

## Unionisation and Firm Performance in China's Manufacturing Industries

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**Abstract** Using firm level data, this paper examines the link between unionisation and firm performance in China's manufacturing industries. The empirical results suggest that unionisation has not greatly benefitted workers in China's textile industry but it has contributed to much larger increase in average wages in both domestic and foreign invested firms in communication equipment, computer and other electronic equipment manufacturing industry. In the case of the general equipment manufacturing industry, unionised domestic firms pay higher average wages but there is no link between unionisation and average wage in foreign invested firms.

**Keywords** Unionisation · Economic development · Coarsened exact matching · China

**JEL Classification** J01 · J31 · J50

### Introduction

Prior to the reform process that started in 1978, the Chinese economy was dominated by the agricultural sector. The Chinese economy of today is dominated by an urban-export oriented sector. This transformation resulted in significant migration from rural to urban areas. The number of migrant workers in China is estimated to be in excess of 140 million. Approximately 17.8 % of the Chinese population used to live in urban areas in 1978 but this proportion increased to 43 % in 2005.<sup>1</sup> Migrant workers have contributed to a significant increase in labour supply in China. However, recent figures

<sup>1</sup>The share of the agricultural sector in GDP and the share of agricultural sector employment as a proportion of total employment have significantly declined (Lee 2009). Recent years have also witnessed the rapid expansion of the private sector in China (which includes both domestic and foreign firms) at the expense of state owned firms.

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suggest that labour supply reached its peak in 2010 (Yao and Zhong 2013). Massive foreign investment and a significant increase in the minimum wage over the past two decades have contributed to increase in labour cost in China. Knight et al. (2011) suggest that in 2009 alone there was an increase in the real wages of migrant workers by 17.3 %.

Rising prosperity has also coincided with rising income inequality in China. A number of studies have examined various types of income inequalities—e.g., regional income inequality, urban–rural income inequality, skilled-unskilled wage inequality, etc.<sup>2</sup> In order to address the issue of rising regional inequality, the Chinese government is constantly encouraging foreign firms to invest in the Western provinces. This policy seems to be working and companies like Intel, Hewlett-Packard and Pfizer have shown some interest in taking advantage of relatively more favourable economic conditions in these areas.<sup>3</sup> The Chinese government has also raised the minimum wage. Because the cost of living varies from region to region, the minimum wage is not the same everywhere. The minimum wage is highest in Shanghai and the lowest in Ningxia (Xu 2010).<sup>4</sup> Trade unions can play an important role in addressing the issue of rising income inequality. This paper focuses on the link between unionisation in Chinese firms and firm performance.

There has been a significant increase in unionisation in Chinese firms from 2007. At the grassroots level, the number of trade unions is well in excess of 1.8 million; managed by more than 400,000 full-time and a similar number of part-time union officials (Yao and Zhong 2013). Unionisation has affected both domestic and foreign invested firms in China. In recent years, there has been a sharp increase in legal action arising from labour disputes. Labour disputes related law suits increased from 45,172 in 2001 to 225,061 in 2008 (Yuan et al. 2011). Like all aspects of the society, unions in China are controlled by the Communist Party of China (CPC). With a rapid increase in the number of labour disputes, the unions are finding it hard always to side with the CPC and the employers. The aim of government and the CPC is to minimise and, if possible, totally eliminate disruption to production schedules that could adversely affect China's reputation as a reliable supplier to its international clients.<sup>5</sup>

Since the beginning of the current era of reform and openness in China that started from the late 1970s, labour unions in China have also gone through some changes. In 1992, the Chinese government introduced its new Trade Union Law that defines the nature and functions of the Chinese trade unions. This law highlights the need for union to take a more active role in protecting workers interests. Additional rights were granted to labour unions in 1994. The rapid inflow of foreign investment in China coincided with labour shortages and a sharp rise in labour disputes. In an attempt to maintain

<sup>2</sup> See Anwar and Sun (2012) and references therein.

<sup>3</sup> An interesting discussion of the related issues can be found in Lu et al. (2010) and Wright et al. (2011).

<sup>4</sup> More recent figures on the minimum wage in China can be found in China Briefing (2012).

<sup>5</sup> Several incidences of labour exploitation in China's export sector have been reported in the media. Notable recent labour disputes include a strike at the Honda plant in 2010 and worker suicides at Foxconn, which is a very large OEM electronics producer (Cunningham and Wassersstrom 2011). Other studies, such as Nagi (2005), Sun and Nagi (2005) and Chan and Siu (2010) suggest that some domestic firms have been involved in worker exploitation which can take the form of forced overtime. In some cases, Chinese firms have used a voluntary code of conduct to control the workers.

harmony in the Chinese society, the government granted additional rights to trade unions. The unions play a major role in dispute resolution (Chan 2010).<sup>6</sup> Based on their research that mainly covers China's Hainan province in 2004 and 2005, Metcalf and Li (2005) believe that unions are viewed as irrelevant by many workers. They argue that there is a need for effective representation in unions. Collective bargaining which aims to maximise the income of union members does not take place in China.<sup>7</sup> Yuan et al. (2011) argue that trade unions do not affect industrial labour income in China. They suggest that inactive trade unions in fact have contributed to a rise in income inequality. They believe that only independent trade unions can have a significant impact on labour income in China. On the other hand, the empirical work of Yao and Zhong (2008, 2013) suggests that unionisation has resulted in an increase in the hourly wage and pension coverage in China. This study concludes that unionisation has resulted in welfare improvement. Yao and Zhong's work is based on cross-sectional data collected from 1268 firms in 12 cities. They argue that despite government control, unions in China are effective. Their empirical results suggest that unionisation has resulted in a decrease in workplace accidents and an increase in unemployment insurance.

Due to unavailability of data, few studies have considered the impact of unionisation in China. These studies produced mixed results. Lu et al. (2010) used a sample of 3837 private firms in 2006. They found that the relationship between wages and unionisation was not significant. However, unionisation has resulted in an increase in worker benefits. Both Yao and Zhong (2008) and Yao and Zhong (2013) use Seemingly Unrelated Regression (SUR). However, the former study also acknowledges the possibility of two-way causality between wages and unionisation. In order to reduce the potential bias, Yao and Zhong (2008) used instrumental variables 3SLS estimation. Yao and Zhong (2008, 2013) found the impact of unionisation on wages and working hours to be statistically significant. Unionisation has reduced working hours and wages are higher. However, as indicated earlier, the empirical evidence provided by Yuan et al. (2011) suggests that unionisation has not made a significant contribution to labour income. In a very interesting study, Ge (2013) considers the impact of unionisation on employee benefits and firm performance. This study which is based on data collected in 2004 suggests that unionisation has resulted in an improvement in worker wages and benefits. For example the impact of unionisation on worker training was found to be positive. However, this study does not appear to have taken the endogeneity problem into account.

While the earlier studies are mainly based on aggregate data, this paper considers the impact of unionisation on three major manufacturing industries: (i) textile, (ii) general equipment manufacturing and (iii) communication, computer and other electronic equipment manufacturing. Due to unavailability of more recent data from published sources, the empirical results presented in this paper are based on data collected in 2004. Almost all available studies that deal with the impact of unionisation in China are based on cross-sectional data. Among other things, studies based on cross-section data may be affected by that fact that some industries are better unionised as compared to others. In order to overcome this problem, we examine the impact of unionisation on

<sup>6</sup> For an interesting discussion of the transformation of Chinese labour relations, see Kai and Brown (2013).

<sup>7</sup> See Wang et al. (2009) for an interesting analysis of the movement towards collective bargaining in China.

firm performance within industry groups. As foreign invested firms were slow to embrace unionisation, we consider the link between firm performance and unionisation within each of the three industries in aggregate as well as separately for domestic and foreign invested firms. Firm productivity, sales, profitability and average wage are used as indicators of firm performance. Workers are mainly interested in wages whereas, from the point of view of firms, labour productivity, sales and profitability are likely to be the main issues of concern. By examining the impact of unionisation on productivity, sales, profitability and average wage, we may be able to assess the extent to which unions in China are able to work in the best interests of (i) workers and (ii) employers.

In addition, in order to account for the possible endogeneity problem, this paper utilises a Coarsened Exact Matching (CEM) technique that allows one to investigate the impact of unionisation on firm performance. This technique involves construction of a comparison group (see Iacus et al. 2011a, b). The idea is to find a non-unionised twin of a unionised firm. The difference between the performance of a firm and its twin can then be attributed to unionisation. Unionisation can be endogenous as big firms tend to be unionised. However, the CEM technique, which allows one to calculate the difference between a unionised firm and its non-unionised twin, tends to eliminate the possible bias due to this endogeneity.

The rest of the paper is organised as follows. “Labour Unions in China” section contains a brief discussion of the nature of unionisation in China. The empirical methods are explained in “Methodology” section. “Results” section contains a discussion of the empirical results whereas “Concluding Remarks” section contains some concluding remarks.

### Labour Unions in China

The All-China Federation of Trade Unions (ACFTU) is the only government approved trade union in China. It was established in 1925 and socialist control of China in 1949 led to restructuring of the union. In reality, the communist party of China uses ACFTU to control workers. The economic reforms of 1978 led to the use of surplus labour from the agriculture sector to China’s growing industrial sector. These reforms also signalled the end of lifelong employment (Athreya 2004 and Liu 2010). Labour market first emerged in the agricultural sector and then expanded to cover the fast growing industrial sector.<sup>8</sup>

China’s trade union law as amended in 2001 requires all firms (domestic and foreign invested) having 25 or more employees to form a union. Up until a few years ago, some foreign invested firms did not comply with this requirement. For example Foxconn Technology group (a Taiwan based firm) unionised only after bad publicity concerning long shifts without a break. Unionisation was initially resisted by foreign invested firms and unions in these firms were relatively weak. However, in recent years, foreign firms such as Walmart have allowed unions (Qi and Burkitt 2014). The formation of ACFTU recognised unions in foreign invested firms can help foreign firms in China to establish a good rapport with the central government.

<sup>8</sup> For an interesting analysis of the challenges faced by workers in China’s labour market, see Dong and Xu (2008) and Friedman and Lee (2010).

## The impact of Unionisation—the Case of Communication, Computer and Other Electronic Equipment Manufacturing Industry

The estimated results reported in Table 11 reveal that, within China's communication equipment, computer and other electronic equipment manufacturing industry, unionisation has no effect on firm productivity. However, sales, profitability and average wage, respectively, in unionised firms, are on average 0.0257 %, 0.0045 % and 0.0794 % higher. The impact on profitability is significant only at the 10 % level and very small. Table 11 shows that, as expected, capital intensity has a positive and highly significant impact on all indicators of firm performance. However, older firms appear to be doing badly in the areas of productivity, profitability and sales. Large firms have higher sales and these firms are also more productive but their profitability is declining. The bottom panel of Table 13 shows that once we exclude all control variables except for the impact on productivity, all other results continue to hold.

Tables 12 and 14 reveal that both domestic and foreign invested unionised firms pay higher wages and their sales are also higher. Based on the size of the impact on average wage, it can be argued that unions are more effective in domestic firm. Unionised domestic firms are more profitable but less productive. Table 14 shows that unionised foreign invested firms are more productive but in terms of profitability there is no difference between the unionised and non-unionised foreign invested firms. The impact of capital intensity on all indicators of firm performance is positive and significant in the case of both domestic and foreign invested firms. Large domestic firms are less productive but their sales are higher. On the other hand, large foreign invested firms are more productive but less profitable.

The empirical results presented in this paper reveal that the impact of unionisation on firm performance in China is heterogeneous. The heterogeneity has several dimensions—the impact of unionisation varies across industries as well as across domestic and foreign invested firms. In general, it seems that unionisation has a negative impact on labour productivity and a positive impact on average wage. Out of the three industries considered, unionisation has the smallest positive impact on average wage in textile industry. Unions are relatively more effective in domestic firms. While the impact of unionisation on average wage varies across domestic and foreign invested firms, the impact on sales in positive across both domestic and foreign invested firms.

### Concluding Remarks

The economic reform process that started in the late 1970s has transformed China from agrarian to an urban-based industrialised economy. This transformation led to a rapid rise in wages in the urban areas which resulted in significant labour migration from rural to urban areas. Rising prosperity and a recent decline in rural to urban migration has resulted in a situation where labour cost in China has sharply risen, giving China the third highest wages amongst emerging Asian nations. A very large number of firms in China are unionised. However, trade unions in China do not play their traditional role. While unions in China play an important role in resolving worker-employer disputes, they are not involved in collective bargaining. In fact, union officials in China are paid from a levy imposed on firm profits. In addition, a number of union officials

**Table 14** Estimated results for foreign invested firms in communication equipment, computer and other electronic equipment manufacturing industry

| Regressors     | Productivity |       | Sales      |        | Profitability |       | Average wage |       |
|----------------|--------------|-------|------------|--------|---------------|-------|--------------|-------|
|                | Coeff.       | z     | Coeff.     | z      | Coeff.        | z     | Coeff.       | z     |
| Firmsize       | 0.1339***    | 7.30  | 0.0808***  | 44.23  | -0.0064***    | -4.10 | 0.0014       | 0.15  |
| Age            | -0.0158***   | -3.25 | 0.0001     | 0.12   | -0.0028***    | -6.69 | 0.0098***    | 3.81  |
| k              | 0.0028***    | 20.27 | 0.0002***  | 16.79  | 0.0000***     | 3.99  | 0.0010***    | 14.07 |
| Ownership      | 0.1494       | 0.75  | -0.0064    | -0.32  | 0.0361**      | 2.14  | -0.0970      | -0.93 |
| Western        | 0.4454**     | 2.35  | 0.0115     | 0.61   | 0.0053        | 0.33  | 0.1687*      | 1.70  |
| Middle         | -0.2314*     | -1.67 | -0.0436*** | -3.15  | 0.0115        | 0.98  | -0.2236***   | -3.06 |
| Dunion         | 0.1329***    | 3.20  | 0.0172***  | 4.16   | -0.0010       | -0.28 | 0.0647***    | 2.96  |
| Constant       | 4.8559***    | 23.90 | 2.3214***  | 114.71 | 0.0648***     | 3.77  | 2.7097***    | 25.37 |
| No. of obs.    | 3044         |       | 3044       |        | 3044          |       | 3044         |       |
| Chi2           | 512.94       |       | 2352.1     |        | 102.04        |       | 228.67       |       |
| R <sup>2</sup> | 0.14         |       | 0.44       |        | 0.03          |       | 0.07         |       |

\*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 per cent level respectively

concurrently hold positions in the Communist Party of China. Unions in China are practically under government control.

This paper examines the impact of unionisation on firm performance in China's (i) textile industry, (ii) general equipment manufacturing industry and (iii) communication equipment, computer equipment and other equipment manufacturing industry. We focus on four indicators of firm performance; labour productivity, sales, profitability and average wage. As the unions in China do not play their traditional role, it is useful to examine the impact of unionisation on both workers and employer's interests. Workers are of course interested in wages whereas the management is more concerned about sales, profitability and labour productivity. It is well-known that self selection can lead to a significant bias when the unionised-non-unionised firm performance gap is calculated. In order to avoid this bias, we use the Coarsened Exact Matching (CEM) technique, which involves finding a unionised firm and its non-unionised twin. One can then calculate the unionised-non-unionised firm performance gap. We use Seemingly Unrelated Regression to examine the impact of unionisation on the performance gap. The empirical analysis presented in this paper is based on data collected from a national survey conducted by China's National Bureau of Statistics in 2004. This survey contains all the data that we need. Obviously, it would have been preferable if panel data were available, but it is perhaps worth mentioning that only a handful of studies have examined the impact of unionisation on wages and worker welfare in China and these studies also used cross-section data. However, this paper utilises a different methodology and focuses on three industries within China's manufacturing sector.

The empirical results presented in this paper reveal interesting variations across sectors and also across domestic and foreign invested firms. In the case of the textile industry, we find that on average workers in unionised domestic firms are less productive and firm profitability, as compared to non-unionised firms, is also lower. The sales of unionised domestic textile firms are higher. On average, unionised firms pay higher wages but further investigation revealed that the positive impact on average wage in textile industry is restricted to workers in domestic firms; unionisation has not affected the average wage in foreign invested textile firms. However, unionisation in the textile industry appears to have helped the employers and perhaps the union officials; the sales of both domestic and foreign invested unionised firms are higher.

In the case of the general equipment manufacturing industry, our empirical results suggest that unionised domestic firms pay higher average wages but the average wage gap between the unionised and non-unionised foreign invested firms is statistically insignificant. Sales of both unionised domestic and unionised foreign invested firms are higher. Labour productivity in unionised domestic firms is lower and the same applies to firm profitability. The difference between the productivity and profitability of unionised and non-unionised foreign invested firms in general equipment manufacturing industry is statistically insignificant.

In the case of the communication equipment, computer equipment and other equipment manufacturing industry, we found that both unionised domestic and unionised foreign invested firms pay higher wages. While the sales of both unionised domestic and unionised foreign invested firms are higher, workers in unionised foreign invested firms are more productive but the opposite is true in the case of unionised domestic firms. Unionisation has not resulted in a change in the profitability of foreign invested firms but it has a positive impact on profitability of unionised domestic firms.

In summary, while unions in China are currently not playing their traditional role, one could not claim that they are totally ineffective. Our results suggest that the impact of unionisation on average wage varies across industries. In relative terms, the gain to workers in domestic textile firms is the smallest and workers in foreign invested textile firms have not gained at all. Workers in domestically owned firms in the general equipment manufacturing sectors have gained but workers in foreign invested firms have not benefitted from unionisation. There is however, one conclusion that appears to hold across all industries and all types of unionised firms that have been considered in this paper—unionisation has resulted in increases in sales. It seems that while unions are able to exert a positive influence on wages in some industries, they are successful in looking after the interests of the employers across all industries and all types of firms (domestic as well as foreign invested).

Finally, as this study is based on cross-section data, it would be useful to examine the impact of unionisation on firm performance when panel data becomes available. At this stage, due to unavailability of data, we have no choice but to rely on cross-sectional data. Lack of data also dictated our choice of control variables, which has implications for the identification strategy.

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## Human-Capital Investments and Productivity

By SANDRA E. BLACK AND LISA M. LYNCH\*

There have been few studies in the United States on the impact of human-capital investments, such as education and employer-provided training, on productivity. Some of the researchers who have been able to examine the linkage between training and productivity (e.g., John Barron et al., 1987; John Bishop, 1994) have used a subjective measure of productivity such as the answer to the survey question: "on a scale of 1-4 how has your productivity changed over the last year?" The main problem with subjective measures of productivity is that they are not comparable across firms or even within firms over time. However, given these caveats, Bishop (1994) concludes that employer-provided training raises this subjective productivity measure by almost 16 percent.

Ann Bartel (1989) has linked data from a survey of human-resource management practices at the establishment level with firm-level data from Compustat on productivity and financial performance. However, this approach is also problematic because most of the establishments in the survey used by Bartel (1989) were part of multiple-establishment firms. Therefore there is a discrepancy in the unit of analysis of inputs and outcomes, since the Compustat data refer to the firm as a whole, not to specific establishments. This problem, along with a low overall response rate in the survey used by Bartel (1989) (6 percent), limits

its reliability of the productivity analysis. Nevertheless, Bartel finds evidence that returns to training investments increase productivity on the order of 16 percent. In a follow-up study using longitudinal data on manufacturing firms, Bartel (1992) found that lagged training investments rather than current training yield positive effects on productivity.

Our paper, using unique data from the National Center on the Educational Quality of the Workforce (EQW) National Employers' Survey, presents findings on the impact of human-capital investments on business productivity. The survey was designed to overcome some of the limitations of previous studies and collect more precise data on human-capital inputs and establishment output. Part of the survey (see Lynch and Black [1995] for more details) was designed to replicate the questions asked in the Annual Survey of Manufacturers (ASM) on the dollar value of sales, receipts or shipments, the book value of the capital stock, and the cost of materials (including energy) used in production during calendar year 1993. Given the survey design, these variables can then be augmented with worker characteristics (such as education and training), other establishment characteristics (such as the age of the capital stock), and workplace practices (such as TQM [total quality management], benchmarking, etc.) to estimate a much richer production function than has been possible before. In addition, since we have collected sales, materials, and capital data specifically for the establishment we are not forced to match establishment-level workplace practices with enterprise-level sales information.

The EQW National Employers Survey (designed by Lynch in collaboration with EQW Co-Directors Robert Zemsky and Peter Cappelli) was administered by the U.S. Bureau of the Census as a telephone interview in August and September 1994 to a nationally representative sample drawn from the Census Standard Statistical Establishment Listing (SSEL) data base of private establishments with more than 20

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employees. The survey oversampled establishments in the manufacturing sector and those with over 100 employees. Public-sector employers, not-for-profit institutions, and corporate headquarters were excluded from the sample. Of the 4,633 eligible employers contacted by the Census Bureau, 1,275 refused to participate in the survey. This represents a 72-percent response rate, substantially higher than many similar employer surveys. Of the 3,358 establishments that participated in the survey, not all respondents completed all parts of the<sup>1</sup> survey by the interview cutoff date of October 1, 1994. The final number of employers who completed all parts of the survey was 1,621 in the manufacturing sector and 1,324 in nonmanufacturing. This represents a 64-percent overall "completed" survey response rate.

Using these data we are able to estimate the impact of human-capital investments on productivity. We assume a standard Cobb-Douglas production function where

$$(1) \quad \log(Y_i) = \text{constant} + \mathbf{a}'\mathbf{X}_i \\ + b \log K_i + c \log M_i \\ + d \log(LH)_i + e \log(LQ)_i.$$

Output  $Y_i$  is proxied by the dollar value of sales, receipts, or shipments for calendar year 1993 for establishment  $i$ , denoted by  $S_i$ ;  $K_i$  is the 1993 book value of the capital stock;  $M_i$  is the total cost of goods and services used in the production of 1993 sales, including energy;  $LH_i$  are total labor hours for 1993, and  $LQ_i$  is a measure of labor quality, which we proxy with the average educational level of the establishment, denoted by  $ED$ . The vector  $\mathbf{X}_i$  includes whether or not the establishment is part of a multi-establishment enterprise, the age distribution of the capital stock, total number of workers trained in 1990 and 1993,<sup>2</sup> the percentage of formal training that occurs off the job, dummy variables for three specific types of training activities, the percentage of the full-time workforce that has been em-

ployed at the establishment for less than one year, whether or not grades or communication skills are considered important for recruitment purposes, dummy variables for the use of TQM or benchmarking, a dummy variable equal to 1 if the establishment exports any sales of its principal product, a dummy variable equal to 1 if there is an R&D center anywhere in the enterprise, controls for capacity utilization, and whether or not the establishment is unionized. Since the values of sales, capital stock, and materials need to be deflated by the appropriate price deflators, we use dummy variables for the two-digit standard industrial classification of the establishment in our cross-section estimation.

As shown in Table 1, human capital is an important determinant of establishment productivity. The average educational level of the establishment has a positive and significant effect in both the manufacturing and nonmanufacturing sectors. The estimated coefficient in the unrestricted Cobb-Douglas model implies that a 10-percent increase in average education in the establishment (approximately one more year of school) will lead to an 8.5-percent increase in productivity in manufacturing and a 12.7-percent increase in nonmanufacturing.

In results reported in Lynch and Black (1995) we also estimated a model with two additional restrictions. The first restriction tests (in the spirit of Dale Jorgenson and Zvi Griliches [1967]) whether or not the coefficients on labor quality (average education) and labor hours are equal. If this is the case, then we can consider the labor input to be adjusted for quality, where the adjustment factor is proportional to the average educational level of the establishment. In addition we test to see whether the restriction of constant returns to scale is accepted by our data.<sup>2</sup> Both of these restrictions are accepted. In the

<sup>1</sup> We have also included training in the form of the proportion of workers trained, but the reported results do not change.

<sup>2</sup> Most studies on the determinants of productivity of U.S. establishments using cross-section data find constant returns to scale. One difference between our results and those of other studies is that the coefficient on materials is much lower than what has been found elsewhere. We believe that this is because respondents had more difficulty answering this question in a telephone interview than the questions on sales, capital, or labor. Therefore, there is probably significant measurement error for materials.

TABLE 1—DETERMINANTS OF LOG SALES  
(COBB-DOUGLAS PRODUCTION FUNCTION)

| Independent variable                                | Dependent variable = log(sales) |                     |
|---|---------------------------------|---------------------|
|   | Manufacturing                   | Nomnanufacturing    |
| Constant  | 0.341<br>(0.317)                | -1.252<br>(-0.659)  |
| Log capital   | 0.25*<br>(11.304)               | 0.36*<br>(9.957)    |
| Log materials                                       | 0.26*<br>(11.812)               | 0.06*<br>(2.958)    |
| Log hours   | 0.47*<br>(12.45)                | 0.628*<br>(10.948)  |
| Multiple establishments                             | 0.13*<br>(2.257)                | -0.05<br>(-0.382)   |
| Percentage of equipment <1 year old                 | -0.003<br>(-1.331)              | 0.005<br>(1.249)    |
| Percentage of equipment 1–4 years old               | 0.003*<br>(2.153)               | -0.0003<br>(-0.155) |
| log (average education)                             | 0.86*<br>(2.028)                | 1.29*<br>(1.793)    |
| log (trained in 1993)                               | -0.12<br>(-1.294)               | 0.08<br>(0.39)      |
| log (trained in 1990)                               | 0.09<br>(0.994)                 | -0.11<br>(-0.515)   |
| Percentage of formal training outside working hours | 0.002*<br>(2.104)               | -0.001<br>(-0.461)  |
| Computer training                                   | 0.05<br>(0.714)                 | 0.26*<br>(1.895)    |
| Teamwork training                                   | 0.07<br>(0.983)                 | -0.20<br>(-1.617)   |
| Supervisor training                                 | -0.03<br>(-0.336)               | 0.20<br>(1.392)     |
| Grades a priority in recruitment                    | -0.08<br>(-1.226)               | 0.27*<br>(1.655)    |
| Communication a priority in recruitment             | 0.09<br>(1.52)                  | 0.14<br>(0.962)     |
| Percent workers employed <1 year                    | -0.003<br>(-1.61)               | -0.008*<br>(-2.692) |
| Unionized   | -0.05<br>(-0.793)               | 0.35*<br>(2.494)    |
| TOM   | -0.02<br>(-0.347)               | -0.01<br>(-0.121)   |
| Benchmark   | 0.03<br>(0.539)                 | 0.08<br>(0.621)     |
| R&D center  | -0.01<br>(-0.200)               | -0.05<br>(-0.334)   |
| <i>N</i> :  | 821                             | 525                 |
| Adjusted <i>R</i> <sup>2</sup> :                    | 0.8387                          | 0.6512              |

Notes: The estimated equation also includes two-digit SIC industry controls, capacity utilization, unionization, age of the establishment, and a dummy variable for whether the primary product is exported. Numbers in parentheses are *t*-test results.

\* Statistically significant at the 10-percent level.

\*\* Statistically significant at the 5-percent level.

restricted model (see Lynch and Black, 1995) the implied coefficient on education would suggest that for a 10-percent increase in education, productivity would rise 4.9 percent in manufacturing and 5.9 percent in nonmanufacturing. These values combined with those presented in Table 1 set the range of education's impact on productivity. Although the range is somewhat large, the impact of education on establishment productivity is substantial, especially in nonmanufacturing. Since the nonmanufacturing sector is expanding much more rapidly than manufacturing in the United States, this result may shed some light on the widening college–high-school wage gap that occurred during the 1980's.

