, the year dummies lose their significance.

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 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. Similarly to what was found with 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.

## **5. Summary and Final Comments**

There is evidence of a clear reduction in union density right after the passage of the Collective Bargaining Law in 1992. Holding constant worker and firm observable characteristics, the unionization likelihood diminished sharply since 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 very small. 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 reforms in the labor market, only the further increase in temporary employment had a small role in explaining the further reduction in union density, and most of the changes were observed within categories and economic sector.

With respect to the impact of unions on firm performance, a simple first difference analysis finds a negative impact of unions 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 the unionization showed a sharp reduction and unions saw their power diminished, partially as a consequence of the Collective Bargaining Law of 1993. However, the reduction in the negative union effect could not be confirmed in all specifications. This 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 having 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 conflictual labor management relations. Management and unions were in many cases suspicious of each other's objectives and strategies. The high degree of politicization of unions, and the infiltration of terrorist groups in many large unions in the manufacturing sector during the 1980s, led to a situation of very little trust, with no incentives to work cooperatively to improve working conditions or improve 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 a 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.

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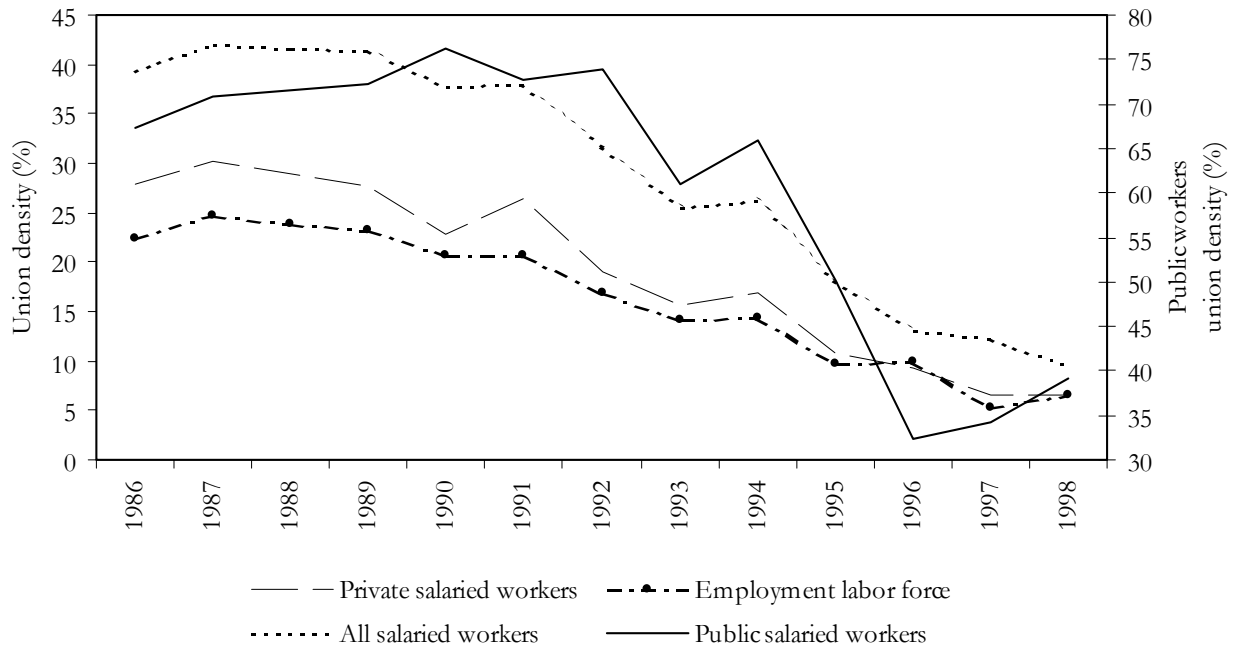
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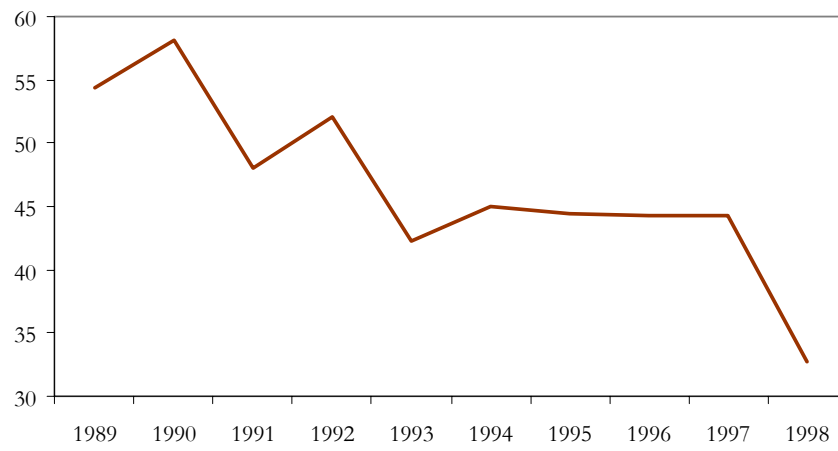


