



RIETI Discussion Paper Series 08-E-027

What Do Japanese Unions Do for Productivity?: An Empirical Analysis Using Firm-Level Data

MORIKAWA Masayuki
RIETI



The Research Institute of Economy, Trade and Industry
<http://www.rieti.go.jp/en/>

What Do Japanese Unions Do for Productivity? An Empirical Analysis Using Firm-Level Data*

Masayuki Morikawa

Research Institute of Economy, Trade and Industry (RIETI)

July 2008

Abstract

This paper empirically analyzes the relationship between union presence and firm performance in areas such as productivity and profitability by using data on a large number of Japanese firms, covering both manufacturing and non-manufacturing industries.

Results indicate that the presence of labor unions has large positive effects on productivity level and growth. The effects of union presence on wages are also positive and the magnitude is similar to that of productivity. I find no negative effect for the presence of unions on firm profitability. These results differ from studies in the U.S. The number of employees decreases more for unionized firms than non-unionized firms. Most of the difference in employment is attributable to the change in the number of part-time workers.

In order to enhance the productivity of the service sector, close cooperation between management and unions is required.

Keywords: labor union, productivity, wage, part-time worker

JEL Classification: J51, M12

* I would like to thank Kotaro Tsuru, Kazuo Motoishi, and Masahisa Fujita for their helpful comments and suggestions.

1. Introduction

The purpose of this paper is to investigate empirically the relationship between the presence of labor unions and firm performance including productivity, wage, profitability, and employment growth in Japan. I use data on around 5,000 Japanese firms, covering both manufacturing and non-manufacturing firms.

Amid a decreasing labor force due to population aging, productivity growth of industries, especially service industries, is a focus of current Japanese economic policy. As dispersions of productivity level and growth are very large among firms, even those in the same industry, in order to plan and to implement effective policy measures it is essential to thoroughly understand what types of firms perform well. Morikawa (2007b), for example, by using Japanese firm-level panel data, including non-manufacturing industries, from the Basic Survey of Japanese Business Structure and Activities, analyzed quantitatively the relationships between various firm characteristics and total factor productivity (TFP). Those results showed that R&D investment and high-level usage of information networks have a positive relationship with levels and growth rates of TFP at the firm level. However, after controlling for firm fixed effects, it is impossible to confirm that increased use of information networks boosts levels and growth rates of TFP, and so it can be inferred that ingrained corporate culture and managerial quality are more fundamental determinants of productivity. Therefore, policy should focus on changing fundamental firm characteristics, such as corporate governance and management quality.¹

The focus of this paper is the role of labor unions. I investigate the effects of labor unions on firm productivity, profitability, wages, and employment. It is a well-known fact that firm-based labor unions are distinct characteristics of the Japanese labor system, along with long-term employment and the seniority-based wage structure. Japanese labor unions participated in the “productivity movement” during the high growth era and made efforts to enhance productivity in cooperation with management. Today, labor unions participate in Service Productivity and Innovations for Growth (SPRING), a business-government-academia forum established in 2007, at which two union representatives are in fact board members. On the other hand, according to aggregated statistics on labor unions, the unionization rate has been declining steadily.² The rate, which exceeded 50% at its postwar peak, stood only at 18.1% as of 2007. This declining trend is similar to other major advanced economies such as the U.S., UK, Germany, and France.³ By industry, the unionization rate in the manufacturing industry is 25.2%, but 10.6% in wholesale and retail, 8.5% in medical care and welfare services, and 6.2%

1 Bloom and Van Reenen (2007) is an example analyzing management quality. Morikawa (2008) analyzed the relationship between the structure of shareholding and firm productivity in Japan.

2 Basic Survey of Labor Unions (Ministry of Health, Labour and Welfare)

3 Blanchflower (2007) is a good survey on the declining trend of labor unions.

in other services. The service sector's unionization rate is generally lower than manufacturing. Under these circumstances, this paper tries to shed light on the economic roles labor unions play in Japan.