Training has a more complex impact on the productivity of establishments. Unfortunately, we are only able to measure the number of workers involved in training at two points in time: 1990 and 1993. This means that we do not have a measure of the accumulated stock of training for all workers; instead we are only able to capture training that occurred during two particular years. Thus our estimates of the impact of training are likely to underestimate the true returns. We find that the number of workers trained, especially in 1993, has no apparent impact on productivity. In manufacturing, the number of workers trained at the two points in time is not statistically significant, although the point estimates suggest that current training lowers productivity, while past training raises current productivity. This is very similar to what we see happening with the age of the capital stock in manufacturing. Capital equipment less than one year old lowers productivity (although the effect is not statistically significant), while capital stock aged 1–4 years raises current productivity. This suggests some sort of adjustment story, where initially there are adjusted costs associated with the introduction of new skills and capital into the workplace which are then followed by positive improvements in productivity.

When we include other dimensions of training we see more compelling evidence about the impact of training on productivity. For manufacturing, the greater the proportion of time spent in formal off-the-job training, the higher the productivity. There are two possible reasons. First, training workers outside

TABLE 2—RELATIVE RANKING OF FACTORS  
IN MAKING HIRING DECISIONS

| Applicant characteristic                              | Rank |
|---|------|
| Applicant's attitude                                  | 4.6  |
| Applicant's communication skills                      | 4.2  |
| Previous work experience                              | 4.0  |
| Recommendations from current employees                | 3.4  |
| Previous employer recommendation                      | 3.4  |
| Industry-based credentials                            | 3.2  |
| Years of completed schooling                          | 2.9  |
| Scores on tests administered as part of the interview | 2.5  |
| Academic performance (grades)                         | 2.5  |
| Reputation of applicant's school                      | 2.4  |
| Teacher recommendations                               | 2.1  |

Note: Rank is based on a scale of 1–5, where 1 = not important or not considered, 5 = very important.

Source: Lynch and Zemsky, 1995. These data come from the answer to the following question: "When you consider hiring a new non-supervisory or production worker (*front-line worker*), how important are the following in your decision to hire?"

working hours lowers the output loss associated with on-the-job training. Second, those employers that train their workers off the job may be investing in more advanced and time-intensive skills development. Unfortunately, our survey does not allow us to explore this issue in more detail.

For nonmanufacturing, the content of the training programs provided by employers seems to have an important impact on productivity. In particular, computer-skills development has a significant and positive impact on establishment productivity, even controlling for industry. This finding is consistent with evidence presented in Alan Krueger (1993) of higher wage premiums associated with workers who use computers on the job. This result suggests that it is not so much whether you train workers, but rather *what you train the workers* in that affects establishment productivity.

Recruitment strategies of establishments also play an important role in their productivity. In nonmanufacturing, those establishments that cite grades as an important priority in hiring also have higher productivity. Table 2 shows the ranking in importance by employers of different applicant characteristics for recruitment and selection. What is striking about this table is how low priority an applicant's

grades are for most employers. Yet the results presented in Table 1, at least for nonmanufacturing, suggest that those employers who do focus on grades experience significantly higher productivity than their competitors.

Other interesting results in Table 1 include the negative impact that high labor turnover has on productivity, especially for nonmanufacturing. Although it is not news that turnover is high in nonmanufacturing, this table suggests that establishments pay quite a high price for this turnover in terms of lower sales. In nonmanufacturing, unionization has a positive and rather large effect on establishment productivity.

At the same time, the use of TQM or benchmarking does not seem to have any impact on current productivity of establishments. One possible explanation of why these variables do not enter significantly is that we have not controlled for the timing of the introduction of these practices. If an employer has only just introduced these practices we would expect to see a delay in their impact on productivity, just as in the introduction of new physical capital. In addition, crude measures of the incidence of TQM or benchmarking do not capture how these programs are actually being implemented. Perhaps what is most important is not the introduction of TQM, but rather how it is introduced, when it is introduced, and how it has been implemented. This issue has been examined in much more detail in Casey Ichniowski et al. (1993) where, using more detailed industry information obtained in personal interviews, they find the effect on productivity of high-performance work systems depends on how they were actually implemented. Therefore, future data-collection efforts should focus on obtaining more information on the content, timing, and implementation of programs such as employer-provided training and total quality management.

While the results in Table 1 highlight the importance of human capital, especially education and certain types of employer-provided training, for establishments' productivity, there are several limitations with these findings. First and foremost is the problem of endogeneity. The presence of unobserved establishment characteristics that are time-invariant is likely to bias our estimated coefficients. Although we have a

richer specification for the production function than most researchers, we may still not be capturing all establishment characteristics linked to productivity. Our estimated coefficients may also be affected by measurement error. If we had longitudinal data on the establishments in our survey we could try to address the first problem of unobserved heterogeneity using "within" estimators to control for time-invariant, unobserved employer characteristics. Generalized method-of-moments estimation of the model in first differences would also allow us, in principle, to address the issue of measurement error. Longitudinal data on training inputs would also allow us to examine how the accumulation of training over time within a business affects current productivity. Finally, our results suggest that it is important to move beyond simple measures of the incidence of workplace practices such as training or TQM in order to understand how these types of workplace strategies/investments actually pay off for employers.

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## What Do Unions in China Do? Provincial-Level Evidence on Wages, Employment, Productivity, and Economic Output

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**Abstract** Utilizing provincial-level data from the period of 1994–2008, this article studies the relationship between union density and wages, employment, productivity, and economic output in China. The findings indicate that union density does not affect average wage levels, but is positively associated with aggregate productivity and output. We discuss if and to what extent these findings are consistent with the familiar two faces of unions model and alternative explanations relevant in the context of Chinese labor and union institutions.

**Keywords** Labor unions · China · Wages

Given the importance of labor unions in modern labor markets, many scholars have studied the effects of labor unions on wages, employment, and other important economic variables, such as labor productivity and economic growth. While the findings are extensive and insightful, little is known about these effects in China. This incomplete understanding of what unions do in China is a significant issue

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## DO UNIONS IMPACT EFFICIENCY?: EVIDENCE FROM THE U.S. MANUFACTURING SECTOR

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*This study investigates the impact of labor unions on productivity and technical inefficiency of the U.S. manufacturing sector, using state-level panel data on 48 states from 1983 to 1996. The results indicate that while labor unions reduce firms' technical progress, they improve firm efficiency in utilizing the existing technology. The findings also suggest that the decline of unionization rate in the sample period impaired firms' technical efficiency by 2.4 percentage points. (JEL C33, C51, O51, J51)*

### 1. INTRODUCTION

The relationship between labor unions and firm performance has garnered a vast amount of attention from scholars, unions, and businesses, as well as from policymakers as extensive studies have explored both the theoretical foundations and the empirical evidence regarding the impact of labor unions on productivity, as well as on other aspects of business, such as sales, profitability, investment, and employment growth (Doucouliagos and Laroche 2003). Perhaps one of the most relevant public policy questions is how unions affect productivity. Although studies have empirically investigated union productivity effects for a variety of industries and public sectors, particularly in the U.S. and European countries, empirical evidence on this question, however, is mixed.

Brown and Medoff (1978) and Freeman and Medoff (1984), in their early and influential work, argued that labor unions can raise productivity by inducing managers to adopt more efficient production methods and policies, and by providing better communication channels between workers and management. Supporting this impression, Dworkin and Ahlburg (1985) argued that opening communication channels between management and workers can result in integrative, rather than distributive, bargaining.

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Allen (1984) used the example of the construction industry, and cited union hiring halls, apprenticeship programs, and managerial shock effects as the reasons for union productivity improvements. In recent years, many employers have adopted new ways of organizing work that emphasize employee involvement. Empirical evidence suggests that various human resources management practices have a positive impact on firms' productivity. Black and Lynch (2001) found that unionized plants with these new approaches to organizing work had higher productivity than other similar non-union plants. Recent studies indicate that improved productivity of firms with labor unions may reflect better human resources management practices (Bloom and Van Reenen 2007; Doucouliagos and Laroche 2006; Ichniowski and Shaw 2003; Machin and Wood 2005).

However, Lewis (1963) pointed out that one of the most well-established impacts of labor unions on firms is the ability to raise wages above competitive levels. Such a monopoly power may exert adverse impacts on firm productivity by distorting the labor market. Other unfavorable effects of unions are on R&D spending and investments, since by acting as a tax on the return on investment, unions limit innovative and investment activities (Connolly, Hirsch, and Hirschey 1986; Hirsch and Link 1987; Link and Siegel 2002; Lommerud, Meland, and Straume 2006; Menezes-Filho and

**ABBREVIATIONS**  
DEA: Data Envelopment Analysis  
LR: Likelihood Ratio

Van Reenen 2003). These effects can have a detrimental impact on the dynamic productivity of firms. Thus, unions can both enhance and detract from firms' productivity performance. Because of the ambiguity over the net effect of unions, an assessment of the union's effects on economic performance hinges on empirical evidence (Doucouliagos and Laroche 2003).<sup>1</sup>

Although most literature focuses on the performance or productivity impacts of unions, a strand of literature also looks at the channels through which unions affect measured performance/productivity. Measured productivity can be decomposed into two important components: the adopted production technologies and the efficiency<sup>2</sup> of utilizing the technology. The former represents a shift in the production function and the latter shows the distance between actual production level and frontier production level for given inputs. An increase in the measured productivity may result if a firm adopts a better production technology or improves "technical efficiency" by moving production toward the frontier level of a given technology.

The arguments for or against unions regarding productivity can trace their causes to the impacts on one or both of the productivity components. For instance, the communication effect of Brown and Medoff (1978) and Freeman and Medoff (1984) results in improved efficiency in using installed technology, whereas the outcome of changing production methods, also mentioned by the same authors, amounts to choosing new production technologies. Freeman and Medoff (1984) also suggested that "union shocked" management is able to extract more output from a given amount of inputs than management, which may be because of improved information flow among workers or between workers and management (Carmichael and MacLeod 1993).

1. As noted by Kuhn (1998), a fair summary of the literature suggests that not only are both positive and negative effects conceivable, but both may well exist in different industries and situations. Supporting this impression, Hoxby (1996) used district-level data to find a negative effect of unions on productivity of U.S. public elementary schools. Black and Lynch (2001) found that unions' productivity effects depend on other aspects of the human resources environment, which tends to be negative when unions maintain more traditional labor management relations, but positive when unions adopt new or "transformed" industrial relations practices that promote joint decision making coupled with incentive based compensation. A recent meta-analysis by Doucouliagos and Laroche (2003) on 73 studies shows negative association between unions and productivity for the United Kingdom, whereas a positive association for the United States in general and for U.S. manufacturing.

This channel of effect also amounts to improved technical efficiency.

For theoretical arguments, Kuhn (1985) provided a model that explains unions' effect on firm productivity, utilizing an agency cost model to show that unions may improve firm productivity by reducing its monitoring costs. Based on the agency cost theory of Jensen and Meckling (1976), Kuhn (1985) assumed that firm managers own  $\alpha$  of the firm, whereas outside shareholders own  $(1-\alpha)$  of the firm. Because  $\alpha < 1$ , the effort level of managers would be less than the optimal level required to maximize the total value of the firm. The agency problem is partially mitigated if managers' efforts can be monitored by outside shareholders. However, because shareholders may be numerous and not well organized, the cost of monitoring could be high. However, organizing the union makes monitoring much easier with lower cost. The union stewards and representatives are always in the plant and can easily observe managers' performance, enhancing managers' efforts and resulting in improved technology efficiency. Better monitoring would most likely lead to a more efficient use of current technology, that is, improving technical efficiency.

A strand of empirical research employs the data envelopment analysis (DEA) approach, which is a mathematical programming method. Byrnes et al. (1988) used the DEA approach to estimate the effect of unions on technical efficiency using data from the U.S. mine establishments in the 1970s. They did not find evidence that unions harmed technical efficiency. Doucouliagos and Laroche (2006) also used the DEA approach to investigate the effects of human resource practices and unionization on technical efficiency of French industries. They found that while the human resource practice improves efficiency, existing unions moderated the effect. A different strand of literature uses the econometrics approach of stochastic frontier models. Cavalluzzo and Baldwin (1993) compared the productivity differential between union and non-union contractors in the United States and found a substantial union productivity premium. Dickerson et al. (1997) used the model proposed by Cornwell et al. (1990) to examine the effects of union strikes on productivity and efficiency in a sample of UK manufacturing industries in the 1970s. They found that strikes only had a negligible net impact on output in this period, and the presence of unions mitigated the effect.

This article estimates the impact of labor unions on the U.S. manufacturing sector using state-level panel data on 48 states from 1983 to 1996, focusing on technical efficiency effect of the union. The main motivation of this article stems from observing that unionization rates in the U.S. manufacturing sector at both the national and state levels have been continuously declining for the last few decades. Understanding how much these changes over time have affected efficiency or productivity of the U.S. manufacturing sector would be useful for scholars, unions, and businesses, as well as policymakers. Given this objective, using the state-level manufacturing sector as a unit of analysis would be appropriate as data on dependent and independent variables are not only available, but also provide a rich panel data set that consists of 48 states and over 14 years (672 observations).<sup>2</sup>

The current study adopts the econometric approach (the stochastic frontier model) in this research. Stochastic production frontiers are preferred for a number of reasons. Although the DEA approach has the advantage of not requiring the specification of any particular functional form of the underlying production process, using deterministic frontiers is based on the unrealistic assumption that total error is because of inefficiency and that there are no random errors that occur in the production process.<sup>3</sup> Another benefit of stochastic frontiers is that they allow inefficiency to exist in all states. In contrast, DEA identifies the frontier by assigning some of the states as operating under best practice (100% efficient) and defining the frontier in relation to these firms. With a stochastic production frontier, every state can be inefficient, although some will be more inefficient than others. Compared to the DEA method, the econometrics approach of the stochastic frontier model is more structural in specifying the relationships between variables and easily accommodates random noises in the data.

2. While there is substantial intra-industry variation in union coverage in the United States, at least at the two-digit SIC-level, 75 of 82 census industry codes (three-digit CIC) in the U.S. manufacturing sector have experienced declining unionization rate, on average 13%, from 1983 to 1996 ([www.unionstats.com](http://www.unionstats.com)). This study also found a similar decline in state-level unionization rate for the manufacturing sector as a whole (Table 1).

3. It should be noted that here we employed a translog specification on the stochastic frontier model which is considered more flexible than the Cobb-Douglas specification.

This article adds to the union-efficiency literature in several ways. First, this article employs a translog stochastic production specification which is more flexible than the Cobb-Douglas specification adopted by most existing studies (Cavalluzzo and Baldwin 1993; Dickerson et al. 1997). Second, the cross-sectional nature of the data typically limits studies in the union-efficiency literature at the firm level, and the labor union measure is commonly defined with a dummy variable with a value of 1 if a union is present and 0 otherwise, because the preferred union density figures are hardly available. Not only does state-level manufacturing data enable us to cover an extended period, from 1983 to 1996, but the availability of union density also allows us to measure the effect of the continuous decline in union density in U.S. manufacturing on technical efficiency and productivity. Third, by employing the "true-fixed effect" panel stochastic frontier model of Greene (2005), econometric analysis presented in the article captures the effects of unionization rate on technical efficiency on U.S. states' manufacturing, while unmeasured attributes that are fixed over time are controlled for estimating the effect of labor unionization. To our knowledge, this is the first study that applies the true-fixed effect model to estimate union effects.

The remainder of this article is organized as follows. Section 2 discusses the empirical model and data. Section 3 presents the results, and Section 4 concludes.

## II. EMPIRICAL MODEL AND DATA

The stochastic frontier model for cross-state panel data is specified as follows:

$$(1) \quad \ln y = f(\ln x; \theta) - u_{it}(\mathbf{z}; \delta) + v_{it} = \theta_0$$

$$\begin{aligned} &+ \sum_{m=1}^M (\theta_m \ln x_{imt} + \theta_{mm} (\ln x_{imt}^2 / 2)) \\ &+ \sum_{m=1}^{M-1} \sum_{n=m+1}^M \theta_{mn} \ln x_{imt} \ln x_{int} \\ &+ \sum_{m=1}^M \theta_{mt} \ln x_{imt} + \theta_t t + (\theta_{tt} t^2 / 2) \\ &+ \mu_i - u_{it}(\mathbf{z}, \delta) + v_{it}, \end{aligned}$$

$$i = 1, \dots, N, t = 1, \dots, T,$$

where  $y$  (state manufacturing output) is subscripted with  $i$  (state) and  $t$  (year),  $\mu_i$  are state-specific fixed effects and  $m = 1, \dots, M$  indexes inputs that affect the frontier (maximal) level of output. The input variables ( $x$ s) consist of state public capital stock ( $g$ ), state private manufacturing capital stock ( $k$ ), manufacturing labor ( $l$ ), and unionization rate (union).<sup>4</sup> Non-neutral technical change is assumed in Equation (1) by introducing  $t$  (time trend),  $t^2$  (time trend squared), and cross-products of  $t$  and inputs to capture technical change effect.<sup>5</sup>  $v_{it}$  is an error term which is independent and identically distributed  $N(0, \sigma_v^2)$  and independent of  $u_{it}$  which are non-negative random variables that account for technical inefficiencies in production.  $u_{it}$  are assumed to be independently distributed as truncations at zero of the  $N(S_{it}, \sigma_u^2)$  distribution where  $S_{it} = z_{it}\delta$ , where  $z_{it}$  is a vector of variables that affects the deviation of output from the frontier causing technical inefficiency and  $\delta$  is a vector of parameters to be estimated.

The inefficiency is determined by U.S. states' private manufacturing unionization rates, unemployment rates, wage index, U.S. unemployment rates, and time trend. The primary variable of interest is U.S. states' private manufacturing unionization rate. To disentangle the union effect from other effects, several variables are included in the inefficiency function. U.S. states' unemployment rate and U.S.'s unemployment rate are included to account for cyclical changes in unutilized capital and hoarded labor that are likely to hinder a state from reaching the

production frontier (Munnell 1990). We also controlled for worker quality by including the wage index in the equation. The quality of union and non-union workers may be different because unions encourage their members to stay longer in the firm and thus their skill levels may be higher because of average longer job tenure. Given the fact that workers are generally paid according to their performance, the wage index obtained by dividing the gross earnings of all employees on the payroll of operating manufacturing establishments by the number of employees is used as a proxy for labor quality.<sup>6</sup> Finally, this study includes time trend, commonly employed in the frontier production literature, to capture other time-related factors. Following Battese and Corra (1977), we replace  $\sigma_v^2$  and  $\sigma_u^2$  with  $\sigma^2 = \sigma_v^2 + \sigma_u^2$  and  $\gamma = \sigma_u^2 / (\sigma_v^2 + \sigma_u^2)$ . The maximum-likelihood estimator (MLE)<sup>7</sup> estimates the model parameters  $(\theta, \delta, \sigma^2, \text{ and } \gamma)$ .

The above-specified model allows the production function (frontier) to have state-specific fixed effects ( $\mu_i$ ). That is, instead of assuming a single U.S. frontier function for all the states, we allow heterogeneity via state-specific intercepts in the frontier production function (the "true-fixed effect" panel stochastic frontier model by Greene 2005). This effectively eliminates biases in the parameter estimates that arise from omitting unobserved time-invariant variables correlated with included explanatory variables. As emphasized in theoretical and empirical studies by Kumbhakar (1991) and Greene (2005) respectively, failure to include individual-specific effects in a panel stochastic model is likely to bias the estimate of the one-sided error,  $u_{it}$ , which is one of the most important estimation elements. In a recent study, Kumbhakar and Wang (2005) provided evidence of heterogeneity in the production functions, for both the translog and Cobb-Douglas specifications, across countries.

4. In Equation (1), we allow unionization to affect the frontier by including the union variable into the production function as suggested by empirical evidence on unions and technology change. For example, Link and Siegel (2002) investigated the relationship between unions and implementing new technologies by utilizing a qualitative analysis (field-based methods) in the U.S. coal mining industry. The findings suggest that unions constitute an obstacle in adopting and using new technologies. Menezes-Filho and Van Reenen (2003) focused on surveying recent microeconometric results in the areas of R&D, innovation, technological diffusion, and productivity growth. Empirical evidence shows consistently strong and negative impacts of unions on R&D in North American studies.

5. Non-neutral technical change has been widely used in studying stochastic frontier models (Heshmati, Kumbhakar, and Hjalmarsson 1995). In addition, recent empirical evidence on aggregation production (Henderson and Russell 2005) suggests that the production function shifted in a non-neutral way.

6. Cohen and Morrison Paul (2004) used a similar strategy to determine the price of labor at the state-level manufacturing sector.

7. The likelihood function can be found in the appendix of Battese and Coelli (1993).

**TABLE 5**  
Efficiency Indexes

| Model | Mean  | 25%   | 50%   | 75%   |
|-------|-------|-------|-------|-------|
| 1     | 0.908 | 0.892 | 0.930 | 0.951 |
| 2     | 0.940 | 0.928 | 0.958 | 0.973 |

Note: The efficiency index is  $E(\exp(-u_{it})|v_{it} - u_{it})$  based on Battese and Coelli (1988).

but reduces overall productivity, it would be interesting to see the impact on production efficiency and productivity had the unionization rate remained at the higher level of 1983. To this end, we conducted two sets of counterfactual simulations. First, we used the estimated parameters of Model 2 to recalculate the efficiency index for the year 1996 assuming the unionization rate in each state was at the 1983 level. The result yields a mean efficiency index of 0.975. If the actual data is used, the mean efficiency index in 1996 is 0.951. Therefore, declined unionization rate impairs the technical efficiency by about 2.4 percentage points.

Second, we used the results of Model 2 to compute the (conditional) expected level of log-output with and without the unionization rate fixed at the 1983 level.

The expected level of output is defined as follows:

$$(4) \quad E(\ln y_{it} | \ln \mathbf{x}, \mathbf{z}) = f(\ln \mathbf{x}; \hat{\theta}) \\ - E(u_{it} | \ln \mathbf{x}; \mathbf{z}) + E(v_{it} | \ln \mathbf{x}; \mathbf{z}),$$

where  $E(v_{it} | \ln \mathbf{x}, \mathbf{z})$  is zero and the formula of  $E(u_{it} | \ln \mathbf{x}, \mathbf{z})$  is given in Wang (2002). Results

show that the expected log-output in 1996 is 10.704 using the actual data, and the figure would reduce to 10.630 had the unionization rate been fixed at the 1983 level. This indicates an industry gain of 7.4% of output owing to the declining unionization rate.

This section shows that the unionization helps improve the technical efficiency of firms but hampers their technology adoption. The results provide important policy implications. As the long-term trend of the declining unionization rate continues in many of the U.S. states, efforts should focus on implementing efficiency-improving measures where there are less union stewards and representatives in the plants to monitor managements and help communications between workers and managers. One of the possible measures is to improve

the quality of workers, which is shown to be positively correlated with technical efficiency, through better human resource management practices such as training, incentive compensation plans, employee monitoring, profit sharing, and information sharing. However, for a few states which show signs of increasing unionization rates in the recent years (e.g., California and Colorado), the policy should be designed to mitigate the union's negative impacts on firms' technology adoptions. Lowering the cost of R&D and providing more incentives for adopting new technologies are among the possible actions.

#### IV. CONCLUSION

This article investigates channels through which unions affect measured performance/productivity. Utilizing state-level panel data on 48 states from 1983 to 1996, we estimate the impact of labor unions on the U.S. manufacturing sector, focusing on the technical efficiency effect of the union. Employing the "true-fixed effect" panel stochastic frontier model, the results indicate that while labor unions reduce firms' technical progress, they improve the technical efficiency by which firms utilize existing technology. The fall of the unionization rate in the 1983–1996 period thus impaired firms' technical efficiency by 2.4 percentage points. However, because the effect on technical progress dominates the effect on technical efficiency, the overall result of the declining unionization increases the manufacturing output by 7.4% in the sample period.

Although the use of state-level manufacturing sector as the unit of analysis enables us to investigate the impact of labor unions on technical efficiency of the U.S. manufacturing sector, the data does not allow for the investigation of union effects at the less aggregate levels such as industry level. As noted by Kuhn (1998), the union effects may be different among industries within the manufacturing sector because of different management approaches, production methods, and other industry-specific characteristics. In addition, most decisions affecting technical efficiency are made by the firm and, therefore, are likely affected more by union activities at the firm level than by those at the aggregate level. Thus future studies at the industry and firm levels would be nice complements to the current study.

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## Performance-Related Pay, Unions and Productivity in Italy: evidence from quantile regressions

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### ABSTRACT

**Purpose** - This study analyses the effects on productivity of Performance-Related Payments (PRP) and unions, and examines to what extent heterogeneity between firms characterises these impacts.

**Design** - For the Italian economy, the study presents firm-level quantile regressions for Total Factor Productivity (TFP) and controls for various observed characteristics of firms, worker composition and labour relations.

**Findings** - The paper shows the significant impact of PRP and unions on the whole economy and on firms operating in the manufacturing industries. In these industries, the uniform incentive effects of PRP but the increasing impact of unions are estimated along the productivity distribution. Conversely, the role of management - significant in all sectors - is more efficacious in prospering large firms operating in services.

**Research limitations** - The adoption of PRP schemes and the presence of unions maybe endogenous to firms' productivity, and our estimates do not prove causal links but simply suggest correlation associations.

**Practical implications** - The limited incentive effects of PRP schemes in services contribute toward explaining the slowdown in Italian productivity, whereas the role of unions is quite uniform among sectors.

**Originality**- The paper addresses the hitherto poorly developed issue of firm heterogeneity and TFP, and offers the first Italian study of PRP and unions, which covers all dimensional classes of firms and private non-agricultural sectors of the Italian economy.

JEL Classification: J33; D24

Keywords: Performance - related pay, productivity

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## 1. Introduction<sup>1</sup>

Starting from the early 1990s, a number of labour market reforms have been enacted in many European countries, to favour the 'flexibility' of industrial relations and to link wage increases to the dynamics of labour productivity. The efficacy of this type of reform raises many unsolved issues (OECD, 2004; ch. 3).

One theoretical question regards positive expected results of wage flexibility and performance - related payments (PRP) on productivity, but also side - effects (negative), due to new opportunities for rent-sharing opened up by firm level agreements. The trade-off has already been pointed out by the German *Mitbestimmung* literature, which advocates separating factors that determine firm outcome results from those related to their distribution. This theme has engendered new interest in the recent empirical literature; it has shown that in two European economies, Germany (Gürtzgen, 2009) and Belgium (Rusinek and Rycx, 2008), the disadvantages of distributive, rent-sharing rules overcome the positive effects of flexible wage structures.

Another critical issue concerns the strategic role of complementary workplace practices which influence the actual impact of performance management systems. For instance, Black and Lynch (2001) find that, in the American economy, unionised plants, where joint decision-making accompanies incentive pays, record higher productivity performance than non-unionised establishments. The adoption of 'high involvement' systems is thus a necessary condition to making contingent pay settings effective on productivity growth, as explored by a growing empirical literature (see survey by Godard and Delaney, 2000).

Both fields of research indicate the existence of alternative reasons for expecting that links between productivity and wage incentives are weaker or stronger. This is confirmed by micro - evidence revealing that disparities in efficiency gains may persist even *among firms* within a single country. Indeed, it is now widely recognised (after the contribution on trade of Melitz, 2003) that firms are heterogeneous with respect to key variables, including productivity and wage setting. The controversial impact of PRP

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thus seems to find its natural place within literature on heterogeneity. Nevertheless, there are few empirical studies for European countries on wage rules, productivity and heterogeneity (Wagner *et al.*, 2004 for Germany; Bastos *et al.*, 2009, for Portugal); there is no evidence for the Italian economy.