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**Figure 1. Metropolitan Lima: Union Density, 1986-1998**

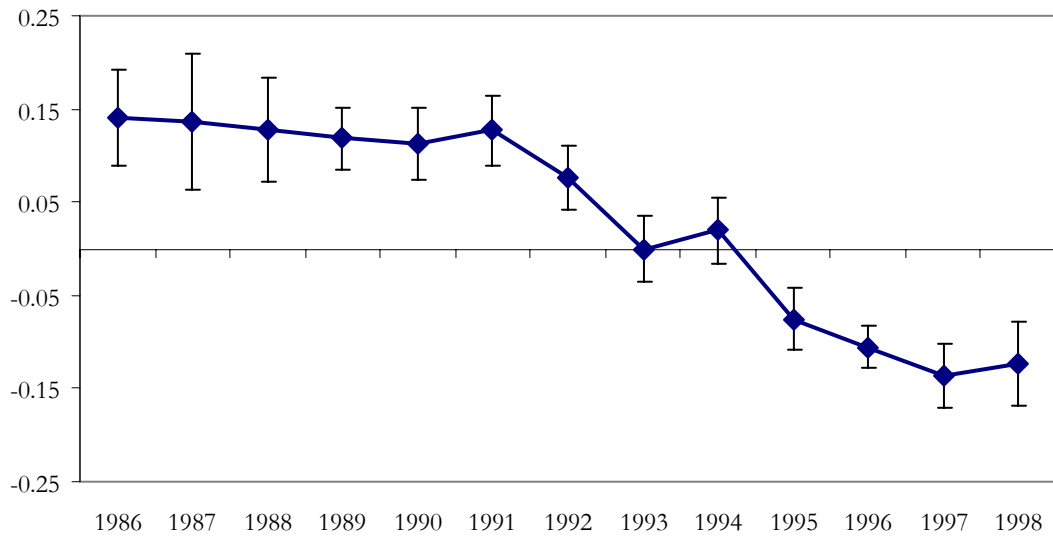


**Figure 2. Metropolitan Lima: Union Membership 1989-1998<sup>1/</sup>.**



1/. Shows the percentage of workers in unionized firms that belong to a union  
*Source:* Household Survey, Ministry of Labor-INEI.

**Figure 4. Metropolitan Lima: Unionization Probabilities**



1/. The vertical lines show confidence intervals at 95% of significance.

*Note:* Marginal effects take as base year 1993.

Excludes 1996 because of problems with the data for type of worker.