According to my analysis, the presence of a labor union has large positive effects on firm productivity (labor productivity and TFP) level and growth. The effects of union presence on wages are also positive and the magnitude is similar to that of productivity. I found no negative effect of union presence on firm profitability. These results are different from most of the recent studies in the U.S. The number of employees is decreasing more for unionized firms than non-unionized firms. Most of the difference is attributable to the increasing number of part-time workers.

The rest of this paper is organized as follows. Section 2 briefly reviews related studies. Section 3 explains the data used and method of the analysis. Section 4 reports the results and Section 5 concludes.

2. Literature Review

The relationship between labor unions and productivity has been an important issue of research in the fields of labor economics and industrial relations. It is beyond the scope of this paper to comprehensively survey these studies, but I will discuss very briefly the conclusions of these studies.

Brown and Medoff (1978) and Freeman and Medoff (1984) are the early representative contributions in this area, indicating positive effects of labor unions on firm productivity. They argue that unions can raise productivity by providing better communication channels between workers and management. On the other hand, unions may reduce productivity by distorting the labor market through their monopoly power. Therefore it is an empirical question whether labor unions have positive or negative effects on productivity. Although empirical studies in the U.S. and in European countries have produced wide-ranging results including the sign of the coefficients, unions have, at most, small positive effects on productivity, at least in the U.S. (Hirsch 2007, 2008) According to the survey by Fuchs et al. (1998) for U.S. economists, the average estimated value of union productivity effects is 3.1% and the median value is 0.0%. A meta-analysis by Doucouliagos and Laroche (2003) shows the simple mean of the estimated union productivity effects is 4% and the weighted average is 1% - very small effects.⁴

4 Among the 73 studies analyzed by Doucouliagos and Laroche (2003), five cover Japan. According to the result of the meta-analysis, the union productivity effects in these five studies are negative and significant.

Studies on union wage effects (union wage premium) outnumber those on productivity. Generally speaking, union wage effects are large and the magnitude is larger than the effects on productivity. According to Fuchs et al (1998), the mean and median values in the view of economists at research universities in the U.S. are 13.1% and 15%, respectively.⁵ As a result, the effects of labor unions on firm profitability are generally negative in the U.S.-based studies (Addison and Hirsch 1991; Hirsch 2007, 2008).

However, most of the past empirical studies use a small number of firms, because official statistics on firms or establishments rarely have information about the presence of labor unions. In addition, studies using firm-level data usually cover only manufacturing firms, with some exceptions for construction or airlines.

In Japan, Muramatsu (1983) is an early study which quantitatively assesses the union productivity effect. This study uses two-digit manufacturing industry data for 1973 and 1978 and indicates that the union effect on labor productivity in 1978 was 18.5% after controlling for labor quality (and insignificant in 1973). It interprets the results as indicating that union productivity effects are through the reduction of the employee turnover rate. Sakamoto (1995) also uses aggregated manufacturing industry data, from 1980 to 1990, and shows that unions reduce employee turnover and enhance labor productivity. On the other hand, Brunello (1992), by using firm-level, cross-section data for manufacturing in 1986 (979 sample firms), indicates that the presence of labor unions reduces labor productivity around 15% and also reduces profitability between 20% and 30%. Noda (1997) uses panel data from 1989 to 1995 on 106 manufacturing firms and shows that union effects on labor productivity differ depending on the composition of workers' ages. For a firm with an average age structure, the union effect is estimated to be around 3%.⁶

Benson (2006) is an example of empirical studies that have been conducted on the relationship between union and firm *profitability*. This study uses survey data on Japanese manufacturing firms from 1991, 1995, and 2001 (sample sizes are 253, 172, and 184, respectively) and conducts ordered-probit analysis to explain the rate of return on assets. The results indicate that profitability of unionized firms is significantly low.

Almost all of the prior studies in Japan focus on manufacturing industries or firms and the numbers of sample firms are very small. Labor productivity is often calculated as sales per employee (not value-added productivity or TFP). Furthermore, past studies analyze union effects on the *level* of productivity, but do not deal with productivity *growth*. In order to

5 Lewis (1986) is an early representative survey on union wage premium. Recent examples include Blanchflower and Bryson (2002, 2003).