The present work integrates these elements - the role of PRP and firms' heterogeneity - and makes a start at filling this gap. One additional point that motivates our analysis is that in Italy PRP systems differ across regions and sectors, and PRP firms show the higher presence of unions, as documented in a recent work by Damiani and Ricci (2009)<sup>2</sup>. But is the divide between winners and losers also *within* sectors and regions? Do firms improve their performance *differently* by exploiting or not exploiting these remuneration systems? Is the overall union impact on productivity more pronounced in some group of firms?

Other good reasons suggest that Italy is an interesting case study. In 1993, the country began a large-scale reform of its industrial relations system, aimed at providing more space to wage compensation related to efficiency gains. However, since the mid-1990s, Italian labour productivity growth started to record a significant slowdown. Also, as reported by Daveri and Jona-Lasinio (2005), growth accounting revealed the crucial impact of the Total Factor Productivity (TFP), the component which cannot be due to capital deepening but to organisational strategies represented by innovation in human resources practices. An additional question is to what extent do firm heterogeneities in PRP practices and union action influence this aggregate impact?

The present paper starts to explore these issues by using a unique dataset which collects firm-level information for both manufacturing and services sectors. This dataset was obtained by merging longitudinal information on balance-sheet data from the AIDA archive for the period 2002-2005 and cross-sectional information on the adoption of PRP, and the presence of unions and other workplace characteristics gathered from the ISFOL Employer-Employee (RIL) survey for 2005<sup>3</sup>.

The basic idea was to use a two-step estimation procedure, similar to that used by Black and Lynch (2001), and quantile regressions. In the first step, we estimate a classical

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<sup>2</sup>Damiani and Ricci (2009) found the higher presence of unions in PRP firms (91%), as opposed to 15% in non-PRP firms.

<sup>3</sup>RIL: *Rilevazione sulle Imprese e sui Lavoratori*.

production function, by using longitudinal data on balance sheet variables for the period 2002–2005. In the second step, we use quantile regression to estimate the impact of PRP, unions and other workplace characteristics on the distribution of the average values of residuals, obtained by the first step. This allows us to analyse whether the role of some leading institutional factors, such as unions and PRP practices, changes greatly across the distribution of the firm-specific time-invariant component, i.e., across the distribution of TPF.

In this context, we find two main results. First, the adoption of PRP exerts a positive effect on the TFP - more significant in manufacturing sectors, where efficiency gains associated with PRP are quite homogenous throughout the whole distribution. Second, the presence of unions has a positive impact on firms' unobserved productivity across all quantiles, being significantly higher for best performing firms (those placed at the highest quantile of the productivity distribution). These significant effects, found for two important institutions (PRP and worker representations), are particularly meaningful since they were obtained from ample coverage and including all size classes.

Other minor results which deserve further research are the effects obtained due to worker composition, the impact of which changes significantly among the different quantiles. In particular, we found a negative impact exerted by the share of women on TFP, even though its estimated coefficient decreases significantly along the distribution, to the point of being statistically insignificant, at least in manufacturing, at the highest quantiles.

This paper is organised as follows. In Section 2 we briefly discuss the theoretical and empirical literature. In Section 3, we present data and offer descriptive statistics. Section 4 illustrates the econometric framework. Section 5 presents the estimation results, and Section 6 concludes.

## 2. Productivity, performance payments and unions: a short reappraisal

Our research is related to various fields of theoretical and empirical literature. One field is that of 'employee financial participation' literature, which advocates that payments of collective bonuses such as profit sharing schemes reveal a commitment device to

between size and location in Northern regions and unobserved productivity at all quantiles of the distribution.

Concerning the services sector (Table 5), the main difference with respect to the manufacturing sector is that the positive impact of PRP holds only at the 25<sup>th</sup> and 50<sup>th</sup> quantiles.<sup>14</sup> Our estimates thus signal that productivity enhancements, due to PRP, are more questionable and reveal a remarkable gap between industries. The insignificant effect of PRP on productivity in the private tertiary sector is particularly meaningful, and is a critical aspect for a labour-intensive sector, where promotion of organisational and motivational innovation is expected to enhance total factor productivity growth.

Conversely, the union dummy variable continues to be positive and significant across the entire distribution, with a higher impact at the 75<sup>th</sup> and 90<sup>th</sup> quantiles (around 0.30). In addition, the negative effect of the women' share for services is significant and its absolute value decreases across quantiles, although its magnitude is lower than that found in manufacturing. Interestingly, trained workers play no significant role, whereas the share of fixed-term workers is detrimental at all quantiles of the distribution.

For under-performer companies, we also found that occupational categories with respect to managerial and supervisory staff (the omitted group) have a negative and significant impact, higher than in firms characterised by low and medium productivity increases. This last finding also suggests that management counts more in a sector like the tertiary, where production processes are the results of the intangible competences of human capital<sup>15</sup>.

Lastly, size and location in Northern regions also favour productivity growth in the services sector, as found for manufacturing. One probable reason behind the role of size is that larger firms are expected to be associated with superior managerial competence, an omitted variable which is caught by the dimensional feature. Indeed, the best

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<sup>14</sup>Damiani and Ricci (2009) already showed the limited diffusion of PRP contracts which are only adopted in a small number of firms in services. The present work complements these findings by showing the moderate efficacy of wage premiums granted in this sector, a result which appears near-universal, being a common feature for all groups of firms in the private tertiary sector.

<sup>15</sup>In another study, on Italian manufacturing firms, Piva, Santarelli and Vivarelli (2005) have shown that organisational improvements, combined with technological innovation, jointly affect the demand for labour and skill composition, proxied by white- and blue-collar shares.

performers (represented by larger firms) can afford costly strategies such as the upgrading of management: this leads to implementation of better practices, which allow them to enjoy greater efficiency results. In addition, in large companies, economies of scale reduce implementation costs per employee and explain why benefits are expected to exceed costs.

Our results, in any case, call for further investigation of the importance of the competences of managers in establishing a climate of successful cooperation with workers and their representatives. Thus, complementary factors (interactions of participation and high performance work practices) would allow to verify the importance of the 'high commitment' alternative, according to which employers seek to obtain competitive advantages with quality, worker participation and involvement, as found in other researches (see Ichniowski et al. 1997).

## 6. Conclusions

Efficiency is expected to be higher when more incentives - in terms of wage premiums - are offered. This expectation is confirmed from our estimates, which show the positive and significant role of PRP agreements for the whole economy. However, our research also finds a considerable gap *between* sectors: higher significant effects of wage agreements are found for firms operating in manufacturing industries, uniform along the whole productivity distribution; for services, no significant impacts are obtained for any groups of firms. Rent-sharing and limited implementation of systems of complementary human resources practices thus partly explain the slowdown in Italian productivity, mainly due to the bad performance of private services.

Other main findings concern the positive and significant role of a second important institutional factor - the presence of unions. For this variable too, estimates for the whole economy show that significant differences do exist between firms: unions and, plausibly, collective bargaining, which minimise free-riding behaviour and promote cooperative attitudes, are revealed as more powerful in over-achiever firms.

Other heterogeneities concern innovative management and best work practices. These practices, costly to design and implement are significant in all sectors and groups of

firms, but more efficacious in prospering large enterprises operating in the services sector, where organisational issues play a greater role. One suggested interpretation, which should be thoroughly explored, is that different channels, management-led initiatives, and employee representations, often stigmatised as opposite paradigms in the relevant literature (Godard and Delaney, 2000), both occur in Italy, but in distinct sectors and groups of firms.

Another robust finding refers to the role of the women's share on efficiency growth - negative in all sectors, but absent in over-achiever firms - a puzzling result that should be better investigated.

The main limitation of our study concerns the possible endogeneity of institutions and human resources management, perhaps due to firm productivity.

Future research will aim at exploring this issue by exploiting the second wave of the RIL survey, which allows longitudinal tracking of the adoption of PRP and the presence of unions at firm level. In this perspective, it should also evaluate whether employee financial participation turns out to be a superior strategy for those groups of unionised Italian companies which better exploit the participatory content of these practices. It may be an additional step in detecting the reasons behind the successes and failures of Italian firms.

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## HUMAN RESOURCE MANAGEMENT AND LABOR PRODUCTIVITY: DOES INDUSTRY MATTER?

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There has been growing interest in the degree to which human resource systems contribute to organizational effectiveness, yet limited research attention has been paid to the contextual conditions that moderate the efficacy of these practices. In this study, we examined how industry characteristics affect the relative importance and value of high-performance work systems. Findings indicate that the impact of these human resources systems on productivity is influenced by industry capital intensity, growth, and differentiation.

Although not yet widely incorporated into research paradigms, industry characteristics may have far-reaching implications for HRM. Industries, like national cultures, are the contexts within which meanings are construed, effectiveness is defined, and behaviors are evaluated. (Jackson & Schuler, 1995: 252)

Recent years have witnessed burgeoning interest in the degree to which human resource systems contribute to organizational effectiveness. Pfeffer (1994, 1998), for example, argued that success in today's hypercompetitive markets depends less on advantages associated with economies of scale, technology, patents, and access to capital and more on innovation, speed, and adaptability. Pfeffer further argued that these latter sources of competitive advantage are largely derived from firms' human resources. On the basis of these and similar arguments, Pfeffer (1994, 1998) and others (e.g., Kochan & Osterman, 1994; Lawler, 1992, 1996; Levine,

1995) have strongly advocated greater firm investments in *high-performance* or *high-involvement human resource systems*, which are systems of human resource (HR) practices designed to enhance employees' skills, commitment, and productivity. We believe these sentiments to be true in the main; however, we also believe that these investments may be more beneficial in some contexts than in others. More specifically, as emphasized in the strategic management and industrial organization literatures (e.g., Porter, 1980), a firm's industry (or industries) is an important part of the milieu within which organizational policies and practices are framed and executed. We believe this to also be true for HR policies and practices. Unfortunately, extant HR research has generally ignored the impact and influence of industry characteristics on the efficacy of HR systems. We sought in this study to fill this important void by examining how industry characteristics moderated the effectiveness of high-performance work systems. Because labor productivity is the key indicator of workforce performance (Deleruy & Shaw, 2001), we examined the relationship between high-performance work systems and this critical outcome measure.

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### HISTORICAL ROOTS AND THEORETICAL PERSPECTIVES

Wright and McMahan defined strategic human resource management (SHRM) as "the pattern of planned human resource deployments and activi-

ties intended to enable an organization to achieve its goals" (1992: 298). According to Delery and Shaw (2001), at least two major features distinguish SHRM research from the more traditional HR management (HRM) practice research. First, SHRM studies have focused on explicating the strategic role that HR can play in enhancing organizational effectiveness. A second distinguishing feature is the level of analysis. HRM practice research has traditionally had an individual-level focus; in contrast, SHRM research is typically conducted at the business-unit or organizational level of analysis. Reflecting this orientation, recent HR research has focused on high-performance work systems, a term used to denote a system of HR practices designed to enhance employees' skills, commitment, and productivity in such a way that employees become a source of sustainable competitive advantage (Lawler, 1992, 1996; Levine, 1995; Pfeffer, 1998).

Neither conceptual/prescriptive (e.g., Lawler, 1992; Levine, 1995; Pfeffer, 1998) nor empirical work (e.g., Arthur, 1994; Huselid, 1995) yields a precise definition of a high-performance work system, but these systems include practices such as rigorous selection procedures, internal merit-based promotions, grievance procedures, cross-functional and cross-trained teams, high levels of training, information sharing, participatory mechanisms, group-based rewards, and skill-based pay. A number of studies have revealed links between greater use of these types of practices and labor productivity (e.g., Arthur, 1994; Guthrie, 2001; Huselid, 1995; Ichniowski, Shaw, & Prennushi, 1997; Koch & McGrath, 1996; MacDuffie, 1995).

Guided by contingency theory, our position is that the value of utilizing high-performance work systems will be influenced by a firm's industry context. A number of seminal organizational theorists (e.g., Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Thompson, 1967; Woodward, 1965) have discussed the interplay of firms' external environments and their management structures or styles. Burns and Stalker were the first to establish this link, concluding that environments imbued with "changing conditions, which give rise constantly to fresh problems and unforeseen requirements" (1961: 121) were better served by an "organic" management style, as opposed to a "mechanistic" approach. Analogous to a "control-oriented" HR system (cf. Arthur, 1994), a mechanistic management style emphasizes the expertise and authority of members at the top of an organizational pyramid. In contrast, in a firm with an organic management style, knowledge is assumed to be widely dispersed throughout the organization, and broadened task roles and employee com-

mitment to the entire organization are emphasized. Communication patterns tend to be lateral (rather than vertical), emphasizing information exchange consisting of information and counsel. The discussion in the SHRM literature of high-commitment, high-involvement, or high performance HR systems resonates strongly with Burns and Stalker's organic style of management. These management styles or systems are employee-centered by design: It is assumed that optimal organizational performance will be achieved through high employee capability, paired with employee commitment and involvement.

Burns and Stalker also presaged the debate in the SHRM literature regarding whether high-performance work systems' effectiveness is "universal" or "contingent" upon firm context. As contextualists, Burns and Stalker (1961) discussed—and noted their objection to—H.A. Shepard's (1956) proposal that a "new orientation" in management (i.e., organic management styles) would be equally effective in all industries. Thus, discussions of high-performance work systems and debates regarding their universal or contingent effects have deep historical roots.

More recently, the resource-based view of the firm has also incorporated a contingency perspective. In this view, organizational resources can be a source of sustainable competitive advantage to the extent that they create value and allow a firm to excel in its particular competitive environment. As Barney stated, "Firm resources are not valuable in a vacuum, but rather are valuable only when they exploit opportunities and/or neutralize threats" (1995: 52). The notion of "fit" is embedded in the resource-based view: resources contribute more or less value depending on a firm's competitive environment. In the SHRM literature, Batt (2002) invoked resource-based contingency notions in her exploration of the moderating effects of customer segments on the HR-firm performance relationship.

By engendering broad repertoires of skill and behavior, many high-performance work system elements promote organizational flexibility. Broad perspectives and experience sets, coupled with aligned interests, information sharing, and participatory mechanisms, enhance prospects for spontaneity, innovation, and alternative strategy generation throughout an organization (Wright & Snell, 1999). Thus, high-performance work systems seem particularly well suited for competitive environments requiring a dynamic fit. Empirical work to date, however, has not systematically explored the validity of this general proposal. Most SHRM researchers have treated industry as a nuisance variable to be controlled or "partialed out of" their models. As developed below, we believe a set of

TABLE 2  
Results of Regression Analyses: High-Performance Work Systems,  
Industry Characteristics, and Labor Productivity<sup>a</sup>

| Variable   | Model 1                 | Model 2           | Model 3           | Model 4           | Model 5           | Model 6           |
|--|-------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Industry capital intensity                               | 0.50***<br>(0.07)       | 0.51***<br>(0.07) | 0.43***<br>(0.08) | 0.49***<br>(0.07) | 0.49***<br>(0.07) | 0.51***<br>(0.07) |
| Industry growth  | -0.05<br>(0.16)         | -0.07<br>(0.16)   | -0.06<br>(0.15)   | -0.11<br>(0.15)   | -0.06<br>(0.15)   | -0.06<br>(0.16)   |
| Industry differentiation                                 | -0.06<br>(0.06)         | -0.10<br>(0.05)   | -0.19<br>(0.04)   | 0.03<br>(0.03)    | -0.34<br>(0.04)   | -0.10<br>(0.05)   |
| Industry dynamism  | 0.07<br>(0.07)          | 0.08<br>(0.08)    | 0.08<br>(0.08)    | 0.09<br>(0.08)    | 0.09<br>(0.08)    | 0.01<br>(0.05)    |
| Firm size  | 0.00<br>(0.03)          | -0.01<br>(0.03)   | 0.00<br>(0.03)    | -0.02<br>(0.03)   | -0.02<br>(0.03)   | -0.01<br>(0.03)   |
| Firm sales growth  | 0.21***<br>(0.08)       | 0.21***<br>(0.08) | 0.22***<br>(0.07) | 0.27***<br>(0.08) | 0.26***<br>(0.08) | 0.21***<br>(0.08) |
| Firm unionization  | -0.00*<br>(0.00)        | -0.00*<br>(0.00)  | -0.00*<br>(0.00)  | -0.00*<br>(0.00)  | -0.00*<br>(0.00)  | -0.00*<br>(0.00)  |
| Firm strategy <sup>b</sup>                               | 0.19**<br>(0.07)        | 0.17*<br>(0.07)   | 0.17*<br>(0.07)   | 0.17*<br>(0.07)   | 0.17*<br>(0.07)   | 0.17*<br>(0.07)   |
| Firm relative capital intensity                          | 0.01<br>(0.06)          | 0.01<br>(0.06)    | 0.05<br>(0.06)    | 0.02<br>(0.06)    | 0.02<br>(0.06)    | 0.01<br>(0.06)    |
| Intercept  | 4.62***<br>(0.26)       | 4.68***<br>(0.27) | 4.67***<br>(0.25) | 4.59***<br>(0.26) | 4.65***<br>(0.25) | 4.68***<br>(0.26) |
| High-performance work systems                            | 0.01*<br>(0.00)         | 0.01*<br>(0.00)   | 0.01*<br>(0.00)   | 0.01*<br>(0.00)   | 0.01*<br>(0.00)   | 0.01<br>(0.01)    |
| High-performance work systems × industry                 | -0.01*<br>(0.00)        |                   |                   |                   |                   |                   |
| High-performance work systems × capital intensity        |                         |                   |                   |                   |                   |                   |
| High-performance work systems × industry growth          |                         |                   | 0.03*<br>(0.01)   |                   |                   |                   |
| High-performance work systems × industry differentiation |                         |                   | 0.12**<br>(0.05)  |                   |                   |                   |
| High-performance work systems × industry dynamism        |                         |                   | 0.03<br>(0.28)    |                   |                   |                   |
| Intercept  | 0.42***<br>$\Delta R^2$ | 0.44***<br>.02    | 0.46***<br>.02    | 0.46***<br>.03    | 0.47***<br>.03    | 0.44***<br>.00    |
| R <sup>2</sup>   |                         |                   |                   |                   |                   |                   |
| ΔR <sup>2</sup>  |                         |                   |                   |                   |                   |                   |
| F for $\Delta R^2$                                       | 2.89*                   | 3.91*             | 5.35*             | 5.70**            | 0.09              |                   |

<sup>a</sup> Unstandardized coefficients are reported; the figures in parentheses are standard errors.  $n = 118$  for all models.

<sup>b</sup> Cost leadership.

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

One-tailed tests.

able from observed values. This results in the interaction terms having relatively low correlations with the direct terms. In addition, we assessed whether multicollinearity was a problem by computing the variance inflation factors (VIFs). None of the VIFs approached the threshold value of 10 suggested by Neter, Wasserman, and Kutner (1985).

As indicated in Table 2, the interaction term comprised of high-performance work systems and industry capital intensity (model 3) was significant in the regression model ( $p < .05$ ), suggesting that industry capital intensity moderated the relationship between high-performance work systems and

productivity. Plotting the interaction effects using the approach outlined by Aiken and West (1991) indicated that the relationship between high-performance work systems and productivity strengthens as industry capital intensity diminishes, supporting Hypothesis 1. Similarly, the significance ( $p < .05$ ) of the interaction term involving industry growth and high-performance work systems (model 4) indicated that the relationship between use of a high-performance work system and firm productivity was also moderated by industry growth. Again, a plot of the interaction effects showed that the relationship between the high-performance work

systems scale and productivity is relatively stronger under circumstances of high industry growth, supporting Hypothesis 2.

The significance ( $p < .01$ ) of the regression coefficient associated with the interaction of industry product differentiation and high-performance work systems in model 5 provides support for Hypothesis 3, which states that industry differentiation moderates the relationship between high-performance work systems and productivity. As expected, plotting the interaction showed that the relationship between high-performance work systems and productivity is greater under conditions of high industry differentiation. However, contrary to expectations (Hypothesis 4), no support was found for the moderating effect of industry dynamism. In sum, while results indicate a positive main effect for high-performance work systems, three of the four moderating effects indicate that industry characteristics influence the extent of the relationship between high-performance work systems and productivity.

## DISCUSSION AND CONCLUSIONS

Our analysis supports arguments and previous findings suggesting that firm competitiveness can be enhanced by high-performance work systems (Arthur, 1994; Guthrie, 2001; Huselid, 1995; Koch & McGrath, 1996; Kochan & Osterman, 1994; Lawler, 1992, 1996; Levine, 1995; MacDuffie, 1995; Pfeffer, 1998). Using an approach that controls for firm-level differences to investigate industry-level effects, this study makes its primary contribution by illustrating the potential for industry context to moderate the relationship between HR systems and organizational effectiveness.

Two primary perspectives, a *universal* approach and a *contingency* approach, have been used to model the link between HRM and firm effectiveness (Youndt, Snell, Dean, & Lepak, 1996). Those taking the universal approach have posited a generally positive relationship between "best-practice" HRM and firm performance. In contrast, those taking the contingency approach have proposed that the extent (or even the direction) of the effect of HRM on firm performance will depend on a firm's context or environmental conditions. Our results provide some support for both perspectives. In addition to seeing generally positive effects of high-performance work system practices on productivity, we also observed significant contingency effects, with industry characteristics influencing the degree of high-performance HR practices' impact on labor productivity.

Beyond statistical effects, however, the practical

significance of results is an important consideration. Following the advice and previous practice of SHRM scholars (e.g., Becker & Gerhart, 1996; Huselid, 1995), we estimated the practical significance of our results by calculating the impact of a one-standard-deviation increase in the use of the high-performance work systems scale on labor productivity. With all other variables held at their means, the main effects model (model 1) estimates that each one-standard-deviation increase in the high-performance work systems scale is associated with a \$15,435 increase in sales per employee. This represents a 7.98 percent gain in labor productivity over the mean sales per employee (\$193,322). By way of comparison, the equivalent calculations reported in Huselid (1995) and Becker and Huselid (1998) showed productivity (sales/employee) gains of 16 and 4.8 percent, respectively. For the average-sized firm in our sample, this increase in labor productivity would generate an additional \$47 million in total revenue.

To illustrate the practical effect of the moderated regression results, we calculated and compared the impact of a one-standard-deviation increase in use of the high-performance work systems scale on labor productivity under different industry conditions. With all other variables set at their means, when capital intensity is low (one standard deviation below the sample mean), the model estimates that each one-standard-deviation increase in the high-performance work systems scale is associated with a \$21,620 increase in sales per employee. Given the lower levels of labor productivity in low-capital-intensity industries (\$151,636 per employee), this represents a rather substantial (14.3%) gain. In contrast, in high-capital-intensity (one standard deviation above the sample mean) industries, a one-standard-deviation increase in the high-performance work systems scale is associated with a 1 percent gain over the mean sales per employee figure of \$244,664. Turning next to industry growth, when industry growth is high (+1 s.d.), each one-standard-deviation increase in the scale is associated with a \$39,172 increase in sales per employee, a 20.1 percent increase over the mean sales per employee figure of \$189,854. In slow or low growth (-1 s.d.) industries, each one-standard-deviation increase in the high-performance work systems scale is associated with a small (\$6,399, or 3.23%) decrease in sales revenue per employee. In high differentiation (+1 s.d.) industries, each one-standard-deviation increase in the scale is associated with a \$34,707 increase in sales per employee, representing an 18.2 percent gain over the mean sales per employee figure of \$191,205. In industries marked by low (-1 s.d.) product differentiation,

the effect is quite different; each one-standard-deviation increase in the high-performance work systems scale is associated with a small (\$3,829 or 1.9%) loss in sales per employee.

Our study also has relevance for discussions of the reliability of single-source measures of human resource management systems (e.g., Gerhart et al., 2000; Huselid & Becker, 2000; Wright, Gardner, Moynihan, Park, Gerhart, & Delery, 2001). The reliability evidence reported in this study is somewhat more positive than results reported in previous work. As discussed earlier, the ICC(1) estimate indicated a reasonable level of consistency across respondents in the 33 firms providing multiple responses. However, several additional comments are warranted.

First, conditions in this sample favored relatively high shared knowledge. Companies were nondiversified and relatively small (the median number of employees was 2,587). Moreover, respondents had significant job and organizational experience. Primary respondents reported an average of 6.4 years of position tenure and 10.1 years of organizational tenure. Secondary respondents had an average of 4.6 years in their current jobs and 9.9 years of firm experience. Also, respondents were in the same geographic location and both were fairly highly placed within the HR managerial hierarchy. Second, while the ICC(1) value indicated fairly good reliability at the system level (that is, the average of each rater's 18 high-performance work systems items), at the level of the individual HR practice item, ICC(1) values were lower and varied considerably across items. Lower reliability at the item versus the scale level is consistent with results reported elsewhere (Wright et al., 2001) and supports arguments suggesting that high-performance HR practices are most appropriately measured at the system level (Becker & Huselid, 1998). Third, while we did not aggregate HR system responses in this study, the calculated ICC(2) value for the 33 firms with multiple respondents was .77, supporting Wright and colleagues' (2001) conclusion that multiple respondents do indeed improve measurement reliability levels.

On the other hand, this study also illustrates the challenge of procuring multiple survey responses from sample firms. Our approach was to solicit a second survey following receipt of an initial survey—a method that resulted in a 25 percent response rate among initial respondents. As such, the overall response rate for multiple-respondent firms was only 3.4 percent (33 of 971). Thus, obtaining a sufficiently high response rate in multi-industry research designs may prove challenging.

Although our study provides interesting insights

into the relationships between use of high-performance work practices, industry conditions, and labor productivity, our findings should be interpreted in the context of the limitations inherent in this study. For example, one legitimate concern is the question of simultaneity. We analyzed and discussed data as if the extent of use of a high-performance work system affected firm productivity; it is also possible that firms experiencing higher productivity are better positioned to invest in high-performance practices. Second, the fact that our study was limited to manufacturing firms limits the generalizability of our findings. Future studies should represent attempts to examine similar relationships in the service sector (cf. Batt, 2002).

Third, while our study suggests significant productivity gains occur with use of high-performance work systems, especially under specific industry conditions, we were unable to assess the costs associated with the implementation of these systems. It is certainly possible that increases in costs—especially labor costs—may significantly diminish the types of benefits identified above (cf. Cappelli & Neumark, 2001).

In 1961, Burns and Stalker wrote, "The beginning of administrative wisdom is the awareness that there is no one optimal type of management system" (1961: 125). Our study does not unequivocally support a contingency perspective, but it does suggest a role for industry conditions as a moderator of the HR system–firm performance relationship. Much work remains, however, in identifying other conditions that may influence the generally positive impact of high-performance work systems on firm success. We hope this study encourages further work in this regard.

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## ECONOMIC IMPACTS OF NEW UNIONIZATION ON PRIVATE SECTOR EMPLOYERS: 1984–2001\*

JOHN DiNARDO AND DAVID S. LEE

Economic impacts of unionization on employers are difficult to estimate in the absence of large, representative data on establishments with union status information. Estimates are also confounded by selection bias, because unions could organize at highly profitable enterprises that are more likely to grow and pay higher wages. Using multiple establishment-level data sets that represent establishments that faced organizing drives in the United States during 1984–1999, this paper uses a regression discontinuity design to estimate the impact of unionization on business survival, employment, output, productivity, and wages. Essentially, outcomes for employers where unions barely won the election (e.g., by one vote) are compared with those where the unions barely lost. The analysis finds small impacts on all outcomes that we examine, estimates for wages are close to zero. The evidence suggests that—at least in recent decades—for wages are close to zero. The evidence suggests that—at least in recent decades—for wages are close to zero. The evidence suggests that—at least in recent decades—for wages are close to zero. The evidence suggests that—at least in recent decades—for wages are close to zero.

that requires the employer to bargain with a certified union has had little economic impact on employers, because unions have been somewhat unsuccessful at securing significant wage gains.