**Figure 4. Evolution of Strikes and Workers Involved, 1970-1998**



**Table 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		

**Table 2.**  
**Metropolitan Lima: Means and Deviations of Variables by Union and Union Membership 1986-1998**

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

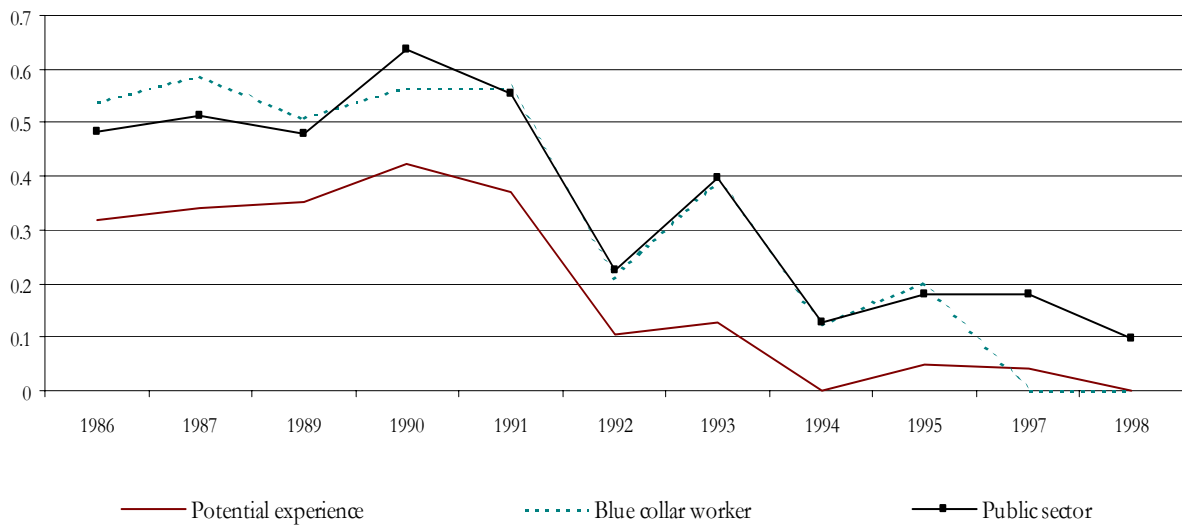
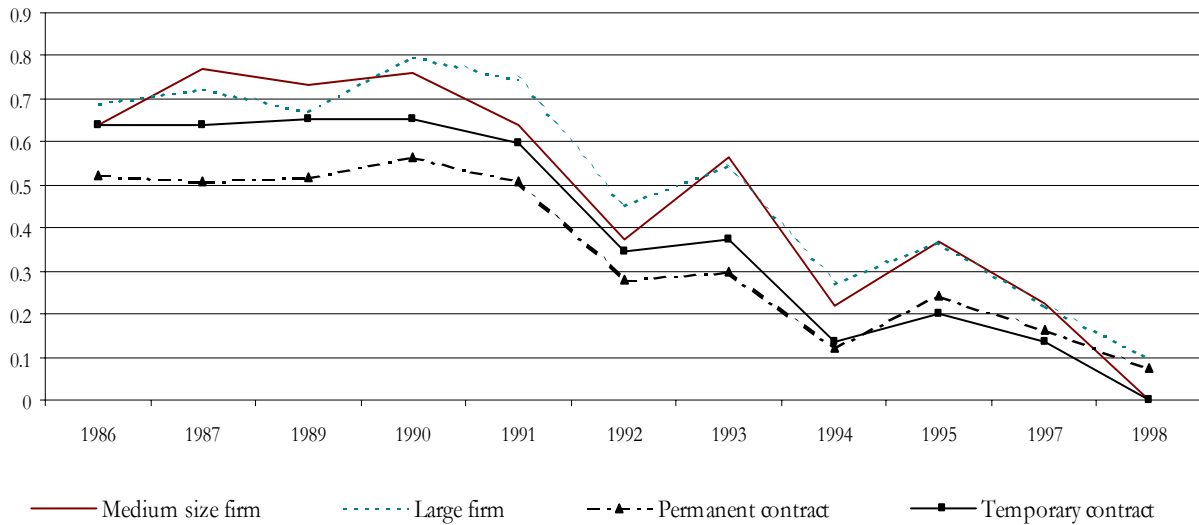
Standard Deviations in parentheses

**Table 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
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
Unionization and employment [salaried/selfemployed] status error correlation (standar error)	-0.698 (0.159)**		-0.1911 (0.142)		-0.618 (0.195)**		0.026 (0.16)		0.868 (0.118)**		0.8331 (0.042)**	
Uncensored observations	3811		3811		6724		6724		8089		8089	
Wald Chi2	522.3 (9)		1104 (30)		1084.2 (11)		2213 (32)		870 (12)		9357 (33)	