6 In Brunello (1992) and Noda (1997), labor productivity is defined as sales per employee.

overcome the limitations of these studies, this paper uses data on more than 4,000 Japanese firms, both manufacturing and non-manufacturing, and analyzes union effects on value-added labor productivity, TFP, and profitability. In addition, not only *level* effects, but also *growth* effects are analyzed. It is important to understand the role of unions in recent years because the Japanese labor market has been changing rapidly since the latter half of the 1990s.

3. Data and Methods

The data used in this paper come from the Basic Survey of Japanese Business Structure and Activities (Ministry of Economy, Trade and Industry) and the Survey of Corporate Management (Small and Medium Enterprise Agency).

The Basic Survey of Japanese Business Structure and Activities, an annual survey begun in 1991, amasses representative statistics on Japanese firms with 50 or more regular employees, including those engaged in mining, manufacturing, electricity and gas, wholesale, retail, and several service industries. The annual number of firms surveyed exceeds 25,000. The purpose of the survey is to capture a comprehensive picture of Japanese firms, including their basic financial information, composition of businesses, R&D activities, IT usage, and foreign direct investments. As the sample firms are coded by perpetual numbers, it is possible to construct a firm-level longitudinal data set.

The aim of the Survey of Corporate Management was to find facts about the internal structure and governance of Japanese firms. Specifically, this survey investigates managerial objectives, structure of shareholders, internal organization, and so forth. Information on unionization is also available. The number of firms surveyed is 10,000 with more than 5,000 responding (the response rate was 51.5%). The survey was conducted in 1998 by using the registered list of the Basic Survey of Japanese Business Structure and Activities. Therefore, these two surveys can be merged at the firm level by using the perpetual firm numbers.

This paper constructs a longitudinal data from the Basic Survey of Japanese Business Structure and Activities from 1998 to 2004 and then matches with the data of the Survey of Corporate Management. The relationship between the union presence in sample firms in 1998 and their medium-term performance by 2004 can then be analyzed. The number of matched companies in 1998 is around 4,500. In 2004, the number of surviving companies is around 3,500. However, the information on union status is available only for 1998. The possibility also exists that a union dissolved even though a firm survives, or that a new union was established after 1999. This is a limitation of this study, but such cases are expected to be small in Japan.⁷

⁷ According to the Basic Survey on Labor Unions (Ministry of Health, Labour and Welfare), the number

Among the sample, 1,826 firms (36.1%) have labor unions and the remaining 3,229 do not have labor unions in 1998. The share of firms with labor unions is relatively high, because the sample firms of the Basic Survey of Japanese Business Structure and Activities have 50 or more regular employees. By firm size class, among the firms with 300 or less employees, the share of those unionized is 29.7% and among those with more than 300 employees, the share is 52.4%. By industry, unionized firms account for 44.7% in manufacturing and 21.2% in non-manufacturing. By firm age, unionized firms account for 27.3% of firms less than 40 years old and 43.0% of firms 40 years or older. Large and old firms in manufacturing tend to have labor unions.

First, I statistically test the difference of the mean productivity measures between unionized and non-unionized firms. Then I conduct simple regressions to check the coefficients of a union dummy after controlling for various firm characteristics such as size, age, and industry.

Productivity measures used as dependent variables are the levels (in 1998 and 2004) and growth rates from 1998 to 2004 of labor productivity and TFP, which are calculated from the data from the Basic Survey of Japanese Business Structure and Activities. Labor productivity is the value added divided by total working hours. TFP is calculated nonparametrically, which uses a hypothetical (representative) firm as a reference.⁸ When analyzing the productivity level, nominal values are used. When analyzing productivity growth, deflated real values are used.⁹ In addition to these productivity measures, the level and change of profit rate on total assets, those of wage rate per person, and the change in the number of employees are used as dependent variables. All of the variables are expressed in logarithmic form with an exception of profit rate. Major variables and summary statistics are shown in Table 1.

4. Results

(1) Level Effects

Table 2 indicates the simple comparisons of the mean productivity level, wage level, and

of new unions other than opening of new establishments is 510 and the number of dissolutions of unions other than shut down of establishment is 861 in 2007. The ratios to total number of labor unions (58,265) are around 1%.