### I. INTRODUCTION

It is widely understood that unions impose costs on employers; the most important way is by raising members' wages.<sup>1</sup> They can also impose other costs on employers—by limiting discretion in hiring and firing, for example, and altering the structure of pay across skill groups. These constraints can lead employers to reduce employment, output, or most dramatically, to cease opera-

\* A version of this paper with more exhaustive reporting of our results is available as DiNardo and Lee [2004]. Matthew Butler and Francisco Martorell provided outstanding research assistance. We would like to thank David Card, Robert J. LaLonde, Lawrence Katz, Enrico Moretti, Morris Kleiner, and Kenneth Chay for helpful discussions and Henry Farber for providing election data. We also thank seminar participants at the Bureau of Labor Statistics, the Federal Reserve Bank of Chicago, and the NBER Labor Economics Summer Institute, and the University of Michigan Labor Workshop, Princeton University, and the University of California at Berkeley, for comments on an earlier paper. We also thank Andrew Hildreth, Thomas Kochan, and Ritchie Milby, and the Institute for Labor and Employment, and the Hellman Family Faculty Fund for research support. The research in this paper was conducted while one of the authors was a Census Bureau research associate at the Berkeley California Census Research Data Center. Research results and conclusions expressed are those of the authors and do not necessarily indicate concurrence by the Bureau of the Census, National Labor Relations Board, the Federal Mediation and Conciliation Service, or the Institute for Labor and Employment. The results in this paper have been screened to ensure that no confidential data are revealed.

1. Of particular note are Lewis' seminal surveys on union wage gaps [1963, 1986a, 1986b]. For a more recent examination, see Blanchflower and Bryson [2003].

tion all together.<sup>2</sup> Indeed, these effects are often directly acknowledged by employers and employees alike. During union organizing drives, for example, firms routinely threaten to close a plant if the union drive is successful [Bronfenbrenner 1994], and employees seem to take these threats seriously: the risk of plant closure is cited as the leading cause of union withdrawal from organizing attempts.

Are the costs of unionization to employers large or small? Today, in the United States, arguments can be made for either case. On the one hand, conventional estimates suggest that there still exists a sizable union wage premium: demographically similar union workers are paid 15 percent or more than their non-union counterparts.<sup>3</sup> To the extent that employers are sensitive to the price of labor, this may lead to large reductions in employment.<sup>4</sup> On the other hand, there is a broad consensus that in the past three decades, union power in the United States has been on the decline. There has been a decrease in union membership, and new organizing activity,<sup>5</sup> high levels of managerial opposition, and increased use of permanent replacement workers.<sup>6</sup> During the 1980s, prominent unions were accepting wage cuts, facing the pressures of the opening of international competition.

At least two important challenges hinder credible measurement of the causal impacts of unionization on employers. One limiting factor is the absence of large, representative data sets that track establishments over time that also provide information

2. See, for example, Abowd [1989], Ruback and Zimmerman [1984], Freeman and Medoff [1984], and Hirsch and Schumacher [1998]. For a recent survey and critique, see Hirsch [2004].

3. In a helpful review of the time series of the regression adjusted union wage gap from 1973–2001, Blanchflower and Bryson [2003] find that union wage gaps appear 15–20 percent lower in 2001 than in 1973, although the time series patterns are to some extent sensitive to sample selection and data issues (such as whether or not individuals with “imputed” wages in the Current Population Survey should be included) and the choice of covariates to include in the wage regression.

4. See Mankiw [2004] for a textbook example of the argument. Recently, in cross-country analysis Nickell and Layard [1999] report that a change from 25 to over 70 percent of the workers covered by collective bargaining is associated with a doubling of the unemployment rate. LaLonde, Marschke, and Troske [1996], using a “difference-in-difference” approach with LRD data, find successful organization is associated with significant declines in subsequent employment and output.

5. See LaLonde and Meltzer [1991] and Farber [2001], for example. 6. Olson [1998], for example, finds that in all industries excluding construction, the use of striker replacements (as a fraction of strikes) were as high or much higher during the period 1985–1988 than they were during the (pre-Wagner Act) periods of 1901–1911 and 1921–1926.

(a 41)

# HUMAN RESOURCE PRACTICES, UNIONIZATION AND THE ORGANIZATIONAL EFFICIENCY OF FRENCH INDUSTRY

Hristos Doucouliagos and Patrice Laroche

## ABSTRACT

*Organizational performance improves through several channels, including changes in efficiency, innovation and technological change. Most of the extant research has focused on overall performance, often measured by partial measures of productivity, with little attention given to the components of performance. The aim of this paper is to analyze the impact of HR practices and unionization on one important channel – organization efficiency – as measured by technical and scale efficiency. Using French industry survey data, the paper shows that HR practices do influence efficiency, but this is moderated by the existence of unions. The results show a rather complex set of associations. We find robust results that show that in France, HR practices have a positive effect on scale efficiency but this effect is dampened in the presence of unions. On their own, HR practices have no effect on technical efficiency. However, some of the results suggest that HR practices can exert a positive influence when combined with unions.*

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## 1. INTRODUCTION

Recently, attention has turned to human resource (HR) practices that emphasize job enrichment, training and development, performance-based pay and employee empowerment, in order to enhance employee skills, participation and motivation, as well as to maximize employees' commitment to the organization (Godard, 2004). Although different terms have been used such as "high-involvement" (Lawler, 1991), "high-commitment" (Arthur, 1994), "high-performance" (Huselid, 1995), or simply innovative HR practices (MacDuffie, 1995), they all aim to promote efficiency and productivity by creating incentives and by stimulating creativity. A large body of literature deals with the impact of high-involvement work practices on firm performance, especially in the United States (for recent reviews, see Wood, 1999; Boselie, Dietz, & Boon, 2005). The existing literature consists of two broad groups of studies: (a) studies that focus on the effects of specific work practices, such as training, compensation, employee selection and information sharing; and (b) research that examines the influence of systems or "bundles" of such practices on firm performance (for a recent review, see Godard & Delaney, 2000). Most of these studies have found empirical links between the use of HR practices and productivity. A recurrent result is that single or isolated HR practices have a limited effect on productivity, and that a combination of practices has a larger positive impact when they operate in a complementary way (see MacDuffie, 1995; Ichniowski, Shaw, & Prennushi, 1997; Appelbaum, Bailey, Berg, & Kalleberg, 2000).

Despite a voluminous literature, there are still many gaps in our understanding of the process through which HR practices impact on firm performance. Existing studies suffer from three important limitations. First, studies tend to focus on the overall effects of HR practices. In many studies, the term 'performance' is used loosely to summarize a complex set of associations and to infer the net effect of several dimensions of performance. While interest usually lies on the net overall effect, analyses of individual components can better inform management and policy making. One of the more important channels is efficiency – the ability to produce the maximum attainable output given the available resources. Second, only a limited range of countries have been investigated (mainly the US and UK).<sup>1</sup> Third, important interactions are often ignored, especially those between unions and HR practices.

The aim of this paper is to address these noticeable lacunas in the literature with respect to efficiency. While several studies have been conducted on the impact of unions on efficiency (e.g. Byrnes, Fare, Grosskopf, &

Lovell, 1988; Bronars, Deere, & Tracy, 1994; Cavalluzzo & Baldwin, 1993; Dickerson, Geroski, & Knight, 1997; Torii, 1992; Torii & Caves, 1992), we are unaware of prior research into the effects of HR practices on efficiency. Accordingly, in this paper we explore the impact of HR practices on technical as well as scale efficiency. This sheds light on one of the important channels through which HR practices influence performance. By using French data we are able to see the impact of innovative-work practices in other parts of the developed world. Additionally, our particular focus is on the interaction between unions and HR practices in French industry. Unions and HR practices can moderate the influence each has on performance and it is thus important to investigate this moderating effect.

The paper is structured as follows. Section 2 presents a brief review of the theoretical arguments linking HR practices, unions and firm performance. Section 3 discusses the data and empirical methodology. The main results are presented and interpreted in Section 4, with sensitivity analysis reported in Section 5. Section 6 concludes the paper.

## 2. THEORETICAL ARGUMENTS

Productivity and efficiency have a clear and precise meaning in economics. However, these terms are used often very loosely, especially in the media and by non-economists. Productivity is the relationship between outputs and inputs, and is measured as the ratio of output to inputs. Productivity improvements occur when this ratio rises. This can occur through technological change and change in technical and scale efficiency.

The degree of technical efficiency refers to actual output levels in relation to what is achievable. Technical efficiency improvements occur when output levels more closely approximate what is known as the best practice frontier. The frontier is the maximum output of a given quality that can be produced given the available input levels, skills and technology.<sup>2</sup> When technical efficiency improves, an organization is producing more output with the same level of inputs. Hence, *ceteris paribus*, its productivity rises.

Technological change occurs when the frontier expands outwards. Technological change enables firms to produce more output with the same level of inputs, even if that firm is fully technically efficient. Hence, technological change also improves productivity. Technological change can, of course, occur even when firms are not fully efficient. It is possible for firms to find that over time technological change increases their productivity, while their efficiency is deteriorating and hence having a depressing effect on

## 6. SUMMARY

While there has been much research on the impact of HR practices on overall performance, little is known about the impact of HR practices on economic efficiency. The aim of this paper was to investigate the links between HR practices and efficiency, as well as between unions and efficiency and the impact of HR-union interaction effects. DEA was used to calculate technical and scale efficiency scores for a large sample of French firms. The determinants of efficiency scores were then explored through Tobit analysis. In assessing the impact of HR on efficiency, the results show a complex set of associations and that context matters. When HR practices are introduced into a French unionized workplace, the interaction results in a less unfavorable effect on technical efficiency, while at the same time resulting in a negative interaction effect on scale efficiency. On the other hand, HR practices on their own have no affect on technical efficiency, but they do have a large positive effect on scale efficiency. French unions have a detrimental effect on technical efficiency, as well as a positive effect on scale efficiency. On balance, HR practices appear to have a positive effect on productivity in French industry. The analysis needs to be extended in several ways. For example, the impact of HR practices on profitability through their effects on efficiency is a key research question. The use of panel data will inform on the impact of HR practices on technological change and productivity growth.

## NOTES

1. Recent studies include Bartel (2004) for the US and Guest (2003) for the UK.
2. Producing the maximal level of outputs given inputs, or using the minimal level of inputs given output.
3. Similarly, if firms operate with decreasing returns to scale, it is optimal for them to contract their scale of operations.
4. Importantly, this conclusion is robust and is not affected by publication bias (see Doucouliagos, Laroche, & Stanley, 2005).
5. The impact of HR practices on performance can be moderated by other factors. For example, Dawson, Knight-Turvey, Neal, and West (2004) found that financing strategy influences the HR-performance association.
6. Delaney (1991, p. 39) argues that the lack of collaboration between industrial relations and HR management researchers is one barrier to such an assessment of these subjects.
7. A related issue is worker attitudes, including work motivation, job satisfaction and morale. In an interesting study, Guest and Conway (1999) find that the poorest

## Works Councils and Firm Productivity in France

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**Abstract** This paper utilizes establishment-level data to explore the impact of works councils on firm productivity in France. A variety of empirical techniques is employed, including fixed effects and regression discontinuity designs, to identify this impact. We estimate the works council effect on productivity in union and nonunion settings, and investigate the extent to which alternative forms of worker voice and information sharing might substitute for the works council's impact in production. We find no evidence of a positive impact of works councils on firm productivity in any of our results, and some limited evidence of a negative effect in some of the findings. There is no indication that estimated impacts on productivity vary with union status. However, a notable finding is that worker voice and information-sharing human resource practices are prevalent in French firms regardless of works council status, and are found to have positive and statistically significant effects on firm productivity.

**Keywords** Works council · Productivity · Worker voice

**JEL Classification** J53 · J58 · J51

### Introduction

Works councils are an enduring feature of industrial relations in continental Europe, encouraging labor-management cooperation through the joint sharing of information, consultation, and, in some cases, co-determination regarding important firm decisions such as workplace health and safety and overtime work. With the

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European Directive on Information and Consultation, which mandated consultative mechanisms throughout EU workplaces beginning in 2008, the impact of works councils are of growing interest in European countries. However, empirical evidence on the impact of works councils on industrial relations and firm performance is largely limited to the case of Germany.<sup>1</sup> In this paper we present the first empirical evidence of which we are aware on the impact of works councils on firm productivity in France.

The French case is an interesting contrast to the German one. French works councils are much less aligned with trade unions, they possess no statutory co-determination rights, and they are mandated for firms above fifty workers as opposed to firms above five. Exploring the productivity impact of works councils in union and nonunion settings is thus easier in the French than in the German case because the two forms of worker representation are less co-mingled in the former. The higher worker threshold before works councils are mandated by law affords our analysis a healthier proportion of firms without works councils and thereby allows a meaningful opportunity to employ a regression discontinuity research design in exploring the works council impact on productivity.

In addition, and in contrast to much of the German analyses, our data contain a good measure of the capital stock of firms, which is crucial to the estimation of production functions. The French data we employ are relatively short of establishment-level control variables, but our fixed effects estimation strategy serves to partially overcome this drawback. We possess good measures of both union status and establishment workplace practices that allow for an exploration of the extent to which informal mechanisms for worker voice and information-sharing may substitute for works councils in productivity outcomes in France.

The results of our analysis are mixed. We find no evidence of a positive impact of French works councils on firm productivity, and in fact some limited results suggesting a negative impact on productivity. Union status appears to have no influence whatsoever on the estimated productivity impact of works councils. However, human resource practices associated with worker voice and information sharing—features commonly associated with works councils—are widespread in French firms and, according to our findings, have a positive and statistically significant impact on firm productivity.

### Theory and Empirical Evidence on Works Councils and Productivity

Theory suggests that works councils may enhance firm productivity in a variety of ways:<sup>2</sup> They may provide a forum in which workers share valuable knowledge of production with management or in which discussions between labor and management *per se* yield useful ideas for productivity improvements (Freeman and Lazear 1995). Firms with works councils may also be more productive because they are

<sup>1</sup> The Kleiner and Lee (1997) study using data on South Korea, which reveals a positive and statistically significant impact of works council on productivity in that country, is an important exception.

<sup>2</sup> A new book by Addison (2010) offers an exhaustive treatment of both the theory behind works council impacts in production and the empirical evidence to date on these impacts in the German case.

**Table 5** Regression discontinuity results

| Independent variable      | All establishments     |                         |                          |
|---------------------------|------------------------|-------------------------|--------------------------|
|                           | Works council          | TFP                     | TFP                      |
| Works Council             |                        | -0.115**<br>(0.058)     | -0.149**<br>(0.070)      |
| Workforce <sup>50</sup>   | 0.709*<br>(0.021)      |                         |                          |
| Workforce                 | -1.4E-05<br>(3.1E-05)  | 1.1E-04+<br>(6.3E-05)   | 1.1E-04+<br>(6.3E-05)    |
| Workforce <sup>2</sup>    | 2.55E-09<br>(4.9E-09)  | -2.4E-08**<br>(9.9E-09) | -2.45E-08**<br>(9.9E-09) |
| Workforce <sup>3</sup>    | -9.17E-14<br>(1.3E-13) | 6.3E-13**<br>(2.6E-13)  | 6.49E-13*<br>(2.6E-13)   |
| Union                     | 0.209*<br>(0.019)      | -0.01<br>(0.044)        | 0.064<br>(0.087)         |
| Employee Decision Making  | -0.006<br>(0.017)      | 0.083*<br>(0.031)       | 0.053<br>(0.050)         |
| Information to Employees  | 0.039**<br>(0.016)     | 0.072**<br>(0.030)      | 0.03<br>(0.053)          |
| Works Council*Union       |                        | -0.094<br>(0.096)       |                          |
| Works Council*Employee    |                        | 0.047<br>(0.057)        |                          |
| Works Council*Information |                        | 0.059<br>(0.062)        |                          |
| Time                      | -0.005<br>(0.016)      | 0.114*<br>(0.026)       | 0.114*<br>(0.026)        |
| Industry Controls         | ✓                      | ✓                       | ✓                        |
| Constant                  | 0.064<br>(0.042)       | -0.182**<br>(0.088)     | -0.149<br>(0.092)        |
| Observations              | 1008                   | 1008                    | 1008                     |

Standard errors in parentheses. + significant at 10%; \*\* significant at 5%; \* significant at 1%

The total factor productivity regression results, with the instrumented works council variable, appear in columns (2) and (3). The most striking result from these estimated equations is that works councils are found to be statistically significantly and negatively related to firm productivity. This finding is hinted at in the fixed effects results. Looking at the column (2) specification, we see that the estimated

coefficients on the worker voice and information sharing variables are similar in both magnitude and statistical significance to their effects on productivity in the OLS random effects estimation results of Table 4, column (2): granting employees certain decision making ability and sharing particular kinds of information with them enhances productivity by 8% and 7%, respectively. The estimated union effect on productivity, although still statistically insignificant, is unchanged in sign and only slightly changed in magnitude as compared with the OLS random effects results.

Unfortunately, once again the interactive specification results are not very revealing. However, one might safely conclude from these findings that there is little evidence of a positive boost to productivity from combining works councils and unions. As with the interactive findings in Table 4, the impact of worker voice and information sharing in non-works council settings are of a sizeable magnitude, roughly half the quantitative impact in the non-interactive specification of column (2) and virtually the equivalent of or greater than the impact observed when these same human resource practices exist in works council settings. Adding to the latter the quite large and statistically significantly negative impact of works councils on productivity in settings where these human resource practices are absent, and, once again, there is suggestive evidence that the informal existence of such practices outside of formal works council structures might well provide a viable substitute to works councils when it comes to human resource mechanisms for productivity enhancement.

Finally, as a check on these results Table 6 gives the regression discontinuity findings for the smaller, 30–70 workforce sample which narrowly straddles the 50-worker cutoff criterion. The results are estimated with less precision than in the larger sample, and the quantitative magnitudes of the estimated impacts seem less plausibly accurate, but the general conclusion stands—namely, that the works councils are found to have a negative and statistically significant impact on firm productivity. Interestingly, we find no evidence that voice or information-sharing features affect firm productivity in the column (3) specification for this sample of establishments. However, there is some slightly suggestive evidence in the column (4) results that these characteristics interact with works council status in significant ways—negatively, in the case of worker voice, and positively, in the case of information sharing.

## Conclusion

This paper presents the first empirical evidence of which we are aware on the impact of works councils on firm productivity in France. The data are restricted to observations on single establishment firms, and so the findings may well change once data become available on the multi-establishment firm sector. That said, our results offer no evidence that French works councils have a positive impact on firm productivity. Indeed, in the regression discontinuity findings we see some evidence that works councils have a negative impact on productivity. Moreover, our results offer no support for a claim that the works council impact on productivity is superior in unionized environments.

Perhaps the most interesting findings from our analysis are that worker voice and information sharing human resource practices are widely utilized in French firms, that this is true independent of works council status, and that these features are positive, statistically significant and quantitatively important determinants of firm productivity. Thus, one possible explanation for the lack of a positive impact of works councils on firm productivity is that many of the features of works councils that may serve to foster enhanced productivity are informally in existence and relatively pervasive across French firms, independent of works council status.

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**Table 6** Regression discontinuity results for workforce 30–70 sample

| Independent variable                | (1)<br>Random effects   | (2)                   | (3)                    | (4)               |
|-------------------------------------|-------------------------|-----------------------|------------------------|-------------------|
| Establishments with workforce 30–70 |                         |                       |                        |                   |
| log VA                              | log VA                  | Works council         | TFF                    | TFP               |
| log Workforce                       | 0.811*<br>(0.106)       |                       |                        |                   |
| log_Capital                         | 0.149*<br>(0.022)       |                       |                        |                   |
| Works Council                       |                         | -0.569+<br>(0.339)    | -0.727**<br>(0.337)    |                   |
| Workforce50                         | 0.283*<br>(0.097)       |                       |                        |                   |
| Workforce                           | -0.323**<br>(1.5E-01)   | -0.344<br>(2.4E-0)    | -0.399+<br>(2.3E-01)   |                   |
| Workforce <sup>2</sup>              | 0.007**<br>(3.0E-03)    | 0.008<br>(5.0E-03)    | 0.009+<br>(5.0E-03)    |                   |
| Workforce <sup>3</sup>              | -4.80E-05*<br>(3.2E-03) | -5.3E-05<br>(3.4E-05) | -6.0E-05+<br>(3.4E-05) |                   |
| Union                               | 0.263*<br>(0.051)       | 0.145<br>(0.100)      | 0.248**<br>(0.113)     |                   |
| Employee Decision Making            | -0.024<br>(0.046)       | -0.026<br>(0.045)     | 0.009<br>(0.048)       |                   |
| Information to Employees            | 0.031<br>(0.041)        | 0.059<br>(0.040)      | -0.021<br>(0.048)      |                   |
| Works Council*Union                 |                         | -0.08<br>(0.099)      |                        |                   |
| Works Council*Employee              |                         | -0.128+<br>(0.068)    |                        |                   |
| Works Council*Information           |                         | 0.208*<br>(0.075)     |                        |                   |
| Time                                | -0.062<br>(0.041)       | 0.039<br>✓<br>(0.041) | 0.028<br>✓<br>(0.040)  |                   |
| Industry Controls                   | 10.305*<br>(0.389)      | 5.076**<br>(2.253)    | 5.05<br>(3.581)        | 5.955+<br>(3.520) |
| Constant                            |                         |                       |                        |                   |
| Observations                        | 270                     | 270                   | 270                    |                   |

Standard errors in parentheses. + significant at 10%; \*\* significant at 5%; \* significant at 1%

# Union Voice Effects in Mexico

David Fairris

## Abstract

*This paper utilizes establishment survey data from Mexico to explore the impact of union voice on fringe benefits, turnover, job training and productivity. Mexican unions have a significant effect on these outcome measures for workers and firms. Unions increase both the value of fringe benefits per worker and the ratio of fringe benefits to total compensation, increase job training and raise productivity per worker. However, contrary to the broader literature on union voice effects, unionized establishments in Mexico appear to possess greater worker turnover.*

## 1. Introduction

In their widely cited book, *What Do Unions Do?*, Richard Freeman and James Medoff (1984) argued that, in addition to behaving as a ‘monopoly’ and to raising wages above those of similarly situated non-union workers, unions affect a host of other worker and firm outcomes based on their ‘voice’ in collective bargaining. This voice view of unions held that union goals were broader than just wages, that labour markets contained impediments to labour mobility, which made voice a good substitute for exits, and that there was slack and inefficiency in managerial performance, which allowed voice to enhance firm efficiency.

The real power of the book lay in its empirical findings. Freeman and Medoff marshalled persuasive evidence to support their position that union voice effects are quantitatively and statistically significant. They found that unions raise wages, consistent with the earlier work of H. Gregg Lewis (1963), but that unions also decrease overall wage inequality, raise fringe benefits and productivity, and lower turnover and profits. Since the book’s publication, the empirical analysis has undergone further refinement and testing. We now possess a body of empirical evidence supporting many of the propositions put forth by Freeman and Medoff and for a variety of developed economies, such as the UK, Japan and Australia, in addition to the USA.

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However, union voice effects are largely unexplored terrain in developing country contexts.<sup>1</sup> Standing's (1992) analysis of union voice in Malaysia is the only existing contribution of which I am aware. The absence of empirical work on union voice effects in developing countries is unfortunate. Unions in select developing countries are as pervasive and politically powerful as those in some developed economies, and their impact on economic efficiency, growth and distribution is arguably a more pressing matter than in developed-country contexts. Moreover, the evidence to date on union wage impacts in developing countries suggests magnitudes that are generally larger than those found for developed economies. With regard to voice effects, Standing's analysis found that unions lower the quit rate, raise the level of productivity, stimulate product and process innovations, increase firm-sponsored worker training and enhance the likelihood that a worker is enrolled in a pension plan.

The absence of a well-developed literature on union voice effects in developing country contexts is, in part, explained by the fact that high-quality micro-survey data on households and establishments have historically been lacking in these countries. However, data gathering of this sort has now reached a level in both quality and quantity in many developing countries, Mexico among them, that there is nothing currently preventing an extension of Freeman and Medoff's analysis to a number of developing economies.

This paper utilizes recent establishment surveys in Mexico to explore the voice effects of unions on workers and firms in this developing country. After a review of the institutions of collective bargaining in Mexico, I turn to a brief discussion of union density and wage effects from previous research. This is followed by a discussion of the data and the basic empirical approach to be followed in estimating union voice effects. The results reveal that unions increase fringe benefits (both per worker and in relation to overall compensation), raise job training and increase productivity, all of which are consistent with a voice view of union behaviour. However, unionized establishments in Mexico also experience greater worker turnover — an effect that is inconsistent with the voice view of unions but which appears to be exclusive to the domestic sector of the economy. Foreign firms that are unionized experience lower turnover than their non-union foreign counterparts.

## 2. The institutions of collective bargaining in Mexico

Research on the labour movement in Mexico is typically devoted to an analysis of the political power held by unions. A great deal is known about the history of the alliance between Mexican unions and the Institutional Revolutionary Party (PRI), for example, about the power this alliance granted labour, but also the ways in which it prevented independent, democratic unions from forming (Middlebrook 1995). The recent struggle to form independent unions, current efforts to change labour law, the decline in labour's influence in determining the minimum wage, the difficulty of

# 10

## Labor Relations and Human Resource Management in the Airline Industry<sup>1</sup>

Jody Hoffer Gittell, Andrew von Nordenflycht, Thomas A. Kochan,  
Robert McKersie and Greg J. Bamber

Labor relations (LR) and human resource (HR) management are two aspects of the employment relationship, reflecting the ways that firms relate to their employees. The employment relationship is especially important in the airline industry, given its service-intensive nature, its high ratio of labor costs to total costs, and the high level of union representation in the industry. Employees have the ability to affect airline performance in significant ways, both positively and negatively. Through collective bargaining, employees can achieve higher wages and employment security but this can leave firms with higher costs and less operating flexibility. Furthermore, employees can impose additional costs in the process of setting those wages and employment conditions, through strikes or other service disruptions. At the same time, employees can also add significant value, with the potential to play a major role in lowering unit costs through their coordinated and committed efforts and through their productivity-enhancing ideas, and a major role in delivering high-quality service through their friendly, responsive interactions with customers.

Evidence shows that front-line employees play a critical role in achieving quality and productivity outcomes in the airline industry (Gittell, 2003). As a result, airlines around

<sup>1</sup> For much more information and analysis of the issues in this chapter, see Bamber *et al.* (2009). The authors of this chapter participate in the Airline Industry Council's international research network. They acknowledge that this chapter draws on the work conducted by many others in the network. A series of articles from this network will be published in 2009 in the *International Journal of Human Resource Management*.

the world have looked to the management of their workforce for potential sources of advantage, striving to achieve either lower unit costs or superior customer service, or both. However, there are a variety of approaches for achieving such advantages and some are more effective than others.

In addition to firm-level strategies, the industry-level structures and processes that shape the employment relationship are also important. That is, airlines are part of an air transport system that involves competitors, partners in code sharing and other relationships, unions that represent employees at multiple airlines, and government regulatory agencies (such as the National Mediation Board (NMB) in the USA) that oversee labor relations in the airline industry and participate actively in the resolution of collective bargaining disputes. Effective structuring and management of the industry-level aspects of labor relations, including the regulatory framework, can yield outcomes that represent mutual gains for airlines, employees and the flying public.