**Figure 5. Metropolitan Lima: Probability of working in a unionized firm (marginal effects)**



**Table 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 size 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 (5.84)**	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

**Table 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 **	11.60 **	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 **
Average Blue Collar Wages	Non Union	150.362 (170.77)	289.432 (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 (1016.85)	
	Union		1083.681 (868.05)	1606.186 (1149.44)	2656.139 (4796.15)	
t - test				30.80 **	12.23 **	23.78 **

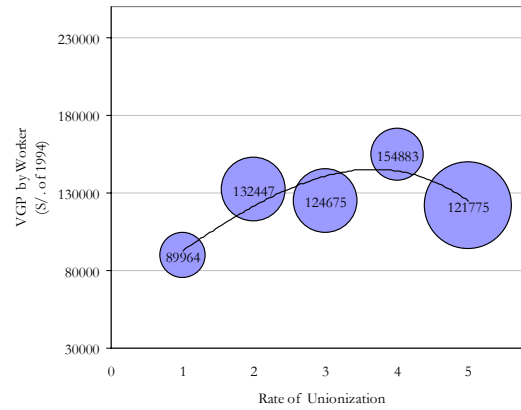
Notes:

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

$$\frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{X}_1} - S_{\bar{X}_2}} = \frac{(\bar{X}_1 - \bar{X}_2)}{\sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 + n_2 - 2)} * \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

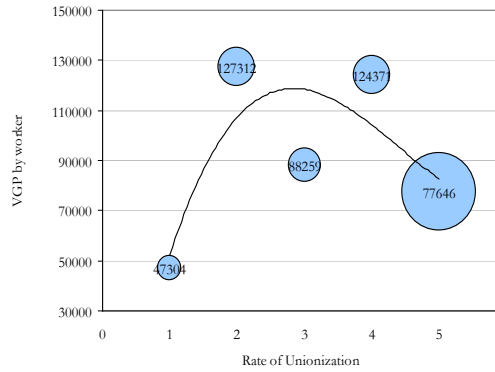
**Figure 6. Impact of Unions on Value of Gross Production per Worker \***

**Panel A**



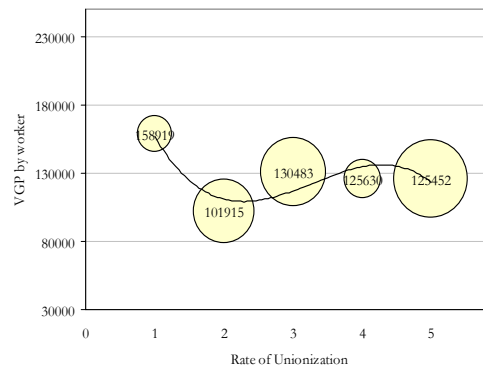
**Panel B**

Small Firms with Union



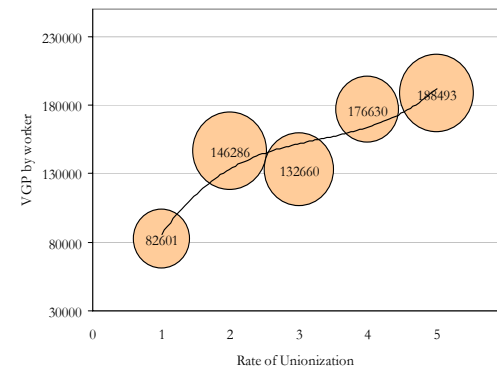
**Panel C**

Medium Firms with Union



**Panel D**

Big 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% or more employees unionized. Only firms with a union are included.