8 The TFP calculation by using a hypothetical firm can be seen in Aw et al. (2001), Nishimura et al. (2005), and Fukao and Kwon (2006), among others. Morikawa (2007a) describes the detail of the measurement of TFP. The Basic Survey of Japanese Business Structure and Activities does not have information on working hours. When necessary, this paper uses industry-level data from the Monthly Labor Survey.

9 Industry-level GDP deflators are used.

profit rate for unionized and non-unionized firms. To convert the figures into percentage differences, unionized firms' mean labor productivity is about 20% higher and TFP is about 14% higher than that of non-unionized firms in 2004 (in 1998, about 15% for labor productivity and about 11% for TFP). The union wage premium is about 20% in 2004 (about 17% in 1998), which is a little higher than the consensus among U.S. labor economists of 15%, but the magnitude is similar to that of labor productivity. As wage is a part of value added, union presence seems to be favorable for both employees and management.¹⁰

When splitting the sample into manufacturing and non-manufacturing firms, in both types of industries the mean labor productivity, TFP, and wages are significantly higher for unionized firms (Table 3). The differentials are similar in magnitude for both types. Union productivity effects are observed not only in manufacturing firms, but also in non-manufacturing firms.

However, as mentioned earlier, it is necessary to control for firm characteristics, because the presence of labor unions depends on firm size, age, and industry. Table 4 shows the coefficients of the union dummy after controlling for firm size (log employees), firm age, and three-digit industry dummies. The sizes of the coefficients drop by around 40%, but are still large and significant in both productivity and wage regressions.¹¹

In the U.S., although unions may enhance productivity, the magnitude is far smaller than the effects on wages. As a result, unions have negative effects on firm profitability. On the contrary, in Japan such a conflict between union and management is not observed.

(2) Growth Effects

I examined union effects on changes in productivity, wage, and profitability from 1998 to 2004. Table 5 shows simple comparisons of the mean productivity growth, wage growth, and change in profit rate for unionized and non-unionized firms. Unionized firms' annual labor productivity growth rate is 1.2% higher and TFP growth rate is 0.9% higher than non-unionized firms.¹² These figures suggest that labor unions have positive productivity growth effects. During the period of the analysis, the growth rates of average wages are negative both for unionized and non-unionized firms because of prolonged deflation and the loose labor market. However, the absolute size on an annual basis is 0.4% smaller for unionized firms.¹³ The profit

10 Although the statistical significance level is not high, the profit rate of unionized firms is higher in 2004.

11 When profit rate on total assets is used as a dependent variable, the coefficient of union is negative and significant in 1998, but positive and insignificant in 2004.

12 Real (deflated) value is used in calculating the growth rate.

13 The figures for productivity growth and wage growth cannot simply be compared because productivity measures are real value and wage is nominal value. If nominal productivity measures are used, unionized firms' labor productivity growth is 0.7% higher and TFP is 0.4% higher than non-unionized firms. The differential for productivity growth rate is larger than that of the wage growth

rate on total asset rises 2.4% for unionized firms and 1.0% for non-unionized firms from 1998 to 2004. Although both of the firms increase their profitability during the six years, unionized firms show significantly better performance. All of these results suggest that labor unions have favorable growth effects on both employees and management.

Even when looking at manufacturing and non-manufacturing firms separately, a similar picture emerges (Table 6). For both industries, the labor productivity growth rate and TFP growth rate are higher in unionized firms. Although the union effect on the change in average wages does not show a significant difference in manufacturing, unionized firms' wage growth rate is about 1% higher and the difference is statistically significant in non-manufacturing industries.

Regression results, which control firm size, firm age, three-digit industry, and the initial productivity level, indicate that the coefficients of the union dummy on labor productivity growth and TFP growth are positive and significant (Table 7). The union coefficient is negative but insignificant for wage growth. Unionized firms' change in profit rate is about 1.5% higher after controlling for firm characteristics. Japanese labor unions are functioning well both for union members and for management, at least during the period of this study.

Although the unionization rate has been declining, Japanese labor unions have positive effects on firms' productivity and wages, both in levels and growth rates. In addition, I found no negative effect of union presence on firm profitability. These results contrast with the studies in the U.S. and suggest that even today Japanese firm-based labor unions function effectively for productivity.