Before discussing the lessons of what works in airline human resources and labor relations (HR/LR), it is useful to examine the basic structures and patterns of HR/LR that have long characterized the airline industry. Thus, this chapter addresses the following topics. First, we outline a general framework for identifying the key aspects of an employment relationship. Second, we describe the regulatory framework and history for LR in the USA. We then provide a discussion of the regulatory frameworks and history for LR in other parts of the world, including Europe, Scandinavia and Asia. Finally, we explore “what works?” in both airline LR and HR management to build high levels of productivity and service quality.

## 10.1 Alternative Strategies for the Employment Relationship

The employment relationship encompasses the broad range of ways in which firms interact with employees to set the terms of employment (e.g., wages) and to communicate and coordinate the work to be performed. Identifying a few major dimensions of this relationship and some basic alternative approaches to addressing those dimensions will help set the context for the chapter. At a conceptual level, the employment relationship can be segmented into three tiers of interaction: workplace; collective bargaining; and strategic decision making (Kochan *et al.*, 1986). The first tier encompasses the way in which employees and managers interact on a day-to-day basis and is the primary sphere of many HR approaches, policies and programs.

Within HR there are, broadly, two alternative models or approaches to the exercise of authority, which have been labeled control and commitment (Walton, 1985). In the control model, the interaction between managers and employees is hierarchical and management acts unilaterally. Employees are expected to comply with management's orders, but are not expected to go above and beyond in exercising initiative on behalf of the company. In the commitment model, managers consult more with employees on decisions and allow employees more discretion in the execution of their jobs. In return, employees are expected to demonstrate greater commitment to the firm and its customers, and to exert higher levels of discretionary effort.

Collective bargaining encompasses the structures and processes of how unions and firms negotiate and implement the labor contracts that set many of the basic employment

One broad lesson from our research is that airlines can benefit from partnering with other key parties in their networks. Just as airlines can benefit from investing in their LR and in HR practices that strengthen relationships among front-line employees, airlines also benefit from partnering with key players in their networks like airports, air traffic controllers and aircraft manufacturers.

Efforts by airlines to reduce labor costs and reform work systems in recent years have highlighted another dimension of coordination and partnership of growing importance in the industry, namely relations between airlines and the various subcontractors that do work previously carried out by the airline's own employees. Maintenance of aircraft is one visible and highly contested example of work that is done partly by airline employees, partly by aircraft manufacturer representatives, and increasingly by specialized mechanical subcontracting firms. Indeed, the 2005 strike of mechanics at Northwest Airlines was largely over the company's decision to contract out much of its heavy (major overhauls of engines etc.) maintenance work to subcontractors and thereby cut its own mechanics' workforce in half. The advantage for firms of this arrangement is that it lowers their fixed labor costs. Moreover, often the outsourcing of work is accompanied by a reorganization of remaining maintenance work in an effort to increase the type of flexibility noted above that, if combined with other supporting HR practices, can enhance productivity.

There is great debate over whether the movement to contract out more airline functions leads to reductions in total costs (direct and indirect labor costs plus contracting fees plus associated contract management and coordination costs), and how this strategy affects the bottom-line safety, productivity, profitability and customer service outcomes. While the verdict on this is still out (there have been no studies to date comparing the bottom-line effects of these different strategies), evidence from other industries that make substantial use of contractors is that the results vary depending on the quality of the relationships among contractors and parent firms and the employee groups of the different enterprises that work together, often side by side (Kochan *et al.*, 1994). Ultimately, this ability to partner is an acquired skill like any other, and one with potentially significant effects on organizational success (Lorenzoni and Lipparini, 1999). By treating these external parties as partners, an airline can extend its sphere of influence beyond its employees to encompass its entire value chain.

## 10.5 Conclusions

While the airline industry has been characterized as a stronghold of traditional industrial relations because of its high levels of unionization, adversarial labor-management relationships and a control-based approach to HR, we are seeing innovations and new directions. Some airlines are striving to move toward a commitment approach to HR, with a focus on building high-quality relationships between employees. Some are seeking to move away from the adversarial approach toward labor unions to develop a partnership approach in its place. These changes are difficult to make and often there are setbacks. But as both legacy and new-entrant airlines face pressures to reduce their costs in the increasingly competitive environment, they are likely to continue experimenting with these innovative approaches, many of which have been pioneered by Southwest Airlines. Other airlines are responding to cost pressures in a very different way, by intensifying

the traditional control approach toward employees and/or moving toward outright union avoidance, approaches that are associated instead with Ryanair.

In this chapter we have described the HR/LR system as composed of interrelated components found at multiple levels: the workplace, labor negotiations, interactions between labor and management at the level of business strategy and corporate governance, and in external relations among the firms, unions and government agencies that combine to form the overall industry. We have stressed that improvements are needed in all aspects of this system if the industry is to find a model for sustained profitability. Marginal improvements, or a hope that the industry can recover on its own and that relationships and practices can return at some point to past patterns, are not realistic. Yet this perspective is only slowly gaining acceptance among participants in the industry. The pace and scope of change will need to accelerate if the parties are to be successful in achieving the improvements necessary to cope with the new competitive environment.

Overall, two points stand out from our research. First, of crucial importance is an underlying philosophy of treating employees as valuable resources, rather than primarily as costs to be minimized, in order to build higher-quality relationships within the firm. Second, this philosophy should be supported by an integrated set of HR practices that fosters teamwork and coordination across the multiple functional groups involved in airline operations.

While HR/LR policies are often thought of as lying within the province of individual companies and unions, a strong rationale exists for developing an industry-wide approach to many of the airline industry's more difficult problems. Management, labor and government representatives are continuing to explore ways to improve labor and employee relations in the industry. Whether these discussions will produce the fundamental changes necessary to support the recovery of the overall industry remains to be seen. If they do, a new chapter in both airline HR/LR and industry performance will be written. If not, others – dissatisfied customers, investors or government officials – may write the next chapter for the industry.

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# Teachers' Unions and Student Achievement in High School Economics

Paul W. Grimes and Charles A. Register

Organized labor has a long history in the teaching profession. As far back as 1799, teachers banded together in local groups for the purpose of discussing problems concerning their wages and working conditions (Braun 1972). Although the first national teachers' union, the American Federation of Teachers (AFT), traces its roots back to 1897, it has only been during the last half of this century that teachers' unions have played a major role in the education industry. Today, the AFT has approximately one-half million members, and its rival, the National Education Association (NEA), represents a similar number in formal collective bargaining agreements. Given the institutional structure of education in the United States, teachers' unions have not suffered the dramatic declines in relative union membership recently experienced in other organized sectors of the economy. As the economic strength of teachers' unions continues to increase, questions have been raised concerning the effect of teachers' unions on the quality of education. One researcher has linked the growth in union membership to the decline in average Scholastic Aptitude Test (SAT) scores (Kurth 1987). Although the association of teachers' unions with poorer student performance has not gone uncriticized (Nelson and Gould 1988), relatively few studies exist that formally investigate the effect of teachers' unions on teacher productivity. Using recently released data, we explored the effect of teachers' unions on the production of a specific type of human capital—economic education.

## BACKGROUND

The economic effects of labor unions have been studied and debated for many years. A large body of empirical research exists that examines the influence of unions on wages and productivity. This literature indicates that unionized workers enjoy a significant and positive wage effect that varies in

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tent with those of prior empirical economic education studies such as Siegfried and Fels 1979.) The student's socioeconomic background was found to affect performance through the father's education (FED) but not through the mother's (MED). The FAMINT coefficient did not carry the expected positive sign, a result not easily explained. However, other studies of the NAEE database have reported similar findings (Marlin 1988), and one may conclude that it was an anomaly created by the self-reporting nature of the variable. (Again, additional research beyond the scope of this study is needed to analyze this empirical relationship.)

With respect to the UNION variable, which was the focus of our research, the data in Table 3 indicate that the UNION coefficient was positive and statistically significant across each model specification; that is, students in unionized school districts demonstrated a significantly higher level of achievement in economics, when other instructional inputs and personal characteristics were held constant. Specifically, the estimated models indicated that the union effect ranged from about 6.5 percent to approximately 2 percent. The coefficient's stability across regression equations suggested that this result was not arbitrary or dependent upon model specification. Thus, we can conclude that the data indicated a positive effect of unionization on teacher productivity of economic understanding. This result implies that the monopoly view of the union productivity effect may not be appropriate to the production of educational services at the senior high school level.

### CONCLUSIONS

By supplementing the NAEE database, we were able to incorporate the effect of teachers' unions into a standard educational production function model of economic understanding. The estimated effects of school district, teacher, and student inputs reflected accepted economic education theory and were consistent with prior empirical studies. Our results concerning the union effect on teacher productivity in the high school economics classroom indicated that students in unionized school districts scored higher on the TEL relative to students in nonunion districts, *ceteris paribus*. This finding suggests that alternatives to the monopoly view of the union-productivity effect should be explored in the case of producing educational services. It should be noted that this finding is consistent with the results of a previous study examining the effect of teachers' unions on learning in elementary schools (Eberts and Stone 1987).

A variety of alternative hypotheses can be put forth as possible explanations for the positive union-productivity effect. For example, institutional factors may cause the collective voice and shock effects to be more relevant in an educational setting, when compared with other public-service markets. Unions may also cause school districts to alter the traditional mix of labor and capital that is employed in providing education, thereby affecting observed student outcomes. Further, a "queuing situation" may arise

from unionization, which allows the school district to choose the best teachers from the queue that forms in response to high union wage scales. Unfortunately, limitations of the NAAE database preclude further examination of these possible causal factors, and the issue is left for future researchers.

Finally, it should be noted that our results do have an implication for educational support and service organizations such as the JCEE. Specifically, because our findings run counter to the popular view that unions reduce productivity and, therefore, quality in education, it is not necessary to devote relatively more resources to a unionized school district. In fact, our results indicate just the opposite. If unions are associated with higher levels of student achievement in economics, then it becomes reasonable to suggest that additional resources need to be targeted to nonunion districts to promote parity.

#### NOTES

1. A more thorough discussion of this dichotomy can be found in Lewis (1986) and Register (1988).
2. Established in 1949, the Joint Council on Economic Education (JCEE) is an independent, nonprofit educational organization with a mission to increase the quantity and enhance the quality of economic education in the United States. The JCEE comprises a network of fifty state councils coordinating over 280 university- and college-based centers for economic education that work directly with the nation's school systems.
3. A representative of each school district was interviewed to determine if the district's teachers engaged in collective bargaining through a labor union (AFT) or association (NEA). If teachers in the district belonged to an association without bargaining powers, then the data were coded as a nonunion district.
4. The NAAE database suffers from a missing-value problem with respect to certain variables. When key demographic variables were missing from an observation, we dropped that observation from the sample. Other missing values were imputed, using multiple regression and zero-order regression techniques (Maddala 1977, 202). A complete description of the methods used for specific variables is available upon request.

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the factor market, thus allowing union and nonunion labor to appropriate some share of firm quasi-rents. Unions typically have significant effects on the level, dispersion, and wage-firm mix of labor to appropriate economic performance of U.S. firms during the 1970s, behavior and economic performance of U.S. firms during the 1970s, with particular emphasis given to union rent seeking of labor unions on the investment, capital investment, and economic productivity. A model of union rent seeking is presented in which a portion of firm quasi-rents is appropriated by labor. The implications of union rent seeking are then examined, with emphasis given to a delineation between "direct" and "indirect" union effects on investment behavior, productivity, and productivit growth. Empirical evidence is based on a unique firm-level data sample representing the activities of U.S. manufacturing firms during the 1970s. Substantial differences in investment behavior and economic performance between union and nonunion firms are found. Unionized com- do similar nonunion firms. The union impact on these investments is and indirect, resulting from union appropriation of investment returns, both direct, resulting from union appropriation of investment returns, and indirect, resulting from lower profitability, which in turn raises the cost of funds. Unions are likewise found to impact negatively on firm productivity and growth. These latter effects occur directly through union major conclusions: first, union effects on long-run firm perfor- mance are substantial and should not be ignored in studies examining investment behavior, technological change, and productivit growth; and second, the relatively poor performance of unionized companies during the 1970s helps to explain increased management resistance to union organizing and the declining importance of collective bargaining in the U.S.

Section II of this paper presents the union rent-seeking framework employed in this study, focusing in particular on the impact of collec- tive bargaining on firm investment decisions. In Section III, the data are described and descriptive evidence on firm performance variables are provided for companies with varying levels of union coverage. Section IV provides discussion of economic specialization and pres- ents evidence, in turn, of union effects on R&D expenditures, capital investment, and economic performance of unionized companies. Section V provides descriptive evidence on firm performance and coverage, is provided for companies with varying levels of union coverage. The five bargaining on firm investment decisions. In Section III, the data are described and descriptive evidence on firm performance variables are provided for companies with varying levels of union coverage. Section IV provides discussion of economic specialization and pres- ents evidence, in turn, of union effects on R&D expenditures, capital investment, and economic performance of unionized companies. Section V provides descriptive evidence on firm performance and coverage, is provided for companies with varying levels of union coverage. The five bargaining on firm investment decisions. In Section III, the data are described and descriptive evidence on firm performance variables are provided for companies with varying levels of union coverage. Section IV provides discussion of economic specialization and pres-

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labor law provides unions with varying degrees of monopoly power in performance. Neglect of unionism's potential role is surprising. U.S. importance role of labor unions on various dimensions of economic performance.<sup>1</sup> Only recently has attention been given to the potentially important factors affecting the appropriability of the returns from R&D and other factors research has focused on product market structure and previous research has focused on productivit levels and growth. Much previous research has focused on productivit levels and growth. Factors limiting the appropriability of returns from innovative activity and capital investment are likely to affect the level and mix of invest- ment and, in turn, have an impact on productivit levels and growth. Factors limiting the appropriability of returns from innovative activity and capital investment are likely to affect the level and mix of invest- ment and, in turn, have an impact on productivit levels and growth.

## 1. INTRODUCTION

Barry T. Hirsch

ARE LABOR UNIONS A SPUR OR A DETERRENT?  
FIRM PERFORMANCE:  
PRODUCTIVITY GROWTH, AND  
INNOVATIVE ACTIVITY,  
S

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investment, productivity levels, and productivity growth. Section V offers an interpretation, and qualification, of the paper's major findings. A summary follows in Section VI.

## II. UNION RENT SEEKING, INVESTMENT, AND ECONOMIC PERFORMANCE

### A. Static Models and the Bargaining Process

Labor unions and management bargain over the level and mix of pecuniary and nonpecuniary compensation, work conditions, and workplace governance structures. Management is assumed to maximize the value of the firm (the discounted stream of future earnings). The union maximand is less clear.<sup>4</sup> It will use its bargaining power to acquire present and future contract provisions providing compensation–employment combinations for its members, more highly valued than those available in a competitive labor market. As discussed below, each party has a degree of monopoly or monopsony power, thus making short- and long-run bargaining outcomes indeterminate *a priori*. The parties engage in repeated bargaining (typically, every 3 years) and arrive at either cooperative (*i.e.*, jointly maximizing) or non-cooperative bargaining outcomes. It will be argued that in either case, company profits, investment decisions, productivity, and productivity growth will likely differ between union and nonunion firms.

Labor union monopoly power derives from a combination of U.S. labor law and the potential costs that a union can impose on a firm through a strike or other variation in labor input. In bargaining units where a union has won recognition under National Labor Relations Board auspices, it is the sole representative of workers in negotiations with management. Management must bargain in "good faith" with the union, but it is not required to arrive at a contractual agreement. Because it is costly for a firm not to reach an agreement or to substitute a nonunion work force, the union has some degree of monopoly power in the labor market. Union bargaining strength is of course limited by the level and elasticity of the labor demand curve (although settlements need not be on the demand curve) or, more specifically, by the substitution capabilities of consumers and management and by the legal rules and enforcement surrounding the NLRB union representation process. Firm monopsony power results primarily from the fixed costs to workers of job change and the fact that employees possess firm-

specific skills not easily transferred to other firms. One can make similar arguments about industry-specific skills that are difficult for workers to transfer in the event of industry-wide employment downturns.

Much of the literature on bargaining outcomes has employed a single-period model and contrasted the properties of settlements on the labor demand curve with Pareto-superior settlements off the labor demand curve. The conventional bargaining model predicts outcomes on the labor demand curve following *sequential* wage and employment determination. The union is constrained by the labor demand curve (*i.e.*, it faces a wage–employment tradeoff) and "selects" a wage above the competitive wage that maximizes union rents, commonly defined as  $(w_u - w_c)L$ , where  $w_u$  is the union wage,  $w_c$  is the (unobserved) competitive wage, and  $L$  is employment. The firm is free to vary employment at the union wage, and maximizes profits by selecting the employment level on its labor demand curve corresponding to  $w_u$ .

Bargaining outcomes on the labor demand curve, however, are generally not Pareto-optimal. There exist outcomes in wage–employment space to the right of the labor demand curve, at a lower wage and higher employment level than at the union's obtainable outcome on the demand curve, preferred by both the union and firm; that is, corresponding to higher union utility and firm profit. The range of "efficient" bargaining outcomes is defined by a contract curve, derived from the tangencies between the union's indifference curves and the firm's isoprofit curves. The contract curve can in general take on a positive or negative slope, but in the unique "strong efficiency" case (Brown and Ashenfelter, 1986) it is vertical at points above  $w_c$  in wage–employment space. Bargaining outcomes on a vertical contract curve would imply the use of a factor mix *identical* to the (short-run) competitive case. In essence, the union and firm agree to maximize the joint value of the enterprise, comprised of the sum of firm profits and union rents, and subsequently bargain over the division of the surplus between profits and wages (Abowd, 1987).

The existence of preferred bargaining outcomes off the labor demand curve does not ensure that such outcomes are obtainable. In order to achieve such an outcome there must be explicit or implicit contracting that allows for simultaneous bargaining over wages *and* employment. Stated alternatively, there must be some mechanism that forces the firm to have a greater employment level than designated by the demand curve. Otherwise, following contract agreement on the wage, the firm would select an employment level to maximize profits,

Further qualification of our results stems from the inherent selection bias engendered by the fact that only firms that survive unionization are observed. If unions impact negatively on profits, investment, and growth, those firms able to partially offset union effects through higher productivity or special firm advantages are more likely to survive than the average firm that becomes unionized (and, as discussed above, successful firms are more likely to become organized). For this reason, estimated negative effects of unions on profits, investment, productivity, and growth are likely to understate average union

A bias in the opposite direction results from simultaneity between R&D and earnings, each having a positive effect on the other. Hence, the coefficient on  $\pi$  in the R&D investment equation may be biased upward and, by extension, the indirect effect of unions on R&D may be estimated with bias (it is conceivable that these biases roughly offset each other). Regarding sizes of these opposing biases on unions, indirect negative impact on investment continues to hold, since union coefficients in the investment equation were negative and significant, regardless of the inclusion of  $\pi$ . Moreover, simultaneity bias between capital and unionization (unions are more likely to organize in capital-intensive industries), likely results in an underestimation of the negative effect of unions on capital investment.

largest potential profits or quasi-rents; hence, the negative union coefficient in the rate of return to education may underestimate the true negative impact of unions on earnings (Voxs and Mishel, 1986; Hirsch and Commodity, 1987). By extension, we may then be underestimating the midirect effect that unions have on R&D and new capital investment.

These remarks are not intended to argue that simultaneous bias is not important but, rather, that superficial treatment of simultaneity is unlikely to be helpful. That being said, we are confident that the quality of these remarks is not a statistical artifact or the result of simultaneity bias. In fact, biases that we can identify suggest that union effects on economic performance may be underestimated.

We have preferred a model of union rent seeking through which union effects on profitability, investment behavior, and productivity growth are closely related and can be analyzed in a unified framework. E-mail evidence is broadly supportive of this framework. Yet, numerical reservations attach to this evidence and it should be interpreted not as conclusive but, rather, as tentative and suggestive support for the

effects, since firms most adversely affected by unions are least likely to have survived and be included in any sample of firms.

A final statistical caveat concerns the difficulty in distinguishing between union and industry effects. Highly unionized firms are more likely to be in less profitable, slower growing industries with lower rates of new investment and productivity growth. Regression results presented in this paper include specifications with and without two-digit industry dummies and, typically, estimated union effects decrease following accounting for industry differences. In order not to overstate the effect of unions on economic performance, conclusions expressed in the paper are based on regression results from specifications with dummies included. We may be understating unionism's true effects by including dummies, however, since some industry differences in performance are likely to result from differences in industry-level union coverage.<sup>29</sup> The presence of both firm- and industry-level union coverage data potentially can enable us to distinguish among these effects, but such analysis awaits future study.

A rather different concern is that expenditures on R&D and estimated R&D stocks may be inadequate proxies for the much broader category of investment—innovative activity—for which we would like to make inferences. While evidence in this area is limited, that which exists suggests that the union effects we have uncovered apply to innovative activity broadly, and not just to R&D. In work not shown in this paper, use of patent stock data instead of R&D (i.e., an output rather than an input measure of innovative activity) produced highly similar inferences about union effects. In other studies, Hirsch and Link (1987) analyze survey data from a sample of small- and medium-sized firms and they find that unionized firms rank product innovative activity as being significantly less important in their strategy and performance than do similar nonunion firms. Also, Acs and Audretsch (1987) find that both small- and large-firm innovations (defined based on measured outcomes independently of R&D or patents) have been significantly lower in more highly unionized industries.

Finally, it should be noted that inferences about union effects on economy-wide efficiency cannot be drawn directly from our evidence. Even though unions significantly distort resource allocation at the firm level, their economy-wide effect may be less significant. For example, lower new capital investment among unionized firms may be offset by higher capital investment elsewhere in the economy. If resources could costlessly flow to their highest valued use, there would be little effect of unions on economy-wide efficiency. But unions could not then have

the significant long-run effects on firm profitability and other aspects of performance that have been observed. Given that unions have some degree of monopoly bargaining power, and shifting of resources from union to nonunion environments occurs slowly, union distortions at the firm level necessarily translate into some degree of inefficiency economy-wide.

## VI. SUMMARY

This paper has provided evidence in broad support of the union rent-seeking model. Building on previous theoretical work, a repeated bargaining model is presented wherein both cooperative and noncooperative outcomes result in lower levels of R&D and capital investment among union companies than among similar nonunion companies. A key assumption of these models is that the time horizon for a union is shorter than investors' horizon over which some forms of long-lived capital are evaluated. Unions appropriate some portion of the quasi-rents that make up the normal return to long-lived capital. Firms rationally reduce their investment in vulnerable forms of physical and innovation capital, due both to the union "tax" on investment returns, and because current firm earnings, which provide a relatively lower cost source of funding, are reduced. Decreased investment in physical and innovation capital subsequently has an impact on productivity and rates of productivity growth. These "indirect" effects of unions on productivity and productivity growth are distinct from any "direct" effects unions may have on productivity (or technical efficiency) in the workplace.

Empirical evidence on the union rent-seeking model is based on an unbalanced 1970 to 1980 panel of 315 firms for which firm-level union coverage data are available for 1972. Examined are union effects on profitability, investment behavior, productivity, and productivity growth. Evidence of large and significant differences in the economic performance of union and nonunion firms is found. Unionized companies are found to have lower investment in R&D and capital investment than their nonunion counterparts. The union effect on investment is comprised of two components—a direct effect resulting from the union tax or appropriation of quasi-rents emanating from long-lived capital, and an indirect effect due to more costly financing owing to lower earnings. Indirect effects appear to be important, accounting for

#### APPENDIX: DEFINITIONS OF VARIABLES INCLUDED IN REGRESSION MODELS

ments on an earlier draft of the paper.

## ACKNOWLEDGMENTS

The intent of this paper has been to draw attention to the potentially important role that labor unions have on the economic performance of firms. Recent theoretical and empirical research strongly suggests that unionization has had a substantial impact on firm profitability, investment behavior, innovative activity, productivity, and productivit growth during the 1970s. Yet the relationship between collective bargaining and firm performance still has received only limited attention from researchers. To date, both the magnitude of union effects and the precise routes through which unions impact economic performance are not well understood. Further study is clearly warranted, although substantial improvement in our understanding of what unions do will depend crucially on the development of improved data sets.<sup>30</sup>

Such efforts should prove fruitful. Private-sector unionism has declined sharply in recent years and nonunion work environments have increased significantly to become the norm for much of the work force and in most sectors of the economy. Indeed, this transformation in U.S. industrial relations may be in part a response to the relatively poor economic performance of union companies. Future research can improve not only our knowledge of unionism's impact on firm performance, but also our understanding of the complex relationship between the approachability of investments returns, innovative activity, and subsequent growth.

The direct and indirect effects of unions on productivity and productivit y growth are then examined. Previous estimates of union effects on productivity have varied considerably. For this sample of firms, unionization is associated with about 8% lower productivity, given levels of inputs. Output in unionized firms is even lower if one considers the indirect effect of unions in lowering the long-run stocks of physical capital and R&D, although these indirect effects appear relatively modest. Finally, attention is focused on the effects of unions on produc tivity growth rates from 1970-1974 through 1976-1980. Union productivity growth is focused on the effects of unions on produc tivity growth, however, union companies are found to have exhib ited slower growth than nonunion companies. We are unable to reliable and firm effects, or in broad two-digit industry groups with lower productivity growth. Even after controlling for these industry and higher energy costs, or in broad two-digit industry groups with being in four-digit industry groups with slower sales (demand) growth and higher energy costs, or in broad two-digit industry groups with but most of this slower growth results from highly unionized firms films exhibiting substantially slower productivity growth over this period, but most of this slower growth results from highly unionized firms

## NOTES

1. Among others, see the articles in Griliches (1984) and, more recently, Levin et al. (1987).

2. For comprehensive reviews of the literature on union effects, see Freeman and Medoff (1984), Hirsch and Addison (1986), and Addison and Hirsch (1989). Lewis (1986) focuses exclusively on estimation of union wage effects, while Kochan et al. (1986) describe the recent transformation in U.S. industrial relations. For a recent analysis of U.S. labor law, see Flanagan (1987).

3. For a recent dialogue on union decline, see Freeman (1988) and Reder (1988).

4. There are, in fact, multiple parties to the bargaining process: management, shareholders, union leadership, and the rank-and-file. It is generally assumed that management (the agent) attempts to maximize shareholders' (principals') wealth. It is also reasonable to assume that union leaders (or agents) accurately represent the interests of the rank-and-file (principals), with union goals being most influenced by members with preferences close to the median. Incentive compatibility between principals and agents effectively reduces the number of bargaining parties to two—the union and the firm.

5. See Baldwin (1983), Grout (1984), Bronars and Deere (1986, 1987), van der Ploeg (1987), Tauman and Weiss (1987), Crawford (1988), and, relatedly, Lawrence and Lawrence (1985). Empirical evidence bearing directly on these models is provided in Connolly et al. (1986) and Bronars and Deere (1986, 1987).

6. Stated alternatively, capital has fixed costs and is relationship specific. Once in place, returns to that capital exceeding its opportunity costs provide quasi-rents; these quasi-rents provide what are largely normal returns to prior R&D and capital investment.

7. We do not consider in this paper the possibility of opportunistic behavior leading firms to appropriate *worker rents*. Firms may appropriate worker rents associated with firm-specific skills by paying wages lower than lifetime marginal products, reneging on pension promises, and the like. Healthy firms are unlikely to do so, however, because the loss in reputation capital will make it more difficult (costly) to attract and retain future workers. Declining firms may be more likely to engage in opportunistic behavior. For discussion of possible firm appropriation of the returns to firm-specific training, see Williamson et al. (1975), Klein et al. (1978), and Crawford (1988).