**Table 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)	1.2273 ** (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 <sup>-3</sup> )				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)
Imports in the firm's 4-digit SIC industry (%)					1369.9659 ** (2.719)	1537.3516 ** (2.849)	1574.3730 ** (2.92)
Advertising as percentage of total sales					472.9611 ** (3.316)	451.4623 ** (3.117)	-330.1033 * (-2.12)
Sector fixed effects						YES	
Firm fixed effects							YES
Constant	104.0862 ** (10.631)	48.5995 ** (3.610)	28.9413 (1.905)	-5.5618 (0.391)	-18.2522 (1.353)	67.2138 (1.719)	55.6982 (0.62)
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 <sub>i</sub> =0							7.90
Prob > F							0.000
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 7. Unionization and Firm performance**  
**Dependent variable: Production by total employment**  
(t-statistics in parentheses)

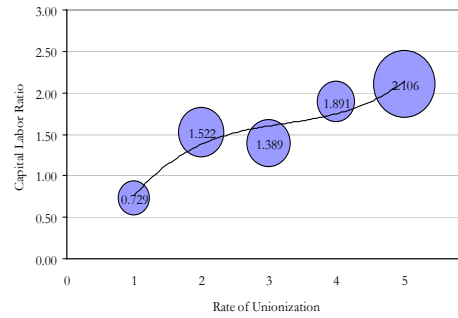
	model 1	model 2	model 3	model 4	model 5	model 6	model 7
Within firm union density	-53.6279 ** (3.372)	-56.3851 ** (3.613)	-66.4230 ** (4.112)	-41.6226 ** (3.321)	-29.0291 * (2.345)	-30.0998 * (2.398)	50.8911 (1.45)
Percentage unionized * Size2	83.5006 ** (2.611)	88.7422 ** (2.693)	72.8800 * (2.156)	1.2599 (0.037)	2.2565 (0.070)	2.7024 (0.085)	-3.8937 (-0.08)
Percentage unionized * Size3	176.8531 ** (4.307)	161.0282 ** (3.982)	139.6397 ** (3.348)	36.7403 (1.011)	31.3961 (0.880)	26.1915 (0.740)	61.8592 (1.30)
Year 1995	14.0695 (1.134)	19.7856 (1.599)	19.2208 (1.557)	24.4463 * (2.082)	18.4412 (1.568)	18.5117 (1.573)	13.1916 ** (2.58)
Year 1996	8.3775 (0.702)	15.5143 (1.305)	13.9327 (1.167)	14.5197 (1.297)	9.6054 (0.861)	9.5081 (0.853)	
Industry concentration index		1.1412 ** (5.447)	1.1095 ** (5.382)	0.9701 ** (4.898)	1.0656 ** (5.509)	1.2203 ** (5.803)	0.3857 (1.60)
Age of the firm (years)			0.8814 ** (2.696)	0.4299 (1.282)	0.1856 (0.559)	0.2705 (0.781)	-33.1453 (-0.75)
Capital labor ratio				20.5505 ** (6.166)	20.2831 ** (6.111)	19.9601 ** (6.003)	9.3545 ** (3.40)
White collar wage bill ( 10 <sup>-3</sup> )				12.8300 (1.841)	11.6477 (1.795)	11.3264 (1.753)	-4.0798 ** (-2.78)
Exports / output				152.0977 ** (3.258)	158.9002 ** (3.399)	154.6562 ** (3.287)	-33.1453 (-0.75)
Imports in the firm's 4-digit SIC industry (%)					1385.3154 ** (2.746)	1555.1054 ** (2.884)	1516.4570 ** (2.82)
Advertising as percentage of total sales					463.4382 ** (3.200)	439.5453 ** (2.970)	-325.8920 ** (-2.10)
Sector fixed effects						YES	
Firm fixed effects							YES
Constant	103.2841 ** (10.921)	49.0048 ** (3.751)	30.8234 * (2.031)	-3.4072 (0.242)	-15.9255 (1.199)	61.4497 (1.445)	-0.4083 (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 <sub>i</sub> =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

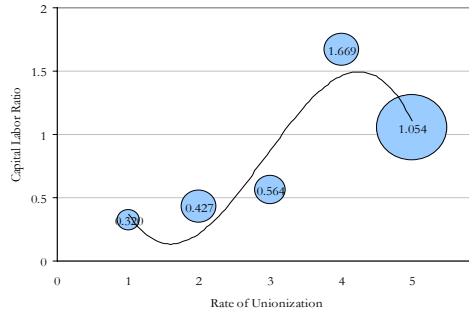
**Figure 7. Impact of Unions over Capital Labor Ratio\***