(3) Employment

Finally, this subsection looks at the relationship between labor unions and employment. Table 8 shows the ratio of part-time workers in 1998 and 2004 by union presence.¹⁴ Among sample firms in this study, the part-time worker ratio in unionized firms is from 3% to 4% lower than in non-unionized firms. As shown in the table, the figures are not affected by firm size, firm age, and industry. Unionized firms have a relatively small number of part-time workers, irrespective of industry.

Table 9 indicates annual changes in employment from 1998 to 2004. The number of employees decreases 2.2% in unionized firms, which is far larger than the corresponding figure for non-unionized firms (decrease of 0.9%). When splitting the employees into fulltime and

rate.

¹⁴ In the Basic Survey of Japanese Business Structure and Activities, "part-time workers" is defined as a worker whose scheduled daily working hours or weekly working days are shorter than those of a regular worker.

part-time, the decrease rates of fulltime employees are similar for unionized and non-unionized firms. On the other hand, the changes in part-time employees show a large discrepancy in relation to union presence. The number of part-time workers increases 1.1% for non-unionized firms, but decreases 0.3% for unionized firms. The difference of the change in total number of employees is mainly caused by the different trend among part-time workers.¹⁵

Although labor unions have positive effects on productivity and wages at the firm level, the increase in part-time workers among non-unionized firms partly offsets the favorable effects on the macroeconomy. Unfortunately, Japanese labor unions have not yet succeeded in realizing overall productivity growth by involving the growing ranks of non-regular workers. Dealing with non-regular workers is a challenge for Japanese firm-based labor unions and ties in the issue of coping with both productivity growth and fair income distribution.¹⁶

5. Conclusions

The relationship between labor unions and productivity growth has long been a topic of economic research. In considering recent change in industrial structure (service economy) and labor market reforms, this paper empirically analyzes this issue by using a large, firm-level data set including non-manufacturing firms.

According to the majority view in the U.S., although unions may enhance productivity, the magnitude is far smaller than their effects on wages. As a result, unions have negative effects on firm profitability. However, in Japan, firm-based labor unions, which are a distinct characteristic of the Japanese labor system, actively participated in the productivity movement during the high growth era and made efforts to enhance productivity in close cooperation with management. The system contributed to strengthening the international competitiveness of manufacturing industries and the growth of the Japanese economy. Today, under the decreasing working-age population, productivity growth, especially in service industries, is a high-priority policy agenda. Service Productivity and Innovation for Growth (SPRING) was established in 2007 to enhance the productivity of the service sector. Japanese labor unions are important members of this new organization and cooperative efforts of labor and management are expected.

According to the analysis herein, the presence of labor unions has positive effects on the firm-level productivity (labor productivity and TFP) level and growth. The effect of union

15 Even when firm size, age, and industry are controlled for, the coefficient of union on employment growth is significantly negative.

16 In 2006, the ratio of part-time workers was 18.2% in manufacturing, 69.9% in hotels and restaurants, and 63.5% in retail.

presence on wages is also positive and the magnitude is similar to that on productivity. As a result, a negative effect of union presence on firm profitability is not observed. These results are different from studies in the U.S. However, the number of employees decreases more for unionized firms than non-unionized firms. Most of the difference in employment trends is attributable to the change in the number of part-time workers.

There are a few limitations of this analysis and there are a number of future research subjects. This paper uses information on the presence of unions in 1998 and subsequent firm performance, but does not explicitly deal with possible endogeneity of labor unions. Although the analysis controls for basic firm characteristics such as size, age, and industry, variables related to industrial relations are not available. In recent years, some research indicates that various human resources management (HRM) practices have a positive impact on productivity.¹⁷ These studies suggest that better productivity performance of firms with labor unions may reflect better HRM practices.¹⁸ In other words, the existence of labor unions may be working as a proxy for better HRM practices. The quality of workers may affect the results because the data used in this paper do not contain information on quality of workers, such as education, age, and tenure. In order to conduct an analysis explicitly considering the worker characteristics, a matched employer-employee data set is essential. This is on the agenda for future research.