8. The implicit assumption in Baldwin's model is that the contract wage is similar across all union plants and the firm is free to vary employment. Hence, union wage demands based on productivity in a firm's efficient plants would lead to layoffs or shutdowns at the firm's inefficient plants.

9. The union could make its wage commitment credible by offering a "bond" or "hostage" that it agrees to forfeit in the event it renege on its promise. The bond must be held by a third party, since if it were held by the firm (say, in the form of promised pension payments), the firm would have incentive to default on the bond and could not make a credible commitment to the union (such commitments are credible in the case of infinitely repeated bargaining). Bonds held by third parties are not observed in practice.

10. Note the somewhat surprising conclusion that union wage demands (and the union–nonunion wage differential) may increase in a *declining* industry with long-

lived specific capital. For similar arguments along these lines, see the analysis of the U.S. steel industry by Lawrence and Lawrence (1985).

11. This is the strong efficiency case (Brown and Ashenfelter, 1986) referred to previously. Strong efficiency implies that the firm's employment level is a function of the opportunity cost wage, and not the "own" wage as implied by settlements on the labor demand curve. This prediction has formed the basis for several empirical tests of on-the-demand curve versus off-the-demand curve bargaining models.

12. Crawford (1988) argues that governing long-term relations with short-term contracts will in general lead to inefficient contracts and underinvestment in relation-specific fixed-cost capital. The argument in this paper is more fundamental: even if efficient (jointly maximizing) contract settlements are obtained, there will be lower investment by union than by similar nonunion companies.

13. Profit sharing, based on current accounting profits rather than stock value, does not make union members more future oriented (although it may increase labor productivity).

14. For evidence that R&D "Granger causes" capital investment, but investment does not Granger cause R&D, see Lach and Schankerman (1987). Most company-financed R&D expenditures are for product innovations (Link and Tassey, 1987). Of course, product innovations by companies selling intermediate products make up the major source of process innovations to purchasers.

15. Unions are also likely to capture profits associated with market power in product markets. For a detailed examination of this issue, an analysis of specification of profit models measuring union effects, and references, see Hirsch and Connolly (1987).

16. The union data were kindly provided by David C. Hershfield, who developed the figures from data collected in a 1972 survey by the Conference Board.

17. These figures compare to union *coverage* figures for manufacturing for 1968–1972, calculated from the BLS Expenditures for Employee Compensation (EEC) surveys, of 46% of the total work force and 61% of production employees; and estimates of union *membership*, calculated from the 1973–1975 May Current Population Surveys, of 37 and 49%, respectively (Freeman and Medoff, 1979). Differences among these measures results in part from the secular decline in private sector unionization during this period.

18. Discussion and documentation for the data set, named the R&D Master File, are provided in Bound et al. (1984), Cummins et al. (1985), and Body and Jaffe (no date). The data were kindly provided by Zvi Griliches.

19. Rates of return on sales exhibit a similar, although less marked, pattern. As expected, rates of return on *equity* are approximately equal across classes (since equity values adjust to differences in expected earnings)—21.3, 20.4, and 20.0 for the low, middle, and high union categories, respectively.

20. Average R&D/S is computed only for firms reporting positive R&D; non-reporting firms are excluded. For early years in our sample, many nonreporting firms are in fact R&D active. For most years, however, nonreporting firms typically are not R&D active. A identical pattern with respect to union coverage is evident when nonreporting firms are assumed to have zero R&D investment. See Bound et al. (1984) for a detailed discussion of nonreporting of R&D.

21. Value added is measured with error owing to the absence of data in Compustat on the cost of materials. The Compustat item "cost of goods" measures materials and

# Unions without rents: the curious economics of faculty unions

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*Abstract.* We show that Canadian faculty unions have had no effect on university revenues, only a small positive effect on earnings, a negative effect on research output, and lead to earnings redistributions across disciplines and ranks. We argue that faculty unions have a negligible positive (and often negative) effect on average faculty wages, because a union that promotes the median faculty member's welfare negotiates wage redistributions and more onerous teaching conditions, despite the negative impact these changes have on research output. Average wages may rise, but only because non-unionized universities trade off wages against the non-pecuniary benefits from research and teaching. JEL classification: I20, J51, J54

*Syndicats sans rentes: l'économie singulière des syndicats de professeurs d'université.* Les auteurs montrent que les syndicats canadiens de professeurs d'université n'ont pas eu d'effet sur les revenus des universités, ont eu seulement un petit effet positif sur les gains, un effet négatif sur la production de recherche, et qu'ils ont entraîné une redistribution des gains entre disciplines et entre les professeurs de divers rangs. On suggère que les syndicats de professeurs ont eu un effet négligeable (positif mais souvent négatif) sur le salaire moyen des professeurs parce qu'un syndicat qui s'attache à promouvoir le mieux-être du professeur médian négocie des redistributions de salaires et des tâches d'enseignement plus lourdes même si ces changements ont un effet négatif sur la production de résultats de recherche. Les salaires moyens peuvent croître mais seulement parce que les universités non-syndiquées négocient des avantages non-pecuniaires portant sur la recherche et l'enseignement en compensation pour des salaires moindres.

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## 1. Introduction

The faculties of Canadian universities began to unionize in the 1970s, starting in 1971 with the Université du Québec at Chicoutimi, Montréal, and Trois-Rivières. As shown in figure 1a, which describes the proportion of universities with faculty unions from 1973 to 1995 (our sample period), unionization first increased rapidly in the 1970s and then slowed in the early 1980s. While two-thirds of Canada's 15 medical-doctoral research universities had faculty unions by 1995, the fractions of comprehensive universities and primarily undergraduate universities that had unions were even higher; see figure 1b.<sup>1</sup> Despite a well-defined upper bound, the process has not quite stalled; Queen's University and the University of Western Ontario were unionized in 1996 and 1998, respectively.<sup>2</sup>

The conventional explanations for faculty unionization in Canada, at least in the 1970s, include a declining academic job market and consequent concern for job security in the face of inadequate or uncertain provincial funding, and a legislative environment that was conducive to the formation of professional unions coupled with the growing acceptance of white-collar unionism (Cameron 1991); as well, 'the circumstances that persuaded faculty majorities in individual universities to vote for certification were, in each instance, unique' (359–60). This view of faculty unionization, which is entirely silent concerning the 1980s and 1990s, is not too different from the standard 'industrial model,' where job security, legislation, and firm-specific events also are important factors. Yet the standard model does not seem to be an especially good fit in higher education. Do universities really behave like profit-maximizing firms? Are faculty members simply another input to production? Is a faculty union only an indifference map confronting a demand curve or an iso-profit line?

In this paper, we propose a new and entirely different model of universities and faculty unions that takes account of the distinguishing features of employment in higher education in Canada and elsewhere. Our aim is to provide an explanation for why faculties at some universities form unions while others do not, an explanation that has testable implications concerning the impact of faculty unions on university revenue, compensation (including relative professors' wages), and output.<sup>3</sup>

<sup>1</sup> We use the *Macleans*' magazine definitions in its annual ranking of Canadian universities: medical-doctoral universities have a broad range of PhD programs and research, as well as medical schools. Comprehensive universities have a significant amount of research activity and a wide range of undergraduate and graduate programs, including professional degrees. Primarily undergraduate universities focus on undergraduate education with relatively few graduate programs. See appendix A.

<sup>2</sup> In the United States the process began earlier and peaked earlier while the resulting fraction of unionized universities is considerably smaller. Part of the difference is attributed to the 1980 U.S. Supreme Court ruling, in *National Labor Relations Board v. Yeshiva University*, which banned unionization by faculties in private universities.

<sup>3</sup> The economic literature on faculty unions is an entirely empirical one. Most papers measure the impact of faculty unions on average wages: Hu and Leslie (1982), Barbezat (1989), Kesselsring (1991), Rees (1993), Rees et al. (1995), Ashraf (1997, 1998) and Monks (2000). Rees (1994) examines turnover and Meador and Walters (1994) examines research productivity, and both start from the standard industrial perspective of Freeman and Medoff (1984).

## WORKS COUNCILS AND COLLECTIVE BARGAINING IN GERMANY: THE IMPACT ON PRODUCTIVITY AND WAGES

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### ABSTRACT

*This paper investigates the interaction between establishment-level codetermination and industry-level collective bargaining in Germany. Based on a bargaining model, we derive our main hypothesis: In establishments covered by collective bargaining agreements, works councils are more likely to be engaged in productivity-enhancing activities and less engaged in rent-seeking activities than their counterparts in uncovered establishments. Our empirical analysis confirms this hypothesis. The presence of works councils exerts a positive impact on productivity within the covered industrial relations regime but not within the uncovered regime. The presence of works councils has a positive effect on wages within the uncovered regime but not to the same degree within the covered regime.*

### I INTRODUCTION

The German system of industrial relations is characterised by a dual structure of employee representation through works councils and unions. Works councils provide a highly developed mechanism for establishment-level participation while collective bargaining agreements are negotiated between unions and employers' associations on an industrial level. The basic question addressed in this paper is: Does the impact of works councils on productivity and wages differ between establishments covered by collective agreements and establishments not covered by collective agreements?

Empirical evidence and a theoretical analysis how codetermination and collective bargaining interact in the process of the creation and distribution of economic rents are extremely scarce. This lack of knowledge is unsatisfying for at least two reasons: First, German works councils have attracted considerable attention in the United States as an alternative form of worker participation. Also in Germany, there is a recent discussion on the role of works councils because the German government has strengthened their participatory rights in

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2001 by an amendment of the Works Constitution Act. However, the economic effects of works councils depend on other parameters of the industrial relations system such as collective bargaining. Policies to encourage councils should take into account these factors. Second, there is an ongoing discussion on the economic effects of centralised bargaining. One claim is that centralised bargaining is not sufficiently responsive to local conditions (Freeman and Gibbons, 1995; Lindbeck and Snower, 2001). However, the interaction between codetermination and collective bargaining, considered in this paper, sheds light on an indirect effect of centralised bargaining that may contribute to improved firm performance. Even if productivity-enhancing work practices must be negotiated at the establishment level between management and works councils, these are more easily negotiated when substantial distributional conflicts are moderated on a central level by unions and employers' associations. The literature to date has not fully recognised this aspect.

In a model by Freeman and Lazear (1995), the works council is viewed as a mechanism for building trustful industrial relations and for improving the information flow between workers and management. Without explicitly analysing the effects within a bargaining framework, Freeman and Lazear also recognise that codetermination may strengthen workers' bargaining power. FitzRoy and Kraft (2000) extend this model to the system of board-level co-determination.

In our paper, the two faces of councils are incorporated in a bargaining model. On the one hand, works councils foster trust and cooperation. They provide a mechanism for negotiating productivity-enhancing work practices. On the other hand, councils can use their codetermination rights to hinder decisions if management and the workforce fail to reach an agreement. Codetermination weakens the management's disagreement position. The presence of councils may result in both the creation and the redistribution of economic rents. We argue that the management's disagreement position is weakened less in establishments covered by collective agreements. Comparing covered and uncovered establishments, the presence of councils should have a more substantial impact on productivity and a less intense impact on wages in the covered industrial relations regime.

Our empirical analysis is based on German establishment data. Applying a double-selection approach, we take into account the endogeneity of the two central variables: the presence of a works council and the coverage by a collective bargaining agreement. The results confirm our hypothesis.

FitzRoy and Kraft (1990) have investigated a related question. In their study, the interaction of works councils with union density exerts a negative impact on the establishment's innovative activities. However, the focus of our approach is not on the interaction of works councils with the proportion of the establishment's employees who are union members. Rather, the basic hypothesis of this paper is that the impact of works councils on firm performance depends on the moderation of substantial distributional conflicts by unions and employers' associations. Therefore, we investigate the interaction of councils with the coverage by collective bargaining agreements.

## Non-union worker representation, foreign owners, and the performance of establishments

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Using German establishment data, this study provides the first econometric analysis on the interaction of establishment-level codetermination and foreign owners. Works councils are associated with higher productivity in domestic-owned establishments while they are associated with lower productivity in foreign-owned establishments.

Our results conform to the notion that foreign ownership can involve strong tensions with the institutional patterns of the host country.

JEL classifications: J53, J54, M54.

### 1. Introduction

Recent decades have witnessed an enormous growth in foreign direct investment (FDI) around the world (UNCTAD, 2004). The growth in corporate globalization has stimulated public and academic interest in the consequences for the national industrial relations systems. Yet, there is surprisingly little systematic evidence on how the functioning of a country's industrial relations system is affected by FDI. This paper provides an econometric analysis for Germany. It examines the interaction effect of foreign ownership and works councils on productivity. This examination reflects our broad interest in the extent to which foreign multinational firms adapt to local institutions or weaken the functioning of those institutions.<sup>1</sup>

Examining the interaction effect of foreign ownership with works councils is particularly interesting. Works councils have attracted considerable attention as an alternative form of worker representation to improve both the quality of

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<sup>1</sup>A handful of econometric studies examine the influence of national industrial relations institutions on the inflow of FDI (Cooke, 1997; Bognanno *et al.*, 2005; Hamm and Kleiner, 2007). Other studies investigate the effect of FDI on domestic unionization (Cooke, 2001; Dreher and Gaston, 2007; Slaughter, 2007) and the desire of workers for works councils (Addison *et al.*, 2003; Schmitt, 2003). None of those studies examines the interaction of foreign ownership and domestic industrial relations on economic performance.

working life and economic performance. They play an important role in corporate governance in many West European countries. Specifically German works councils have acquired extensive powers compared to councils in other countries. Those powers have even been strengthened by the 2001 amendment of the Works Constitution Act (WCA), the law that governs the works council system. Works councils play also a role outside Europe. In Korea, mandated councils deal with productivity concerns, training, and health and safety issues (Kleiner and Lee, 1997). In Canada, mandatory health and safety committees have been introduced in several provinces. Further, committees must be set up in case of layoffs. The committees are similar to European works councils (Adams, 1985). In the US, the interest in nonunion representation has been spurred by a sharp decline in union density and the growth of a 'representation gap' (Freeman and Rogers, 1999). Much of the political discussion has centred on the idea of mandating German-style works councils.

Economists have also shown strong interest in works councils as an institution that fosters workers' cooperation and effort through its information sharing and contract enforcement role (Freeman and Lazear, 1995). This is documented by a remarkably increasing number of econometric studies on the consequences of German works councils. Recent examinations typically obtain neutral or positive effects on training, employee retention, productivity, innovation, family friendly practices, and the use of performance pay (Addison *et al.*, 2001; Heywood and Jirjahn, 2002, 2009; Frick and Moeller, 2003; Huelbler and Jirjahn, 2003; Askildsen *et al.*, 2006; Smith, 2006; Jirjahn and Kraft, 2007, 2011; Wagner, 2008; Pfeifer, 2011; Mueller, 2012). Yet, sociological case studies indicate that councils do not automatically live up to their potential (Frege, 2002). The functioning of works councils depends on the managerial environment. In what follows we examine the moderating role of foreign ownership in the relationship between works councils and establishment performance.

From a theoretical viewpoint, the interaction of works councils and foreign owners is ambiguous. On the one hand, it may be positive. In foreign-owned establishments, there exists a high level of uncertainty and ambiguity from the workers' perspective. Works councils ensuring that foreign owners behave in accordance with their implicit and explicit obligations reduce this uncertainty and, hence, foster workers' effort and cooperativeness. On the other hand, there may be a negative interaction. While the works council of the local establishment has no access to the information possessed by the parent company's managers, the managers of the foreign parent company lack sufficient information about local conditions of the subsidiary. The result is a lot of time spent in meetings and adversarial bargaining to find local solutions. Moreover, the council's power to protect employees' interests is weaker as foreign owners can more easily threaten to transfer production abroad. Finally, foreign owners may have a stronger shareholder value orientation implying a shorter time horizon and, hence, a lower interest in a cooperative relationship with the works council.

Our empirical examination is based on a large representative data set from the IAB Establishment Panel. Random effects estimates provide evidence of a strong negative interaction of foreign ownership and works councils. This interaction effect implies that works councils play completely different roles in domestic and foreign-owned establishments. While previous studies often found a positive association between works council incidence and productivity, our results show that this only holds true for domestic-owned but not for foreign-owned establishments. The incidence of a council is negatively associated with productivity in foreign-owned establishments. This finding suggests that foreign ownership undermines the functioning of establishment-level codetermination in Germany. It conforms to the general notion that foreign ownership can involve strong tensions with the institutional patterns of the host country.

Our pattern of results is robust with respect to alternative productivity measures (value added per employee vs sales per employee). The pattern of results also remains when restricting the estimation sample to medium sized establishments. Moreover, it persists in exploratory treatment effects estimates accounting for the possible endogeneity of works council incidence.

The rest of the paper is organized as follows. In Section 2, the institutional framework is described. Section 3 presents our background discussion. Section 4 describes data and variables. The estimates are presented in Section 5. Section 6 concludes.

## 2. Institutional framework

German industrial relations are characterized by a dual structure of employee representation. While unions negotiate over wage rates and general aspects of the employment contracts, works councils provide a highly developed mechanism for establishment-level participation. Collective contracts are typically negotiated between unions and employers' associations on a sectoral level. Employers are covered by industry-level agreements if they are members of employers' associations. The share of employers covered by firm-level agreements is very small.

Works councils are formally independent of collective bargaining. Their rights are defined in the WCA. Workers in establishments with five or more employees may elect council members but the creation of the council depends on the initiative of the establishment's employees. In fact, councils are not present in the majority of eligible establishments. Councils negotiate over a bundle of interrelated establishment policies. On some issues they have the right to information and consultation, on others a veto power over management initiatives and on still others the right to coequal participation in the design and implementation of policy. Their rights are strongest in social and personnel matters such as the introduction of new payment methods, the introduction of technical devices designed to monitor worker performance, and up and down grading. They also have consultation rights, though not as strong, in matters such as changes in equipment and working methods that affect job requirements, decisions relating to manpower planning and planned

structural alterations to the plant. Their participation rights in financial matters cover only information provision.

Works councils have functions that are distinct from those of unions. They do not have the right to strike. If council and management fail to reach an agreement, they may appeal to an internal arbitration board or to the labour court. Moreover, the WCA does not allow wage negotiations. The aim is to restrict adversarial bargaining on the establishment level. Rather works councils are designed to increase joint establishment surplus. Council representatives are required by law to cooperate with management 'in a spirit of mutual trust... for the good of the employees and of the establishment'.

### 3. Background discussion

#### 3.1 Economic effects of works councils

The existence of information asymmetries and commitment problems is one explanation as to why work councils may play the intended role in fostering cooperative and trustful industrial relations. Employees will withhold effort and cooperation when an employer cannot credibly commit to take into account their interests. There is a variety of situations in which commitment problems can arise. For example, information asymmetries may cause workers to refuse concessions even when concessions are necessary to ensure competitiveness of the establishment. If employees do not share the same economic information possessed by management, they may fear that the employer overstates a crisis to demand greater concessions. Similarly, workers fearing job loss due to organizational change may try to sabotage a management-initiated restructuring of production. Moreover, if information about potentially performance-enhancing innovations is in the hands of the employees, they may not wish to reveal it for the fear that the employer may use the information to their disadvantage.

Worker representation is one way to protect the interests of the workforce and to foster workers' effort and cooperation resulting in mutual gains for the employees and the owners of the establishment (Smith, 1991; Freeman and Lazear, 1995). Providing works councils with information rights helps reduce information asymmetries. This makes it easier to verify employers' claims. Moreover, providing works councils with veto and coequal participation rights helps avoid that employers unilaterally take actions without considering workers' interests. The councils' role in building trustful employer-employee relations is also strengthened by the legal requirement to cooperate with management. Altogether, the unique institutional design suggests that councils have the potential to increase establishment performance by solving commitment problems.

However, from a theoretical viewpoint, there are opposing effects making the relationship between works councils and establishment performance ambiguous. Codetermination requires meetings between works councillors and managers. The increased time spent in discussions may slow down decision making and, hence, may result in delayed decisions. Moreover, even though the WCA aims at

of the individual establishment's probability of having a works council. This holds true for both domestic- and foreign-owned establishments.

Columns (3) and (6) provide the productivity regressions which include the inverse Mills ratio. The coefficient on the inverse Mills ratio is significantly negative in the estimates for domestic-owned establishments. This indicates endogeneity of works councils for this type of establishments. The negative coefficient on the inverse Mills ratio implies that the error terms in the probit and the productivity regression are negatively correlated. Thus, OLS underestimates the productivity-enhancing effect of works councils in domestic-owned establishments. By contrast, the inverse Mills ratio is insignificant in the estimates with foreign-owned establishments. Hence, there is no evidence of endogeneity for this type of establishments. Including the inverse Mills ratio renders the negative coefficient on works council incidence in the estimation with all foreign-owned establishments statistically insignificant. This might suggest that works councils play, at best, no role in foreign-owned establishments. Yet, the insignificance of the negative coefficient is due to an increased standard error and not due to a change in the magnitude of the coefficient. Moreover, there is no need to include the inverse Mills ratio in the estimation for foreign-owned establishments as it proves to be insignificant in that estimation. Hence, for foreign-owned establishments, the regression without the inverse Mills ratio is preferred. That regression suggests a negative role of works councils.

Altogether, even when taking the potential endogeneity of works councils into account, the estimates confirm the basic pattern of results. A productivity-enhancing role of works councils holds true for domestic-owned establishments. Works councils appear to play a rather negative role in foreign-owned establishments.

## 6. Conclusions

From a theoretical viewpoint the interplay between foreign owners and codetermination is not clear. On the one hand, works councils may reduce the high degree of uncertainty and ambiguity existing in foreign-owned establishments. This may foster workers' effort and cooperation. On the other hand, limited access to information possessed by the foreign parent company's managers, reduced power of the council to protect workers' interests, and a possibly stronger focus of foreign owners on short-term shareholder value may result in adversarial industrial relations and delayed decisions. Using the IAB Establishment Panel, our analysis provides evidence of a negative interaction. In domestic-owned establishments, works councils are associated with higher establishment performance. In contrast, they are negatively associated with establishment performance in foreign-owned establishments. This supports the view that foreign direct investment is a challenge for the industrial relations in Germany.

We recognize the need for continued research within this theme. First, future research may analyse the dynamics of the interaction between foreign ownership

and works councils. It would be interesting to examine whether or not the negative interaction effect diminishes as foreign owners and works councils accumulate experience with each other. Second, future work could examine whether the negative interaction effect depends on the home country of the foreign owner. US multinationals might be less willing to adapt to the local institution of German works councils than European multinationals which may have their own versions of works councils.

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## **Employee voice and organizational performance: Team versus representative influence**

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### **Abstract**

This article explores the effects of team voice and worker representative voice, as well as their interaction, on labor productivity. We examine team voice in terms of team influence on key work-related issues and representative voice via the degree of worker representatives' influence on multiple collective voice issues. We thus build on the European tradition of examining both direct and indirect voice and their implications for valued organizational outcomes. We find that neither type of voice bears a significant relationship to labor productivity when examined solely but that team voice significantly contributes to enhanced worker efficiency when considered in conjunction with representative voice. In examining the interaction of the two types of voice, we find that a combination of low team and low representative voice leads to inferior labor efficiency compared to other conditions. We also find a negative interaction between team voice and worker representative voice, supporting an interpretation that these types of voice do not complement each other with respect to worker productivity. The positive impact of each type of voice is significantly stronger at low levels of the other type of voice.

### **Keywords**

comparative management, continuous improvement, employee involvement, employee representation, employee voice, industrial relations, labor relations

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## Introduction

Giving employees greater influence over how they undertake their work and encouraging their input in decision-making is believed to be beneficial for both employees and employers. Studies focused on employee involvement have emphasized employees' discretion in carrying out job tasks and making workplace decisions through a variety of work organization innovations including teams and quality circles (e.g. Black and Lynch, 2004; Cooke, 1994; MacDuffie, 1995a, 1995b; Marchington and Wilkinson, 2000; Wood, 1996). However, the employee involvement studied is often restricted to employees' direct participation in day-to-day operations, through discovery, diagnosis and resolution of problems related to workplace issues, that is, upward problem-solving. The ways in which workers participate in more strategic and organization-wide decisions through various institutions and mechanisms of worker representation (e.g. unions, works councils) are often ignored in this literature.

This interest in non-union forms of employee voice coincides with the decline in unionism in a number of industries and countries. There is some evidence that in the UK at least, there has been a switch away from representative voice (be it union or non-union), towards direct employee involvement (Bryson, 2004). Drawing on the British Workplace Employee Relations Survey (WERS), Bryson finds that the fraction of UK workplaces relying solely on direct voice rose from 11 to 30 percent between 1984 and 1998, while the fraction relying on union mediated voice alone fell from 24 to 9 percent. Other research in Europe has considered this issue from a policy perspective, aimed at understanding the distribution of influence and power in organizations (Heller, 1998; IDE, 1981, 1993). These initiatives investigated the hypothesis that American firms achieved superior economic performance as a consequence of allowing more extensive worker influence (Heller, 1998); however, they found little evidence of any such connection.

In turn, the literature on economic effects of unions and other forms of representative voice has viewed direct participation by workers in management-organized voice activities with skepticism, assuming such activities were either aimed at reducing worker commitment to unions, or as superficial and unlikely to persist. Only recently have more researchers treated direct and indirect voice as viable alternatives and considered their interrelationship (e.g. Doucouliagos and Laroche, 2003; Dundon et al., 2004; Pyman et al., 2006).

In this article, we contrast direct and representative forms of employee voice and their effects on labor efficiency by looking at a targeted sector: the global automotive industry – an industry where the connections between direct and indirect voice and efficiency have been widely debated. An advantage of studying voice in the auto sector is that both direct and representative voice are well understood and diffused. Collective bargaining and other forms of worker representation (i.e. work councils, joint labor-management committees) prevail at most firms (MacDuffie, 1995b). Meanwhile, the diffusion of lean production has promoted the widespread (though unevenly distributed) adoption of more direct forms of employee voice and input such as work teams, off-line problem-solving groups, and suggestion programs (MacDuffie, 2003; Pil and MacDuffie, 1996).

In this study, we choose team voice as the proxy for direct participation. While direct participation can occur through a variety of mechanisms (e.g. two-way briefing groups;

# Teachers' Unions and Excellence in Education: An Analysis of the Decline in SAT Scores

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Controversy surrounds the recent finding that college entrance exams are lower today than they were twenty years ago, but little empirical evidence has been offered in the debate. This paper uses cross-sectional regression analysis to examine the decline in SAT scores between 1972 and 1983. Three explanations are tested: the changing social environment, the financial resources devoted to education, and the emergence of militant teacher unions. The results show teacher unionism to be the most significant factor in the decline in scores.

## 1. Introduction

In 1983, the National Commission on Excellence in Education (NCEE) warned that "for the first time in the history of our country, the educational skills of one generation will not surpass, will not even approach, those of their parents" (NCEE, 1983). Most colleges and universities require applicants to take either the American College Test (ACT), administered by the American College Testing Program, or the Scholastic Aptitude Test (SAT), administered by the College Entrance Examination Board. Both testing services, which standardize their tests so that scores in different years are comparable, report similar score declines from the mid-1960s through 1984. Although scores have risen slightly during the past two years, the increase is not nearly enough to offset the two-decade decline.