**Panel A**



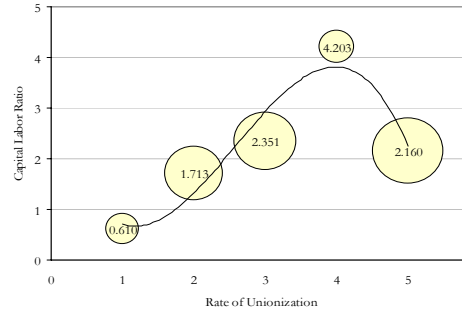
**Panel B**

Small Firms with Union



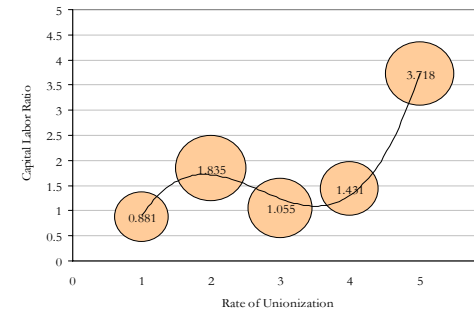
**Panel C**

Medium Firms with Union



**Panel D**

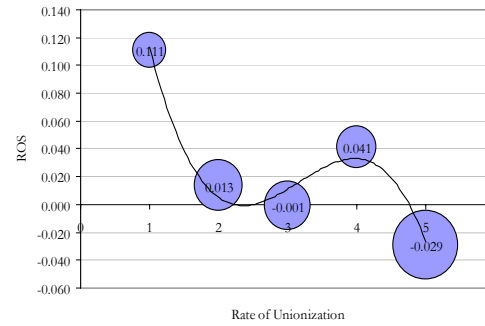
Large Firms with Union



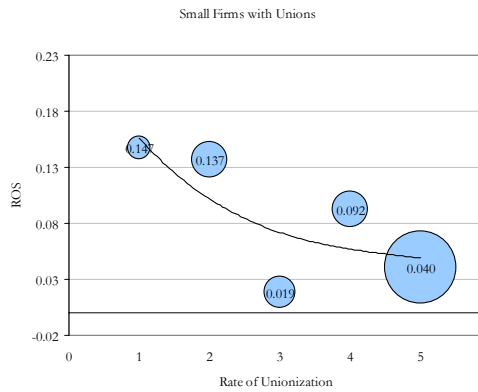
\* The within-firm rates of unionization (or union intensity) go from 1 to 5 and are respectively [0-20], [20,30], [30-40], [40-50] and 50% or more employees unionized. We include in this analysis only firms with a union.

**Figure 8. Impact of Unions over Return on Sales (ROS)**

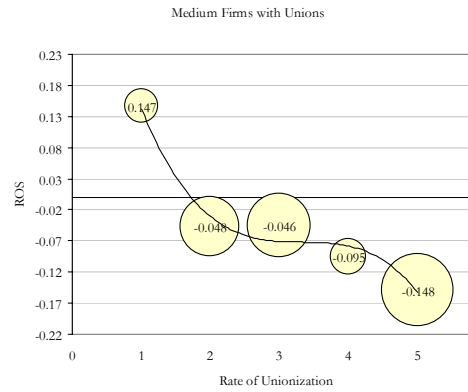
**Panel A**



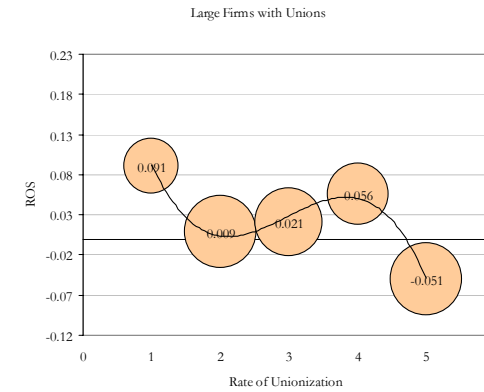
**Panel B**



**Panel C**



**Panel D**



\* 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% or more employees unionized. We include in this analysis only firms with a union.