17 For example, Ichniowski and Shaw (2003) and Bloom and Van Reenen (2007). In Japan, Morishima (1991) indicate that information-sharing between workers and management has a positive effect on productivity.

18 Machin and Wood (2005) show evidence that HRM practices and unions are complementary in the UK.

References

- Aw, Bee Yan, Xiaomin Chen, and Mark J. Roberts (2001), “Firm-Level Evidence on Productivity Differentials and Turnover in Taiwanese Manufacturing,” *Journal of Development Economics*, vol. 66, pp. 51-86.
- Addison, John T. and Barry T. Hirsch (1989), “Union Effects on Productivity, Profits, and Growth: Has the Long Run Arrived?” *Journal of Labor Economics*, vol. 7, no. 1, pp. 72-105.
- Benson, John (2006), “Japanese Management, Enterprise Unions and Company Performance, *Industrial Relations Journal*, vol. 37, no. 3, pp. 242-258.
- Blanchflower, David and Alex Bryson (2002), “Changes Over Time in Union Relative Wage Effects in the UK and the US Revisited,” NBER Working Paper No. 9395.
- Blanchflower, David G. and Alex Bryson (2003), “What Effect do Unions Have on Wages Now and Would ‘What Do Unions Do’ Be Surprised?” NBER Working Paper No. 9973.
- Bloom, Nicholas and John Van Reenen (2007), “Measuring and Explaining Management Practices Across Firms and Countries,” *Quarterly Journal of Economics*, vol. 122, no. 4, pp. 1351-1408.
- Brown, Charles and James Medoff (1978), “Trade Unions in the Production Process,” *Journal of Political Economy*, vol. 86, no. 3, pp. 355-378.
- Brunello, Giorgio (1992), “The Effect of Unions on Firm Performance in Japanese Manufacturing,” *Industrial and Labor Relations Review*, vol. 45, no. 3, pp. 471-487.
- Doucouliagos, Christos and Patrice Laroche (2003), “What Do Unions Do to Productivity? A Meta-Analysis,” *Industrial Relations*, vol. 42, no. 4, pp. 650-691.
- Freeman, Richard B. and James L. Medoff (1984), *What Do Unions Do?* New York: Basic Books.
- Fuchs, Victor R., Alan B. Krueger, and James M. Poterba (1998), “Economists’ View about Parameters, Values, and Policies: Survey Results in Labor and Public Economics,” *Journal of Economic Literature*, vol. 36, no. 3, pp. 1387-1425.
- Fukao, Kyoji and Hyeog Ug Kwon (2006), “Why Did Japan’s TFP Growth Slow Down in the Lost Decade? An Empirical Analysis Based on Firm-Level Data of Manufacturing Firms,” *Japanese Economic Review*, vol. 57, no. 2, pp. 195-228.
- Hirsch, Barry T. (2007), “What Do Unions Do for Economic Performance?” in James T. Bennett and Bruce E. Kaufman eds. *What Do Unions Do? A Twenty-Year Perspective*, New Brunswick, NJ, Transaction Publishers, pp. 193-237.
- Hirsch, Barry T. (2008), “Sluggish Institutions in a Dynamic World: Can Unions and Industrial Competition Coexist?” *Journal of Economic Perspectives*, vol. 22, no. 1, pp.

153-176.