The cause of the lower test scores has been the subject of widespread debate. Much of the decline during the 1960s can be traced to the increased number of students taking college entrance exams, especially students from traditionally low-scoring groups: women, ethnic minorities, and low-income families. During the 1970s, however, fewer students took the test and the composition of the test-takers remained relatively stable, yet test scores continued to fall. This pervasive decline could come from only six sources: the test design, the innate ability of students, the characteristics of those taking the tests, the social environment, the noninstructional resources devoted to education, or the quality of instruction.

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## Union effects on performance and employment relations: Evidence from China

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### ABSTRACT

This paper empirically studies union effects on the performance of, and employment relations in, China's private enterprises. The study finds a positive and statistically significant union effect on labor productivity, but not on profitability. It further finds that unions lead to better employee benefits and increased contract signing in employment. These findings suggest that, in the era of transition from a centrally planned to a market economy, unions in China's private enterprises do promote workers' interests as unions do in other economies. And they do that without abandoning their traditional role of harmonizing employment relations, as required by the Party.

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### 1. Introduction

This paper empirically studies the impact of labor union on performance of, and employment relations in, China's private enterprises. The study is particularly valuable because it is about union effect in the context of a set of unique and striking institutional features. As the largest developing economy, China also has the largest labor force and the largest union membership in the world. Economic reform has allowed China to achieve a record of thirty years of fast economic growth with new employment going mostly into the nonstate sector. In the process, unions in China have acquired the new role of protecting workers' interests, while continuing their traditional role of harmonizing employment relations (more on this shortly). In such a unique context, what are the union effects on the performance of a business and on employment relations? How do these effects compare with those in other economies that the literature has amply studied? These are questions of great academic interest and practical importance.

During the time of central planning, almost all of China's industrial enterprises were state-owned. Labor union was mandated in these state-owned enterprises (SOEs) and subordinated to the Communist Party with union leaders appointed by the Party rather than elected by union members (Ng & Warner, 1998). With the citizens of the country as the ultimate owners of these SOEs, workers' interest was said to coincide with that of their employers.<sup>1</sup> Thus the union was not seen as a countervailing force to the

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<sup>1</sup> The unity of labor's interest with that of the SOEs as employers is consistent with the unitarist view of the employment relation as in Budd and Bhave (2008).  
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employer and not allowed to organize strikes or conduct collective bargaining as its counterparts in other parts of the world would do (Metcalf & Li, 2006). Instead, its main function was to help the government to maintain social and political stability.<sup>2</sup> The union accomplished this function mainly by sponsoring social and entertainment activities and by promoting certain welfare programs, e.g., short-term financial aid to its members with temporary financial difficulties.

Thirty years of economic reform has witnessed a drastic increase of the share of the nonstate sector in China's economy through privatization of SOEs, massive entry of private enterprises and that of multinational companies. Currently the nonstate sector accounts for two thirds of China's gross domestic products (GDPs) and 70 to 80% of its GDP growth (CAIJING Magazine, 2007). Unlike in SOEs, labor union is not mandated in nonstate enterprises. Instead, the employees would have to initiate it. With conflicting interests recognized in nonstate employment, unions in China acquired the new role of defending workers' interests, as their counterparts in other economies do (White, 1996). Free election of union leaders has also become a common practice in China's nonstate enterprises. However, despite all these changes, it remains mandatory that all unions in China follow the Party's rules and policies. Under this principle, promoting social harmony remains the highest goal for unions across China, as demanded by the Party.<sup>3</sup>

Given the mixed roles for the union to play these days (i.e., the traditional role of promoting harmony and the new role of representing the interests of workers), it is an empirical question to what extent have, or have not, unions in China transformed themselves, or how effective are they playing their roles (Clarke, 2005). Specific questions include: do unions in China help the workers to increase their incomes? If yes, in what forms and how significantly do they do it? Do unions in China affect other aspects of employment relations, such as total employment, job security, signing of employment contracts, etc.? What implications does unionization have for the performance of a business? As important as they are, to our best knowledge, these questions have not been empirically studied. This paper studies these questions and thereby fills a gap in the union literature.

Our study finds evidence of a positive and statistically significant union effect on labor productivity.<sup>4</sup> However, there is no evidence of a positive union effect on profitability.<sup>5</sup> These findings remain robust when the regression models are modified to address typical technical concerns in empirical studies.<sup>6</sup>

After the study on productivity and profitability, we further study union effects on various aspects of an employment relation, such as wage, benefits, total employment, and percentage of workers signing legally binding employment contracts.<sup>7</sup> Besides their proper importance, findings on these employment variables also shed light on possible reasons for the positive union effect on labor productivity.

It turns out that we find no evidence of a union effect on wages and bonuses, which is in contrast to the findings of most previous studies using data of developed countries. However, we do find positive and statistically significant union effects on many types of benefits, e.g., medical insurance, pension, unemployment insurance, work-related injury insurance, maternity insurance and housing subsidy. These findings are consistent with those in the existing literature, although the magnitudes of union effects on benefits in China are generally much smaller.

Besides a positive effect on income (in the forms of benefits), we also find statistically significant and positive union effects on other aspects of employment relations in an enterprise, i.e., the size of total employment, and the percentage of workers signing individual or collective employment contracts with the employer.

Two conclusions emerge from these findings. First, unions in China's private enterprises promote workers' interest, albeit mainly in the form of various employment benefits, not wages and bonuses. Second, while playing the newly acquired role of promoting workers' interests, they seem to maintain their traditional role of promoting harmony in employment relations as the union presence has an overall positive effect on labor productivity.<sup>8</sup>

<sup>2</sup> As the founding leader of the former Soviet Union Lenin famously states, one central role of unions is to be the transmission belt for delivering the Party's agenda to the working class (e.g., Lucio, 1990).

<sup>3</sup> Mr. Wang Ying, a senior official of the state-backed All China Federation of Trade Unions (ACFTU) states: "Our purpose is to guarantee a win-win situation for companies and workers. We coordinate labor relations rather than fighting against management" (Ford, 2008). Constance Thomas, head of the China Office of the United Nation's International Labor Organization, states: "They [unions in China] will not necessarily be confrontational as in the West" (Ford, 2008). ACFTU is the only legitimate union organization in China, with branches in all China's regions and major industries. Unions at individual enterprises must be approved and their operations directed by ACFTU branches at regional or industrial levels. In Budd and Bhawe (2008), an employment relationship is considered pluralistic and assumed to have some conflicting interests but also interests in making mutually beneficial arrangements between them.

<sup>4</sup> Freeman and Medoff (1984) suggest that "what unions do to productivity is one of the key factors in assessing the overall economic impact of unions". A landmark study by Freeman and Medoff (1984) finds that unions in general increase productivity. The effect varies with respect to time, place and labor relations environment. Subsequent studies report mixed findings about union effect on productivity. For good surveys, see Becker and Olson (1987), Addison and Hirsch (1989), Belman (1992), Freeman (1992), Booth (1995), Kuhn (1998), Hirsch (1997), Aidt and Tsannatos (2002), Doucouliagos and Laroche (2003), Metcalf (2003), Menezes-filho and Reenen (2003), and Bennett and Kaufman (2007), among others.

<sup>5</sup> In general, when productivity improves, profitability may increase with it, remain unchanged or even go down. The reason is that revenue and profit may both increase with productivity, but, without further specification, their relative magnitudes of increases are not determined. Empirically, negative union effect on profitability has been found using data of developed countries, e.g., Freeman and Medoff (1984).

<sup>6</sup> To address the possibility of reverse causality, the presence of unions is regressed on enterprise performance in the previous year with or without control for a host of other variables. No evidence of reverse causality is found. The findings on productivity and profitability are also robust to the median regression analysis, to the subsample of enterprises started as private enterprises as opposed to those privatized from SOEs, and to the subsample of enterprises whose majority shareholder has more than 50% equity shares.

<sup>7</sup> In China's private sector, it has been more typical than not that an employer does not sign an official employment contract with a worker. We thank an anonymous referee for pointing out that the increase of labor productivity in unionized enterprises could be due to many possible reasons. For example, higher productivity could also be explained by greater work effort induced by higher employment benefits, as in the logic of agency theory. Alternatively, enterprises could attract more capable workers with higher employment benefits. Note that these explanations are not mutually exclusive. The small union effect on benefits we found, however, suggests likely limited effect of effort or ability, and thus a nontrivial impact of employment relations on productivity. Regardless of its explanation, the higher productivity we found suggests that unions promote workers' interests not at the cost of harmony.

## PERFORMANCE-RELATED PAY AND FIRM PRODUCTIVITY: EVIDENCE FROM A REFORM IN THE STRUCTURE OF COLLECTIVE BARGAINING

CLAUDIO LUCIFORA AND FEDERICA ORIGO\*

The authors investigate the causal effect on firm productivity of a switch from fixed wages to collective performance-related pay, exploiting a reform in the structure of collective bargaining triggered by a social pact. They find that an increase in the adoption of collective performance-related pay leads to a 3 to 5% productivity gain but that such effect declines over time. They show that the effect on productivity varies substantially by firm size, industry affiliation, and union density. Both the size of the bonus and the design of the scheme—in terms of number and types of parameters used—are also important features for a firm's productivity.

The compensation packages of a growing proportion of firms, particularly in the private sector, include pay schemes linking pay to employee or company performance (Bloom and Van Reenen 2011). The economic effects of these pay incentives have been extensively investigated, and a large theoretical literature seeks to explain how firms should design compensation schemes to motivate workers in their jobs and maximize firms' profits (for a review, see Prendergast 1999).

While several studies document large productivity gains associated with the adoption of individual performance-related pay (PRP) schemes and in particular piece rates (Lazear 2000; Bandiera, Barankay, and Rasul 2005; Freeman and Kleiner 2005), robust evidence on the impact of collective PRP on firms' productivity is still scarce. Some empirical studies show that collective PRP is able to generate productivity gains for firms, although they are not as large as those found for individual PRP (Cahuc and Dormont 1997; Origo 2009; Gielen, Kerkhofs, and van Ours 2010). Furthermore,

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KEYWORDS: performance-related pay, productivity, unions

studies based on firm-level panel data show that these gains, albeit relatively small, also benefit the employees through higher earnings (Andrews, Bellmann, Schank, and Upward 2010; Long and Fang 2012), and the returns to performance pay are larger for ethnic minorities, particularly in the case of minority women (Fang and Heywood 2006, 2010).

One problem in comparing the above findings, however, lies in the different identification strategies generally used in the literature: while the studies on collective PRP mentioned above usually exploit the panel structure of the data to estimate fixed-effects models, those on individual PRP exploit quasi-natural experiments occurring in the compensation scheme at a given firm.

Both strands of literature have limitations. On the one side, the approach based on panel data provides consistent estimates of the causal effect as long as the changes in the pay structure are strictly exogenous, or alternatively if all the differences between treated and control firms can be attributed to firm-specific fixed effects. The strict exogeneity assumption is violated if firms choose to change their pay structure on the basis of past productivity levels, which is often the case. On the other side, the approach that exploits quasi-natural experiments, being based mostly on specific case studies, often lacks external validity for the results.

This article improves on the previous literature by combining the two approaches above. First, we use a very rich firm-level panel data set for the Italian metal engineering industry and implement a fixed-effects model to account for firms' unobserved heterogeneity. Second, we exploit an exogenous change in the institutional setting, which—in the frame of a social pact—changed the structure of bargaining, shifting firm-level collective bargaining from fixed wages to PRP schemes. The focus on the Italian experience provides an interesting case, as little empirical evidence is available on the effects on firms' productivity of a move to decentralized bargaining, with a variable pay scheme defined as a cash-based bonus linked to specific indicators of productivity, profitability, or other measures of firm performance. While social pacts traditionally involve a policy contract between the government and social partners over income policies and other macroeconomic targets, issues concerning the structure of collective bargaining or firms' payment systems are relatively uncommon (Baccaro and Lim 2007; Hassel 2009; Avdagic, Rhodes, and Visser 2011). Finally, we investigate the existence of heterogeneous productivity effects by firm characteristics (i.e., firm size, industry, and unionization level), paying specific attention to the role of the design of the premium and the actual amount of the bonus paid.

### Theory and Empirical Evidence

Economic theory predicts that collective PRP schemes should be used when it is difficult to measure individual performance. Their use should reduce monitoring costs (Fitzroy and Kraft 1995) and increase the workers' effort, with subsequent positive effects on aggregate productivity: When individual pay depends on aggregate performance, everyone has an incentive to monitor his or her coworkers to avoid opportunistic behaviors that may reduce

*Table 7. Effect of the Amount of the PRP Bonus on Firm Productivity*

|  | <i>All firms with PRP</i> |                     |                     |                     |
|--|---------------------------|---------------------|---------------------|---------------------|
|  | (1)                       | (2)                 | (3)                 | (4)                 |
| Log (PRP bonus)                                    | 0.033***<br>[0.011]       | 0.038***<br>[0.011] | —                   | —                   |
| [Log (PRP bonus) – log (PRP bonus – industry avg)] | —                         | —                   | 0.028***<br>[0.010] | 0.033***<br>[0.010] |
| Firm fixed effects                                 | Yes                       | Yes                 | Yes                 | Yes                 |
| Time fixed effects                                 | Yes                       | Yes                 | Yes                 | Yes                 |
| Firm controls                                      | No                        | Yes                 | No                  | Yes                 |
| R-squared (overall)                                | 0.498                     | 0.506               | 0.497               | 0.506               |
| Observations                                       | 2,539                     | 2,519               | 2,539               | 2,519               |
| Number of firms                                    | 1,103                     | 1,097               | 1,103               | 1,097               |

*Notes:* Full model specification as in column 5 of Table 3. Robust standard errors in brackets. Dependent variable: Log of Real Sales per Worker (Linear Fixed-Effects Estimates)

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$ .

while much larger productivity effects (around 10%) and greater persistence over time (at least for the first three years after the introduction) are found in the case of Korea (Kato et al. 2010).

### Concluding Remarks

This study provides an estimate of the causal effect on firm productivity of a switch from fixed wages to collective PRP, triggered by a reform of the structure of collective bargaining that occurred in Italy in the mid-1990s. This reform represents an exogenous shock that shifts the probability of adopting collective PRP at the firm level, which we used to identify the productivity effect. Using a unique and very rich firm-level panel data set for the Italian metal engineering industry, we implemented a fixed-effects model combined with a quasi-natural experiment and showed that the introduction of collective PRP led to productivity gains of up to 3–5%, which progressively declined over time. Our results are in line with previous findings for other countries and confirm that a modest (positive) effect is to be expected when the average size of the premium paid out is rather small (in our case, around 500 euros yearly). In other words, we find empirical support for the hypothesis that the intensity of incentives does matter for workers' effort and firm performance.

We also found that the productivity effects are heterogeneous across different firm types. Our results indicate that the productivity gains are larger in medium to large firms, high-tech industries and firms with a low level of unionization. We showed that the design of the PRP scheme (in terms of the number and types of parameters) also matters for firm performance. We found the productivity gains to be smaller in the case of PRP schemes based on a large number of performance indicators, while we found no effects

when a "conditional clause" was used (i.e., when the premium is paid only if the firm makes non-negative profits, regardless of the other targets). This result suggests that collective PRP schemes generate productivity gains when they are targeted to workers' effort, while they are not effective when introduced to share risks with workers.

In terms of policy implications, our results suggest that reforms of the institutional setting regulating wage determination and the structure of collective bargaining may be effective in promoting the diffusion of incentive schemes and ultimately firms' productivity. In terms of our estimates, the 1993 reform has proved effective in fostering firms' productivity through the introduction of collective PRP schemes. Any public incentive (subsidies or fiscal deductions) to promote the adoption of such schemes should, however, be carefully evaluated as large deadweight losses may arise as a result of the heterogeneous nature of the pay arrangements within firms.

In more general terms, we can argue that the different social pacts that were implemented in Italy over the 1990s proved to be the only feasible way—given the combination of a weak political setting and widespread social consensus—to reform the labor market and social protection. Moreover, social pacts framed as tripartite agreements may provide a favorable environment in which to make the reforms work by promoting compliance even in the absence of formal incentives or sanctions.

## Relations industrielles

### The Effects of Unions on Profitability: Canadian Evidence

Dennis R. Maki and Lindsay N. Meredith

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#### Article abstract

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# *The Effects of Unions on Profitability*

## *Canadian Evidence*

Dennis R. Maki

and

Lindsay N. Meredith

*Considering rates of return on capital, sales and assets, the evidence primarily but not unambiguously supports a negative effect of unions on profitability. Whether this occurs only through effects on wages and labour productivity or through other channels as well is unclear.*

Despite an impressive collection of recent empirical work investigating the effect of trade unions on a number of variables (Freeman and Medoff, 1984; Clark, 1984, Addison 1985), the effect on profits has received little attention. Perhaps as noted by Freeman and Medoff (1981, p. 60) this is due at least in part to the fact that profits are «an extremely difficult variable to measure». However, data on an accounting measure of profits are usually available, and econometricians have generally been willing to use available data, even if they have obvious deficiencies as measures of what is really desired. We suspect a major reason for the paucity of empirical work in this area has been broad acceptance of the notion that unions have a negative effect on profits. After all, if they do not have such an effect, why have employers historically been so active in opposing unionization? Still, there is surely interest in estimating how large the effect has been, and as Clark (1984) discusses, in determining the manner in which this effect occurs<sup>1</sup>.

This paper investigates the effect of trade unions on profitability in Canadian manufacturing industries, using pooled cross section-time series data for the 20 two-digit industries over the time period 1971-1981. Since the previous literature has suggested that unions have not affected the profit/sales ratio, but have had a negative effect on the return on capital

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<sup>1</sup> Further, those who believe the world to be essentially competitive in the long-run, with all firms earning normal profits in the absence of unions, would argue unions could not reduce the rate of profit. They could at most force some firms out of business.

(Freeman and Medoff, 1981, p. 61), we focus on examining the effect of different denominators as measures of «profitability». We present evidence in the form of reduced form models, as suggested by Clark (1984), as well as simultaneous equation models.

### THEORETICAL CONSIDERATIONS

A naive theoretical formulation might specify that the effect of unions on profits is determined by the effect of unions on wages and labour productivity<sup>2</sup>. There is a large literature suggesting unions have a positive effect on wages (e.g. Macdonald and Evans, 1981); and while the literature concerning the effects of unions on labour productivity is neither as well developed nor unambiguous in its findings (Maki, 1983), the possibility of a positive short-run effect has not been convincingly refuted. Hence, one could argue that unions could have a positive, negative or zero effect on profits. Under this theoretical framework, it would appear that the effect of unions on profits will be properly estimated when the effect of unions on productivity is properly estimated (assuming we «know» the effect on wages).

However, as Clark (1984, pp. 893-903) discusses in detail, the matter is not this simple. First, even under a neoclassical monopoly unionism model, the effect of a union wage differential on the rate of return on capital depends upon the elasticity of substitution of capital for labour. Second, consideration of other models which allow unions to «force employers off their demand curves», and consideration of the structure of the output market faced by the firm, further complicate the analysis.

As discussed in Freeman and Medoff's recent book (1984), unions may affect many aspects of a firm's operations, and since profit is the «bottom line», all of these effects may impinge on profitability. A selected listing of potential effects follows. First, there is evidence that unions have a larger effect on fringe benefits than they do on money wages per se (Freeman, 1981), suggesting that total labour costs, and not wages alone, should be considered. Second, since labour productivity would be expected to rise with the capital-labour ratio, *ceteris paribus*, while profitability is not a monotonically increasing function of this ratio, labour productivity is not a sufficient measure of «productivity» for current purposes. Third, while union wage differentials would be expected to lead to increases in labour quality, the apparent compression of skill differentials attributed to unionism (Kumar, 1972) can lead to very complex labour quality effects

<sup>2</sup> BROWN and MEDOFF (1978) argue in this vein.

across the skill spectrum. Fourth, wage and other rigidities introduced by multi-year union contracts can alter the cyclical behaviour of profitability. Fifth, the wide variety of provisions usually lumped together under the phrase «work rules», ranging from seniority systems and grievance procedures to possible protection of malfeasance, can all potentially affect profitability, some positively and some negatively. Finally, there is some evidence that firms change management teams and management systems upon becoming unionized (Clark, 1980), and this could affect profitability, even in ways unrelated to changes in personnel management directly.

The main points of this section are: (i) that the effect of unions on profitability is an empirical question, since even naive theories yield ambiguous predictions, and (ii) the very large number of ways in which unions could potentially affect profitability implies that it is extremely difficult to pin down exactly how this effect, whatever it turns out to be, comes about.

#### MEASUREMENT PROBLEMS

In contrast to the quote from Freeman and Medoff noted in the introduction to this paper, Caves, et al. (1980, p. 223) state that «profits are highly visible and easily measurable and as a result have probably been the most studied dimension of market performance». As a practical matter, data are available on pre-tax profits and post-tax profits, and the choices facing the researcher are (i) which of these to use, and (ii) whether to adjust them in some way prior to statistical estimation. Regarding the first question, there is precedence in the literature for both approaches, as Clark (1984) uses pre-tax profits and Caves, et al. (1980) use post-tax profits. We decided to use pre-tax profits, under the rationale that they would be less affected by variations in accounting practices among industries. We further use the reported data (from Statistics Canada, 61-207) without adjustment, denoting the variable as PROFIT.

It is useful, however, to note some of the adjustments which could potentially have been made. First, one could conceptually deal with a concept of «total profit» (or perhaps «potential profit»), where some of this represents actual returns to the owners of the firm, some of it represents rents captured by workers (generally through unions) and some of it represents rents squandered in technical inefficiency (Caves, et al., 1980, p. 23). It is obviously a different question to ask whether the total «pie» available to be shared between workers and the owners of the firm is affected by unionization, than it is to ask whether the amount available to the residual claimant is so affected. Although both questions are of interest, we decided to deal with the conceptually simpler one in this paper. We would

## INTERPRETATION AND CONCLUSIONS

We thus have 9 estimates of the effect of unions on profitability, with 7 of these negative and 2 (equations 6 and 7) positive. Both of the positive estimates are small in absolute value relative to the magnitudes of the estimated negative effects. Further, there is wide variation in the magnitudes of the estimated negative effects. Hence, we have not been very successful in pinning down the size of the effect, and there is even contrary evidence regarding the sign.

Given this, it is not surprising that we were unsuccessful in isolating the channels through which the effect (if there is one) operates. Equation 7 provides one answer to the question — all effects operate through wages and labour productivity, and these effects are offsetting, leaving an overall effect near zero. Equations 8 and 9 provide a different story — there is a negative effect operating through channels other than wages and labour productivity — but this story is unreliable due to wrong signs on the wage and/or productivity variables.

Despite this lack of conclusiveness in our results, we present them for the benefit of other researchers who find the questions addressed interesting. Only through considerable replication will a better understanding of the effects of unions on profitability emerge (Mayer, 1980).

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but the effect is not statistically significant at any conventional level. The magnitude of the coefficient is 16 per cent of the mean of VAPE, indicating almost offsetting effects of unionism on wages and labour productivity, a result previously noted by Brown and Medoff (1978). Equation 12 indicates unionization is strongly affected by WAGE, a result previously reported in Maki and Christensen (1980).

Turning to the results of primary interest, equation 7 indicates the rate of return on capital is negatively related to WAGE and positively related to VAPE, both effects being strongly significant. The coefficient of UNION is positive, but small in magnitude and not significant at any conventional level. Hence, this equation indicates that the effect of unions on profitability operates exclusively through wages and labour productivity, and not through other channels. The magnitude of the overall effect of an increase in UNION of 0.1 can be estimated as follows:  $2.659(-0.0031) + 0.27(0.02)$  + 0.004 = 0.0012, a positive number. Multiplying this times the mean of CAP and expressing the result as a percentage of the mean of PROFIT yields 0.8 per cent. Thus, abstracting from significance levels, equation 7 implies almost no effect of unions on the rate of return to capital.

Equation 8, which uses the rate of return on sales as the dependent variable, indicates no significant effect of WAGE on profitability, with a positive and significant effect for VAPE and a negative and significant direct effect for UNION. This estimation thus suggests that if there is a negative effect, it operates through channels other than effects on wages and labour productivity. Calculating the overall effect of an increase in UNION of 0.1 as before:<sup>11</sup>  $2.659(0.000011) + 0.27(0.005) - 0.08 = -0.0066$ . Multiplying this times the mean of SALES and expressing the result as a percentage of the mean of PROFIT yields 9 per cent, a smaller estimate than obtained from reduced form equation 5 of Table 2.

Finally, equation 9, which uses the rate of return on assets as the dependent variable, yields unexpected signs on both WAGE and VAPE, with a large t value for the former. The direct effect of UNION is again negative, indicating that any negative effect on profitability operates through channels other than wages and labour productivity. Calculating the overall effect of a change in UNION of 0.1 for this equation yields -0.0037, which when multiplied times the mean of ASSETS and expressed as a percentage of the mean of PROFIT is about 4 per cent.

<sup>11</sup> Given the structure of the model, the estimates of equations 10-12 do not change when different profit rate equations are substituted in the model.

# Union Retreat and Regional Economic Performance: The UK Experience

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MONASTIRIOTIS V. (2007) Union retreat and regional economic performance: the UK experience, *Regional Studies* 41, 1–14. A panel of regional data is used to investigate the impact the well-documented decline in trade unionism in the UK had on the economic performance of its regions. The analysis departs from the traditional firm-level and cross-sectional analyses and looks at the economy-wide effects of unionism. The findings provide evidence in line with theory that predicts that unions will increase wages and unemployment, but they also indicate that unionism is positively related to productivity and incomes, although in all cases the effects are non-linear. It is concluded that unionism is not necessarily a burden for the economy, so long that the beneficial wage/productivity effects outweigh the negative effects on employment.

Trade unions    Regional economic performance    Panel data    Spatial effects

MONASTIRIOTIS V. (2007) Le déclin syndical et la performance économique régionale: étude de cas du R-U. *Regional Studies* 41, 1–14. On emploie des données régionales provenant d'un échantillon permanent afin d'examiner l'impact bien connu du déclin syndical au R-U sur la performance économique régionale. L'analyse s'éloigne des analyses conventionnelles qui se font auprès des entreprises et à partir des données ponctuelles, et considère l'impact du syndicalisme à l'échelle économique. Les résultats sont en accord avec la théorie qui prévoit une augmentation des salaires et du chômage à cause des syndicats mais ils indiquent aussi que le syndicalisme est en corrélation étroite avec la productivité et les revenus, bien que, dans tous les regards, l'impact s'avère non-linéaire. On conclut que le syndicalisme ne pèse nécessairement pas lourdement sur l'économie, pourvu que les retombées positives des salaires/de la productivité l'emportent sur les retombées négatives de l'emploi.

Syndicats    Performance économique régionale    Échantillon permanent    Retombées géographiques

MONASTIRIOTIS V. (2007) Der Rückzug der Gewerkschaften und die regionale Wirtschaftsleistung: die Erfahrungen in Großbritannien, *Regional Studies* 41, 1–14. Anhand eines Panels aus Regionaldaten untersuchen wir, welche Auswirkungen der gut dokumentierte Niedergang des Gewerkschaftswesens in Großbritannien auf die Wirtschaftsleistung der britischen Regionen hatte. In unserer Analyse gingen wir über die herkömmlichen Analysen auf Firmenebene und Querschnittsanalysen hinaus und untersuchten die wirtschaftsweiten Auswirkungen des Gewerkschaftswesens. Unsere Ergebnisse liefern Belege zur Bekräftigung der Theorie, dass Gewerkschaften zu einem Anstieg von Löhnen und Arbeitslosigkeit führen; sie weisen jedoch auch darauf hin, dass Gewerkschaften einen positiven Einfluss auf Produktivität und Einkommen haben, wobei freilich die Auswirkungen in allen Fällen nicht linearer Natur sind. Wir zielen den Schluss, dass Gewerkschaften nicht unbedingt eine wirtschaftliche Last darstellen, solange die positiven Auswirkungen auf Löhne und Produktivität die negativen Auswirkungen auf das Beschäftigungs niveau ausgleichen.