**Table 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 ** (4.884)	-0.1896 ** (4.884)	-0.1865 ** (4.666)	-0.1737 ** (4.332)	-0.1633 ** (4.148)	-0.1642 ** (4.187)	-0.1551 ** (3.975)	-0.1747 * (2.508)
Union * Size 2	0.1294 * (2.426)	0.1259 * (2.370)	0.1266 * (2.380)	0.1274 * (2.403)	0.1216 * (2.348)	0.1272 * (2.467)	0.1276 * (2.494)	0.0246 (0.687)
Union * Size3	0.1056 * (1.964)	0.0969 (1.807)	0.0975 (1.816)	0.1014 (1.894)	0.1072 * (2.046)	0.1097 * (2.102)	0.1037 * (2.002)	0.0717 (1.628)
Year 1995	-0.1449 ** (4.669)	-0.1364 ** (4.423)	-0.1364 ** (4.423)	-0.1362 ** (4.428)	-0.1412 ** (4.667)	-0.1452 ** (4.778)	-0.1467 ** (4.866)	
Year 1996	-0.1507 ** (4.965)	-0.1393 ** (4.575)	-0.1391 ** (4.565)	-0.1378 ** (4.537)	-0.1361 ** (4.545)	-0.1404 ** (4.669)	-0.1395 ** (4.678)	
Industry concentration index (CI 4)		0.0013 ** (3.168)	0.0013 ** (3.183)	0.0012 ** (2.967)	0.0013 ** (3.375)	0.0013 ** (3.305)	0.0013 ** (3.276)	0.0008 (1.113)
Age of the firm (years)			-0.0002 (0.333)	0.0000 (0.022)	0.0006 (0.849)	0.0004 (0.543)	0.0005 (0.726)	-0.0573 ** (4.309)
Total Employment (10 <sup>-2</sup> )				-0.0162 ** (2.807)	-0.0186 ** (3.134)	-0.0196 ** (3.319)	-0.0197 ** (3.348)	-0.0031 (0.228)
Capital labor ratio					-0.0409 ** (9.199)	-0.0399 ** (9.003)	-0.0394 ** (8.944)	-0.0450 ** (4.681)
White collar wage bill (10 <sup>-3</sup> )					0.0140 ** (3.176)	0.0133 ** (2.983)	0.1320 ** (2.991)	-0.0018 (0.348)
Exports / output					0.0727 (1.293)	0.0882 (1.572)	0.0897 (1.609)	0.1828 (1.356)
Imports in the firm's 4-digit SIC industry (%)						-0.253 (0.285)	-0.0419 (0.046)	-1.4775 (0.820)
Advertising as percentage of total sales						1.1545 ** (3.555)	0.8917 ** (2.697)	-0.5088 (1.004)
Sector fixed effects							YES	
Firm fixed effects								YES
Constant	0.2091 ** (9.193)	0.1469 ** (4.899)	0.1518 ** (4.547)	0.1597 ** (4.782)	0.1635 ** (4.876)	0.1621 ** (4.791)	-0.4136 * (2.213)	1.6975 ** (4.672)
Observations	1108	1108	1108	1108	1108	1108	1108	1108
F	11.01	10.92	9.37	9.24	15.41	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 $u_i=0$								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             $L \leq 9$  (control category)
- Size 2             $9 < L \leq 49$
- Size 3             $L \geq 49$