- Ichniowski, Casey and Kathryn Shaw (2003), "Beyond Incentive Pay: Insiders' Estimates of the Value of Complementary Human Resource Management Practices," *Journal of Economic Perspectives*, vol. 17, no. 1, pp. 155-180.
- Lewis, H. Gregg (1986), "Union Relative Wage Effects," in Orley C. Ashenfelter and Richard Layard eds. *Handbook of Labor Economics*, vol. 2, Elsevier B. V., ch. 20, pp. 1139-1181.
- Machin, Stephen and Stephen Wood (2005), "Human Resource Management as a Substitute for Trade Unions in British Workplaces," *Industrial and Labor Relations Review*, vol. 58, no. 2, pp. 201-218.
- Morikawa, Masayuki (2007a), "Is Productivity in the Service Industries Low? An Analysis Using Firm-level Data on the Dispersion and the Dynamics of Productivity," RIETI Discussion Paper, 07-J-048. (in Japanese)
- Morikawa, Masayuki (2007b), "What Kinds of Company Have High Productivity? Company Characteristics and TFP," RIETI Discussion Paper, 07-J-049. (in Japanese)
- Morikawa, Masayuki (2008), "Productivity and Survival of Family Firms in Japan: An Analysis Using Firm-Level Microdata," RIETI Discussion Paper, 08-E-026.
- Morishima, Motohiro (1991), "Information Sharing and Firm Performance in Japan," *Industrial Relations*, vol. 30, no. 1, pp. 37-61.
- Muramatsu, Kuramitsu (1983), "Productivity and the Role of Labor Unions," in Analyses on Japanese Labor Market, ch. 4, pp. 91-117. (in Japanese)
- Nishimura, Kiyohiko G., Takanobu Nakajima, and Kozo Kiyota (2005), "Does the Natural Selection Mechanism Still Work in Severe Recessions? Examination of the Japanese Economy in the 1990s," *Journal of Economic Behavior and Organization*, vol. 58, no.1, pp. 53-78.
- Noda, Tomohiko (1997), "Labor Union and Productivity: An Analysis Using a Panel of Unlisted Firms," *Japanese Journal of Labour Studies*, vol. 450. (in Japanese)
- Sakamoto, Motoi (1995), "The Effects of Unions on Labor Productivity," *Financial Review*, May, pp. 1-20. (in Japanese)

Tables

Table 1 Summary statistics

Variables	Mean	Std. Dev.	Min	Max
Labor Productivity (1998)	-0.001	0.452	-3.101	2.887
Labor Productivity (2004)	0.078	0.511	-3.218	2.929
TFP (1998)	-0.035	0.415	-3.142	2.798
TFP (2004)	0.019	0.462	-3.523	2.440
Profit Rate on Total Asset (1998)	0.017	0.065	-1.323	0.975
Profit Rate on Total Asset (2004)	0.038	0.111	-4.764	0.663
Wage per Employee (1998)	1.552	0.333	-2.807	3.250
Log Wage per Employee (2004)	1.541	0.433	-3.332	3.104
Wage per Hour (1998)	-6.018	0.318	-10.379	-4.334
Wage per Hour (2004)	-6.056	0.421	-10.938	-4.499
Number of Regular Employees (1998)	5.066	0.939	3.912	11.126
Number of Regular Employees (2004)	5.118	0.947	3.912	11.267
Change in Sales	0.005	0.401	-2.847	3.318
Labor Productivity Growth	0.179	0.458	-2.875	3.258
TFP Growth (real)	0.141	0.465	-2.908	3.904
Change in the Number of Employees	-0.081	0.307	-2.236	2.300
Change in the Number of Full-Time Employees	-0.106	0.948	-3.992	4.259
Change in the Number of Part-Time Employees	0.037	1.007	-4.882	4.234
Change in Wage per Employee	-0.018	0.358	-5.072	3.837
Change in Wage per Hour	-0.044	0.356	-5.062	3.889
Change in Profit Rate	0.015	0.118	-4.901	0.726

(notes) Measures of Productivity, wage, and employment are logarithmic forms. Changes are from 1998 to 2004.

Table 2 Comparisons of the mean values

(1) 2004

Variables	Unionized	Non-unionized	t-value	% differentials
Labor Productivity	0.191	0.005	10.493	20.4%
TFP	0.099	-0.033	8.125	14.0%
Average Wage (per employee)	1.660	1.466	13.276	21.5%
Average Wage (per hour)	-5.946	-6.125	12.538	19.6%
Profit Rate on Total Asset	0.042	0.036	1.762	0.68%

(2) 1998

Variables	Unionized	Non-unionized	t-value	% differentials
Labor Productivity	0.089	-0.054	10.477	15.4%
TFP	0.032	-0.074	8.358	11.2%
Average Wage (per employee)	1.652	1.493	16.107	17.3%
Average Wage (per hour)	-5.926	-6.071	15.218	15.6%
Profit Rate on Total Asset	0.011	0.020	-4.479	-0.89%

(notes) Productivity and wage are logarithmic forms.

Table 3 Differentials with and without labor union (by industry)

(1) 2004

Variables	Manufacturing	Non-manufacturing
Labor Productivity	24.8%	18.7%
TFP	17.2%	15.6%
Average Wage (per employee)	24.5%	19.1%
Average Wage (per hour)	23.5%	18.4%
Profit Rate on Total Asset	0.6%	0.4%

(2) 1998

Variables	Manufacturing	Non-manufacturing
Labor Productivity	18.6%	18.1%
TFP	13.3%	17.7%
Average Wage (per employee)	22.5%	14.6%
Average Wage (per hour)	21.3%	13.3%
Profit Rate on Total Asset	-1.3%	0.1%

(notes) The figures indicate the % differentials between unionized and non-unionized firms. Profit rates are percentage points. Figures in Italics means insignificant at 10% level.

Table 4 Union effects (regression results)

(1) 2004

Variables	2004		
	Coefficients	t-value	% differentials
Labor Productivity	0.099	5.48	10.4%
TFP	0.082	4.88	8.5%
Average Wage (per employee)	0.116	7.42	12.3%
Average Wage (per hour)	0.108	7.11	11.4%
Profit Rate on Total Asset	0.004	0.99	

(2) 1998

Variables	1998		
	Coefficients	t-value	% differentials
Labor Productivity	0.075	5.25	7.8%
TFP	0.094	6.80	9.8%
Average Wage (per employee)	0.121	11.75	12.8%
Average Wage (per hour)	0.111	11.25	11.7%
Profit Rate on Total Asset	-0.013	-5.76	

(note) Firm size (employment), firm age, and 3-digit industry are controlled.

Table 5 Comparisons of the mean values

Variables	Unionized	Non-unionized	t-value	% differentials on an annual rate
Labor Productivity Growth	0.228	0.147	4.934	1.2%
TFP Growth	0.177	0.117	3.561	0.9%
Average Wage Growth(per employee)	-0.003	-0.027	1.828	0.4%
Average Wage Growth (per hour)	-0.031	-0.053	1.686	0.4%
Change in Profit Rate on Total Asset	0.024	0.010	3.450	

Table 6 Differentials in growth rates with and without labor union (by industry)

Variables	1998 - 2004	
	Manufacturing	Non-manufacturing
Labor Productivity Growth	0.8%	1.0%
TFP Growth	0.5%	0.6%
Average Wage Growth(per employee)	0.1%	0.8%
Average Wage Growth (per hour)	0.1%	1.0%
Change in Profit Rate on Total Asset	1.6%	0.4%

(notes) The figures indicate the % differentials on an annual basis between unionized and non-unionized firms. Profit rates are percentage points. Figures in Italics mean insignificant at 10% level.

Table 7 Union effects on growth performance (regression results)

Variables	1998 - 2004	
	Coefficients	t-value
Labor Productivity Growth	0.033	2.060
TFP Growth	0.028	1.720
Average Wage Growth(per employee)	-0.016	-1.100
Average Wage Growth (per hour)	-0.016	-1.110
Change in Profit Rate on Total Asset	0.008	1.760

(note) Firm size (employment), firm age, 3-digit industry, and initial productivity level are controlled. Figures in Italics mean insignificant at 10% level.

Table 8 Ratio of part-time employees

	1998	2004
Unionized firms	6.2%	6.8%
Non-unionized firms	10.1%	10.6%
(difference)	-3.9%	-3.8%
(t-value)	9.093	7.531
Coefficients of union dummy	-0.030	-0.026
(t-value)	-6.66	-4.91

(note) Coefficients indicate the regression results by controlling firm size, age, and industry.

Table 9 Labor union and employment growth

Variables	Unionized	Non-unionized	t-value	% differentials on an annual rate
Change in Total Employment	-0.128	-0.050	-7.165	-1.4%
Change in Full-timers	-0.101	-0.110	0.195	0.2%
Change in Part-timers	-0.015	0.067	-1.689	-1.3%

(note) The figures are expressed in logarithm.