**Table 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 ** (4.818)	-0.3561 ** (4.837)	-0.3480 ** (4.619)	-0.3336 ** (4.438)	-0.2850 ** (3.875)	-0.2818 ** (3.845)	-0.2905 ** (3.993)	-0.2729 * (2.336)
Percentage unionized * Size 2	0.2358 * (2.276)	0.2250 * (2.179)	0.2267 * (2.194)	0.2266 * (2.202)	0.1991 * (1.984)	0.2118 * (2.119)	0.2162 * (2.185)	0.0313 (0.435)
Percentage unionized * Size 3	0.1342 (1.248)	0.1233 (1.151)	0.1246 (1.163)	0.1239 (1.162)	0.1241 (1.192)	0.1329 (1.280)	0.1353 (1.316)	0.0388 (0.441)
Year 1995	-0.1377 ** (4.670)	-0.1287 ** (4.361)	-0.1287 ** (4.360)	-0.1281 ** (4.358)	-0.1304 ** (4.507)	-0.1343 ** (4.615)	-0.1365 ** (4.737)	
Year 1996	-0.1392 ** (4.798)	-0.1290 ** (4.438)	-0.1285 ** (4.417)	-0.1259 ** (4.346)	-0.1213 ** (4.243)	-0.1256 ** (4.369)	-0.1277 ** (4.848)	
Industry concentration index		0.0013 ** (3.205)	0.0013 ** (3.234)	0.0012 ** (3.000)	0.0013 ** (3.412)	0.0013 ** (3.333)	0.0014 ** (3.338)	0.0008 (1.108)
Age of the firm (years)			-0.0004 (0.511)	0.0001 (0.093)	0.0006 (0.802)	0.0003 (0.458)	0.0006 (0.838)	-0.0485 ** (3.805)
Total Employment ( $10^{-3}$ )				-0.0182 ** (3.219)	-0.0201 ** (3.423)	-0.0211 ** (3.608)	-0.0209 ** (3.596)	-0.0097 (0.702)
Capital labor ratio					-0.0401 ** (9.010)	-0.0393 ** (8.831)	-0.0386 ** (8.749)	-0.0419 ** (4.339)
White collar wage bill ( $10^{-3}$ )					0.0133 ** (3.016)	0.0126 ** (2.830)	0.0126 ** (2.867)	-0.0023 (0.443)
Exports / output					0.0622 (1.105)	0.0778 (1.383)	0.0784 (1.407)	0.1692 (1.254)
Imports in the firm's 4-digit SIC industry (%)						-0.2654 (0.299)	-0.0524 (0.058)	-1.7903 (0.994)
Advertising as percentage of total sales						1.1092 ** (3.405)	0.8277 * (2.499)	-0.4966 (0.979)
Sector fixed effects							YES	
Firm fixed effects								YES
Constant	0.1992 ** (9.184)	0.1366 ** (4.690)	0.1441 ** (4.412)	0.1519 ** (4.658)	0.1544 ** (4.708)	0.1536 ** (4.633)	-0.4783 ** (2.574)	1.4545 ** (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 $u_i=0$								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             $L \leq 9$  (control category)
- Size 2             $9 < L \leq 49$
- Size 3             $L \geq 49$

**Table A.1**  
**Number of Observations**  
**Encuesta Nacional de Hogares (ENAHO) <sup>1/.</sup>**

	Salaried Workers	% Unionized
1986	1920	39
1987	1964	42
1989	1808	41
1990	1700	38
1991	1645	38
1992	1707	32
1993	1794	25
1994	1847	26
1995	2133	18
1996	2049	13
1997	1510	11
1998	917	12

1/. Metropolitan Lima only.

**Table A.2**  
**Summary Statistics**

	No. Obs	Mean	Std. Dev.
Rate of return on sales	1634	0.074	0.344
Gross value of production over L ( $10^{-3}$ )	1659	110.271	218.769
Union dummy (yes=1, no=0)	1741	0.228	0.42
Within firm union density <sup>1/.</sup>	1741	0.099	0.207
Industry concentration index <sup>2/.</sup>	1741	44.695	25.031
Employment ( $10^{-2}$ )	1741	0.712	1.535
Experience (years in the business)	1741	23.638	14.972
Capital labor ratio	1690	1.143	2.275
Exports/gross value of production	1725	0.045	0.163
Advertising expenditures / sales	1741	0.011	0.03
White collar real wages ( $10^{-3}$ )	1732	1.186	1.904
% of imports in the SIC of the firm <sup>3/.</sup>	1741	0.009	0.011
Dummy for 1995	1741	0.335	0.472
Dummy for 1996	1741	0.333	0.471

1/. Percentage of the firms' workers that belong to a union

2/. Sum of the four largest firms' market shares

3/. Imports / gross value of production