Gewerkschaften    Regionale Wirtschaftsleistung    Paneldaten    Räumliche Auswirkungen

MONASTIRIOTIS V. (2007) Receso de los sindicatos y desempeño económico regional: el ejemplo del Reino Unido, *Regional Studies* 41, 1–14. Con ayuda de datos de un panel regional, aquí investigamos en qué medida tuvo el bien documentado declive del sindicalismo británico una influencia en el desempeño económico de sus regiones. Nuestro estudio se aleja de los análisis tradicionales de datos entre empresas y datos con diseño transversal y se centra en los efectos del sindicalismo en la economía a todos los niveles. Los resultados obtenidos coinciden con la teoría que prevé que los sindicatos aumentan los salarios y el desempleo pero también indican que el sindicalismo está positivamente relacionado con la productividad y los ingresos, aunque en todos los casos los efectos son no lineales. Concluimos que el sindicalismo no es necesariamente una carga para la economía, siempre y cuando los efectos beneficiosos de los salarios y la productividad superen a los efectos negativos del desempleo.

Sindicatos    Desempeño económico regional    Datos del panel    Efectos espaciales

JEL classifications: J51, R11, R23

## INTRODUCTION

Trade union membership in the UK has followed a declining path over the last two decades, a trend that was only recently halted (METCALF, 2001). This decline was quite robust across different individual and workplace characteristics, including education, gender, industry and location (BLAND, 1999; PENCABEL, 2003). As unions are expected to impact adversely on labour effort and productivity, increase labour costs, and above all generate wage inflation and unemployment, the so-called union retreat has been largely seen as a potential for enhanced flexibility and more competitive economic performance. Nevertheless, the empirics of the economic impact of unionism are not fully consistent with such a view. While the literature provides robust evidence for the wage-increasing role of unions, it reaches less clear conclusions regarding their impact on other economic aggregates. Some studies have found unionism to have a positive impact on investment (MACHIN and WADHWANI, 1989) and productivity (BROWN and MEDOFF, 1978; NICKELL *et al.*, 1989, 1991), but other studies have reported significant negative effects on output (DEFINA, 1983), output growth (NICKELL and LAYARD, 1998), employment growth (BLANCHFLOWER and OSWALD, 1988), productivity (CLARK, 1984; LOVELL *et al.*, 1988), and profitability (FREEMAN, 1983; MACHIN, 1991). Findings on the employment effects of unionism are equally diverse (MINFORD, 1982; SINCLAIR, 1987; BLANCHFLOWER and MILLWARD, 1988), while more aggregate studies have also obtained inconclusive results (OECD, 1997; NICKELL and LAYARD, 1998).

A plausible explanation for these conflicting findings is the implicit influence of the structure of wage bargaining, in line with the 'U'-shaped relationship between centralization of bargaining and economic performance identified by CALMFORS and DRIFILL (1988). Intuitively, estimates of the union effects will vary with the position that the sample economies occupy on the Calmfors–Drifill curve (i.e. the employment effects of unionism will be more negative the closer the country is to intermediate levels of bargaining coordination). Another explanation relates to the selection of the unit of analysis. More often than not cross-sectional firm-level studies find non-unionized firms to grow faster than their unionized counterparts (BLANCHFLOWER and MILLWARD, 1988). In contrast, time-series and panel-data studies frequently observe insignificant or positive employment effects for unions (NICKELL *et al.*, 1989). It is thus possible that the general equilibrium effects of unionism are different to its partial equilibrium effects.<sup>1</sup> Similarly, in a third line of explanation, unions can be a burden to the economy under perfect competition, but improve economic performance under monopolistic conditions and powerful internal labour markets (MAYHEW, 1983; BOOTH and CHATTERJI, 1998; AMABLE and GATTI,

2001). Thus, firm-level studies focusing on competitive sectors of the economy can plausibly observe different mechanics than those identified at the larger scale where market imperfections are more evident.

In fact, the idea that unionism can have both positive and adverse effects has a long history in the literature. In their influential work, FREEMAN and MEDOFF (1984) identify two faces for unionism, one related to wage increases and labour input rigidities ('monopoly face'), the other to higher organizational efficiency, lower labour turnover, and more investment in physical and human capital ('collective voice' face). The debate about the importance of these two faces of unionism is still ongoing, over 20 years after the publication of this work (e.g. JOURNAL OF LABOR RESEARCH, 2004; BENNETT and KAUFMAN, 2006; and FREEMAN'S, 2005, response).

The present paper investigates empirically the impact that declining union density in the UK had on its regional economic performance.<sup>2</sup> It adopts a macroeconomic perspective to examine the economy-wide union effects. The use of the region as the unit of analysis allows one to combine such a perspective with a relatively homogenous set of economies under a homogenous institutional setting. The question asked is to what extent has trade union density had an impact on regional economic performance during the period of sharp decline in unionization rates and overall healthy national economic performance. Further, whether this impact was regionally uneven and whether it helped reduce regional disparities. For the first question the possibility of both linear and non-linear (concentration) effects is examined. For the second, the focus is on the possible presence of spatial dependence, which would indicate that local characteristics generate similar or inverse outcomes in local and neighbouring areas (spatial diffusion or spatial competition, respectively). The next section reviews the regional evolutions and the changing magnitude and functioning of unionism at the regional level during the period. The third section makes some brief theoretical considerations, while the fourth section presents the empirical investigation and discusses the results. The last section concludes.

## REGIONAL ECONOMIC PERFORMANCE AND CHANGES IN UNIONISM

The UK suffered a significant recession in the early 1990s but thereafter experienced sustained rates of growth in a stable macroeconomic environment. As is well documented (e.g. MARTIN, 1997), the regional economies of the UK share a similar business cycle and thus regional economic performance was analogous to that of the national economy. Following the cycle, regional unemployment rates increased and then declined in all regions, while employment rates and

## Economies of Scale and Hospital Productivity: An Empirical Analysis of Medical Area Level Panel Data\*

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### Abstract

This paper estimates the total factor productivity (TFP) of hospitals by using panel data drawn from prefectures and secondary medical areas. The study focuses on the economies of scale at the medical area and hospital levels. It uses the average length of stay as a measure of medical quality. We avoid case-mix bias by using data from medical areas instead of those from the hospital level. We control unobservable regional characteristics by employing panel data estimation. We eliminate price disparities among regions by using quantity data. Our results show that hospital size affects productivity: the larger the hospital, the higher the productivity. The hospital-size effect is economically significant: hospital productivity increases by more than 10% when the size of the hospital doubles. The size effects are null when we do not control the average length of stay. The main policy implication is the clear fact that consolidating hospitals improves productivity.

Key words: hospital, medical area, length of stay, TFP, economies of scale

JEL Classification: D24, I11, L84

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## 1. Introduction

This paper presents empirical evidence concerning the total factor productivity (TFP) of hospitals in Japan. Japan's healthcare sector is becoming an important part of its economy as its population rapidly ages. National healthcare expenditure in fiscal 2007 was 34.1 trillion yen, or 9.1% of the national income. Healthcare expenditure has been increasing by 1.7% every year since fiscal 1997, while its ratio against national income has increased by 1.5% over the same period. Thus, productivity growth in the healthcare sector significantly impacts Japan's aggregate economic performance.

Many have criticized Japanese hospitals for their high beds-per-population ratio, their too-long lengths of stay, and their small capacity. In fact, OECD statistics from 2007 suggest that Japan's rate of acute care hospital beds per 1,000 people is 8.2, more than twice the OECD average (of 3.8 beds) and the highest rate among all OECD countries (see Figure 1). The average length of stay for acute care in Japan is 19 days, three times longer than the OECD average (of 6.5 days) and the longest among all OECD countries.<sup>1</sup> In fiscal 2008, the cost of inpatient care was 13.2 trillion yen, representing 73.3% of total hospital costs: thus, inpatient-care productivity is the dominant factor in overall hospital productivity. The average length of hospital stay is thought to be a major factor in rising medical costs for the elderly. The “Outline of Medical Care System Reform” (2005), as proposed by the Government mandated that Japan's average length of stay be reduced 4.5 days by 2015.

A number of studies have pointed out that changes in quality must be incorporated in calculating healthcare productivity. Some of the studies that have measured productivity changes in the treatment of specific conditions (such as heart attacks, low birth weight, depression, and cataracts) have indicated that the quality of the medical services has been rapidly improved by technological advances (see, for example, Berndt et al., 2000; Cutler and Berndt, 2001). The Boskin Commission Report, which investigated the upward bias of the U.S. Consumer Price Index (CPI), estimated that the CPI on medical services was overestimated by about 3% per year because the rate had not been properly adjusted for quality changes (see Gordon and Griliches, 1997). The updated estimate by Lebow and Rudd (2003) found that the CPI on medical services still had a 2.3% upward bias. Thus, explicit considerations of quality

changes are essential in analyses of the productivity and efficiency of healthcare services.

This paper therefore estimates the TFP of Japanese hospitals by using the shortening of the length of stay as a proxy for quality improvements in medical services. The regional-level panel data used here comes from the Hospital Report and the Survey of Medical Institutions (Ministry of Health, Labour and Welfare). This study focuses on the economies of scale at the hospital and medical area levels in Japan. Morikawa (2009), for example, found significant establishment-level economies of scale for personal service industries, which are larger than those for average-sized manufacturing plants; this result suggests that the expansion of the establishments' size through consolidation may contribute to the productivity growth of the service sector. However, Morikawa's study was limited to a few market services, such as movie theaters, bowling alleys, and fitness clubs. According to Propper and Van Reenen (2010), the UK Government undertook a reconfiguration of hospitals in the late 1990s and early 2000s in order to gain scale economies. We are interested in the potential effectiveness of such a policy on Japanese medical services.

Using micro data at the establishment or firm level is a recent trend in empirical studies on productivity. However, the appropriate treatment of differences in case-mix has been a challenge for researchers studying hospital productivity (see Newhouse, 1994). Hospitals are well known to be quite heterogeneous in their patients and treatments. Using regionally aggregated data is one of the practical ways of controlling the case-mix (see Keeler and Ying, 1996). Japan's "The Medical Care Plan System" identifies "medical area" as the basic regional unit capable of providing various medical services independently. This paper estimates the production functions of hospitals by using data from the prefecture and "Secondary Medical Area" levels. The 47 prefectures usually correspond to the "Tertiary Medical Area," whose medical services include advanced medical treatments, such as those for intractable diseases.<sup>2</sup> The tertiary medical areas are divided into several secondary medical areas. The secondary medical areas are designed to provide inpatient medical services (except advanced medical treatment) self-sufficiently. There were 348 secondary medical areas as of 2008.<sup>3</sup>

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<sup>1</sup> OECD Health at a Glance 2009.

<sup>2</sup> Hokkaido and Nagano, geographically large prefectures in Japan, are the exceptions, each containing more than two tertiary medical areas.

<sup>3</sup> City is the unit of the Primary Medical Area, which provides primary care services.

Our analysis confirms the existence of economies of scale: the larger the hospital, the higher its productivity. Hospital size effect is economically significant: hospital productivity increases by more than 10% when the size of the hospital doubles. This effect cannot be detected without considering the quality of medical care as proxied by the average length of stay. In other words, quality improvements in healthcare services enhance hospital-level economies of scale. This result suggests that the consolidation of small hospitals into larger ones may increase the overall productivity of the healthcare sector.

This paper is structured as follows. Section 2 briefly reviews the literature on the estimation of hospital productivity. Section 3 describes the data employed and the method of analysis. Section 4 reports the estimation results. Section 5 presents conclusions and their policy implications.

## 2. Related Literature

A comprehensive survey of the numerous studies on the productivity and efficiency of hospitals is beyond the scope of this paper, but we briefly review the related literature. Most studies use the estimation of cost functions and the data envelope analysis (DEA) rather than the estimation of production functions because of the diversity of hospital outputs and inputs. Moreover, studies often employ stochastic frontier analysis (SFA) to estimate cost function. Hollingsworth (2003, 2008) provides a good survey of these methods. Many estimations of cost functions found economies of scale in hospitals (Vitaliano, 1987; Carey, 1997; Li and Rosenman, 2001; Preyra and Pink, 2006, among others). However, many studies do not adequately deal with the case-mix bias and service quality. In addition, the cost-function approach has a disadvantage: pecuniary cost is inevitably affected by the time-series changes in price or price differentials among hospitals or regions.

Most of the prior studies use hospital-level micro data to analyze the performance of hospitals, but controlling the difference in case-mix and service quality among hospitals has been difficult (see Newhouse, 1994). Keeler and Ying (1996) use state-level aggregated data in order to avoid case-mix bias in their analysis of the social cost of excessive bed capacity in the community hospitals. Keeler and Ying assert that "larger hospitals get sicker, more expensive

provides ordinary inpatient medical services self-sufficiently.

We also estimate the translog production functions in order to check the robustness of the results. The coefficients for inputs are not well measured, due perhaps to multicollinearity, but the coefficients for the average size of hospital are almost identical to those of the Cobb-Douglas production functions (see Table 4). The findings concerning the significant economies of hospital scale prove to be robust against the choice of the functional forms.

The above results are based on the quality-adjusted output measure. Would they be different if we used the quality-unadjusted output measure as a dependent variable—the annual cumulative number of inpatient days? Table 5 presents the regression results by using a simple quality-unadjusted output measure. According to the pooled OLS results, the coefficients for labor input become very small, the coefficients for capital (beds\*utilization rate) are close to unity, and the statistical significance level is very high (see Table 4 (1), (3)). The number of beds adjusted by the utilization rate determines the cumulative number of inpatient days almost entirely. This result suggests that the Medical Care Plan System introduced in the 1985 revision of the Medical Care Act and the regulation of the number of beds seems to have effectively controlled the actual number of beds.

The estimation results for prefectures show that the coefficients for the size of hospital are small and produce a significant negative figure (-0.0014) in the pooled OLS and are marginally significant and produce a small positive figure (0.0084) in the fixed effect model (see Table 4 (1), (2)). The effects of doubling the average hospital size on the TFP are -0.1% (OLS) and 0.6% (FE). In the secondary medical area, the coefficient for hospital size is insignificant (OLS) and produces a positive but small figure (FE). All of these results are completely different from the results generated by quality-adjusted output measurements. Economies of hospital scale impact on the TFP mainly through the effects of improvements to medical service quality. An appropriate treatment of the length of stay is a critically important component of the analysis of hospital efficiency.

## 5. Conclusion

Medical services are becoming increasingly important as Japan deals with its rapidly aging

population. This paper estimates the total factor productivity of hospitals by using Japanese regional-level panel data. The study pays special attention to the economies of scale at the medical area and hospital levels.

This paper use quality-adjusted total inpatient days as the hospitals' output measure in assessing policy initiatives designed to control medical costs. We use the length of hospital stay to represent the quality of inpatient care. The appropriate treatment of case-mix variability among hospitals has been an important measurement issue in estimating hospital productivity. Using regionally aggregated data is one of the practical ways to control for the case-mix bias. Regional differences in demographics, habit of meals, and endemic diseases often complicate healthcare analyses. We control time-invariant regional characteristics by using panel data sets spanning more than 10 years and employing a fixed effect estimator. Furthermore, this paper employs physical (quantity-based) input and output measures, as an appropriate price deflator to create real value is often difficult to find in a productivity analysis spanning several years. The measured physical productivity is unaffected by time-series changes in price or price differentials among regions.

The analysis in this paper uncovers statistically and economically significant economies of scale at the hospital level. Hospital productivity increases by more than 10% when the average size of hospitals at the secondary medical area level doubles. This effect cannot be confirmed clearly without considering the "quality" of the medical care as proxied by the average length of stay. In other words, hospital-level economies of scale are generated through improvements in the quality of inpatient care. On the other hand, this study finds no medical area level economies of scale. These results suggest that the consolidation of small regional hospitals into larger ones may contribute to the productivity growth of the healthcare sector.

Of course, the quality adjustment in this paper is minimal, because we do not adjust for such "outcomes" of a treatment as may occur after the treatment ends, such as an extension of a life span or an improvement in QOL. In addition, this study does not explicitly consider the amenities of hospitals, the work intensity of physicians, the input of medicines, and the quality of medical equipment. However, the bias caused by the omission of these variables is not serious in comparison with the hospital-level analysis, as this paper uses the prefecture and the secondary medical area as its analytical units.

## Information technology and the changing workplace in Canada: firm-level evidence

Saeed Moshiri\*† and Wayne Simpson\*\*

Recent advances in information and communication technology (ICT) have had dramatic effects on both individual and workplace performance. Use of computers and the Internet as general-purpose technologies has spread rapidly across all sectors of the economy, transforming business organization, increasing competition, and fostering innovation. Understanding the influence of ICT on the dynamics of the workplace requires information on both demand and supply sides of the labor market, but it is only recently that the study of both sides of the market has become feasible using linked employer–employee data. In this article, we investigate the effects of new technology on firm productivity using the rich Canadian Workplace and Employee Survey for the period 1999–2003. We apply a mixed regression model which includes both firm and employee characteristics as well as their interactions with computer use. Our model allows us to control for unobserved heterogeneity at higher levels along many dimensions. Our findings indicate that computer use by employees has a positive and significant effect on the productivity of firms that the effect has not lost its momentum, and that spillover effects are not significant. Moreover, human capital enhances the effect of computer use on productivity, but organizational changes do not interact with computer use in our sample period.

JEL classification: J00, J24, J80, O33.

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## 1. Introduction

Recent advances in information and communication technology (ICT) have had dramatic effects on workplace performance. The computer and the internet, as general-purpose technologies (GPTs),<sup>1</sup> have spread rapidly across all sectors of the economy, transforming business organization, and increasing competition. A major concern about new technology is the extent to which its implementation affects both individual and business productivity and the channels through which these productivity effects occur. The introduction of new technology is usually associated with the costly destruction of old technology as inputs and outputs are reorganized and replaced and, in some cases, even relocation occurs. A new technology affects output not only directly by lowering production costs, but also indirectly by interacting with human and organizational capital.<sup>2</sup> Highly skilled workers can increase the productivity of firms by contributing to problem solving and also by being able to quickly learn new technology and work with high-tech machines. Computerization of the workplace also affects the structure of the organization, leading to greater accumulation of organizational capital. Furthermore, the networking and communication characteristics of computer technology extend its productivity effects beyond the individual firm or industry.

There exists a large body of empirical literature on the effects of ICT on productivity at the national, industry, and firm levels, but many of those studies suffer from measurement errors and/or misspecification. Some studies have used manufacturing industry data, excluding the ICT-intensive service sector, while others have not taken into account the network and external effects of ICT and its interactions with production inputs. The ICT-productivity studies also ignore the effects of intangible assets such as new managerial practices, new skills, and new workplace organization, information not available in official statistics (Brynjolfsson and Hitt, 2002; Basu *et al.*, 2003; Dufour *et al.*, 2007).

Many micro level studies have been limited to either demand- or supply side data.<sup>3</sup> Understanding the dynamics of the workplace and its changes due to the use of new technology requires information on both the demand and supply sides of the

<sup>1</sup>A GPT is a single-generic technology, recognizable as such over its whole lifetime, that initially has much scope for improvement and eventually comes to be widely used, to have many uses, and to have many effects that spread through the economy well beyond the sector that produces the GPT itself (Carlaw *et al.*, 2007). Examples of GPT are the steam engine and electricity.

<sup>2</sup>Human capital is defined as skilled, experienced, trained, and educated labor. Organizational capital refers to factors affecting the structure of the workplace such as job rotation, number of managerial positions, downsizing, and employee–employee or employee–employer relationships (decentralization, teamwork, job training, and labor flexibility.) See Black and Lynch (2004), Lev (2003) and Brynjolfsson *et al.* (2002) for details.

<sup>3</sup>Demand-side data are usually found in plant or firm level surveys and supply-side data in household or individual level surveys.

**Table 5** Computer applications and firms productivity

| Computer applications                       | Coefficients (SE) |
|---|-------------------|
| Word processing                             | 0.01 (0.01)       |
| Spreadsheets                                | 0.05*** (0.01)    |
| Databases                                   | 0.01 (0.01)       |
| Desktop publishing and form design          | -0.02 (0.02)      |
| General management applications             | -0.01 (0.01)      |
| Communications                              | 0.02** (0.01)     |
| Programming languages and development tools | -0.01 (0.02)      |
| Specialized office applications             | -0.01 (0.01)      |
| Data analysis                               | 0.03*** (0.01)    |
| Graphics and presentations                  | 0.01 (0.01)       |
| Computer-aided design                       | -0.04** (0.02)    |
| Computer-aided engineering                  | 0.00 (0.02)       |
| Expert systems                              | 0.02 (0.02)       |
| Other                                       | -0.01 (0.01)      |

The other covariates included in the model are firm characteristics, and employee characteristics. \*\* and \*\*\* indicate significant coefficients at 5 and 1 percent, respectively.

here should be interpreted cautiously. There are more state of the art applications such as ERP (Enterprise Resource Planning), which supports all firm functions and their interactions, and internet applications like e-business and e-procurement that may have significant impact on firm productivity, but these applications are not included in the survey. In addition, the intensity of use of each application may be important to a firm's productivity, but it is not captured by a simple Yes/No survey question.<sup>14</sup>

## 7. Conclusion

The computer as a representation of the new information and communication technology has both direct and indirect effects on the productivity of firms. The direct effect is the capital deepening effect through which a firm would increase its production by using more computers as their relative price decreases. The indirect effect is through the interaction of the computer with human capital and organizational capital within a firm. The use of computer as a network and knowledge capital in one firm would also have spillover effects on productivity of the other firms. In this

<sup>14</sup>We thank an anonymous referee for making these points.

article, we investigate the effects of computer technology on the productivity of firms using the Canadian linked longitudinal WES data. We use a mixed regression model to control for unobserved effects at multiple levels of the industry, size, and time.

Our estimation results show that computer use by employees has positive and significant effects on firms' productivity. Specifically, we find that a 10 Percentage point increase in the ratio of computer users in a firm would result in about 0.67% higher productivity. Moreover, an employee spending one more hour on a computer application enhances the productivity of firms on average by about 0.3%. Our estimates also imply that the impact of computer technology on productivity has not lost its momentum and will likely continue in the future.

We find, however, that computer use has not had a spillover effect on productivity during our sample period. We have offered several suggestions why spillover might not occur. High concentration in Canadian manufacturing may imply that firms internalize the knowledge and learning spillover. A second possibility is that Canadian firms network more with US firms than with local and national firms. Therefore, one should look for spillover effects occurring across the border rather than within Canada.<sup>15</sup> Our measure of spillover might not adequately represent the network and knowledge effects of the computer. While the number of computer users in other firms may represent spillover through the network, it may not adequately capture the flow of knowledge generated by the use of technology in other firms. And finally, one might argue that technological spillover would prevail when the technology is at its growth stage. This is particularly true in the case of networking. When the size of a network passes a critical point, then there should not be any spillover due to the growth of the network. Computer use in Canadian firms has probably reached a point where the growth of the network does not add any extra benefit to an individual firm.

The inclusion of interaction terms between computer use and employee and firm characteristics reveals interesting outcomes. For instance, although on average female employees have a negative effect on productivity (ignoring the possible bias due to measurement errors in productivity), its insignificant interaction with computer use indicates that the computer effect is gender neutral. Furthermore, although the contribution to productivity by employees born abroad is on average more than that by Canadian born employees, the latter increase productivity through the use of computers. The results also show that unionization on average favor productivity, but reduce the positive effect of computer use on productivity. Human capital, measured by level of education and experience, has positive effect on productivity both directly and through its interaction with the computer. Organizational changes, however, do not have any significant impact on productivity and on the relationship between computer use and productivity. This unappealing result may stem from the fact

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<sup>15</sup>Moshiri and Nikpoor (2010) find evidence of ICT spillover among OECD countries.

that most firms likely experienced their organizational changes in the early- and mid-1990s when computer technology began to be widely used. In our sample period, most firms have stable organizational structures, and therefore there is no contemporaneous interaction between computer use and organizational changes. Finally, we find that among the computer applications types, those that aid in multiple information worker tasks such as spreadsheets and data analysis are the applications that enhance firms' productivity significantly.

Although our focus in this article is the impact of information technology on productivity, the rich WES data set allows us to examine the effects on the productivity of firms of many factors from both the demand and supply sides of the labor market. Our mixed regression model controls for possible hierarchical structures in the data and produces consistent estimates. Some caveats in interpreting the results apply, however. Mixed models produce better results when the number of higher level clusters is large. Although our number of industries is relatively large, the number of size categories and years are not. Nevertheless, since our main two-level mixed estimation results are not significantly different from those in the three-level model when size and year levels are added to the model, this might not cause major concern. Furthermore, our measure of productivity is subject to bias, particularly because it uses the number of employees rather than the number of hours. This possible bias might have been reflected in the female coefficient, assuming that females are more likely to work part-time. Alternatively, one may use other measures of productivity and computer use using the WES data. For instance, there are some categorical data on different dimensions of productivity such as improving quality, producing new products, and lowering costs. Although our measure of productivity is more objective than those categorical answers, examining the questions addressed here using those alternative measures would be a worthwhile exercise.

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## Teachers' Unions and Excellence in Education: Comment

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*In a recent article in this journal, Michael Kurth presented what he considered evidence that teachers' unions impair educational achievement and that what they must do to increase teachers' salaries is harmful to educational excellence. This comment critically examines Kurth's misspecified model and the misleadingly defined variables that led to the erroneous empirical support for his conclusion. Our own estimates indicate that states with a high level of collective bargaining had higher SAT scores in 1982.*

### 1. Introduction

Michael Kurth's (1987) recent article in this journal, "Teachers' Unions and Excellence in Education: An Analysis of the Decline in SAT Scores," suggested that little empirical evidence has addressed the decline in Scholastic Aptitude Tests (SAT) scores. He concluded from his empirical investigation that teacher unionism is the most significant factor contributing to the decline in SAT scores. To our knowledge, Kurth is alone in suggesting that teachers' unions have any influence over SAT scores. Exhaustive studies by the Congressional Budget Office (1986, 1987), which considered dozens of explanatory variables and hundreds of studies, failed to find any consideration of teachers' unions. Has Michael Kurth brilliantly identified teachers' unions as the critical factor that academics and policy makers have overlooked? We argue otherwise.

Kurth's theoretically shallow, oddly constructed model of misleadingly defined variables is not designed to show that collective bargaining leads to lower SAT score levels. We first outline our objections to the model and its measurement. Then we present a regression model that unequivocally shows that states with a high level of collective bargaining had higher SAT scores in 1982.

### II. Misleading Model Specification and Variable Definitions

*Mixing Longitudinal and Cross-sectional Analysis.* In his study, Kurth should have first determined the relationship between the level of collective bargaining and SAT score levels — as we do in the concluding section of this comment — before describing a relationship between the change in test scores and the change in collective bargaining. The narrative explanation of Kurth's model tends to

describe either determinants of SAT score levels or national changes in SAT scores, not interstate variation in the change of SAT scores. The mathematical notation of the model also describes SAT score levels, not the change in scores. Kurth's coefficients, on the other hand, estimate the rate of change in the percentage change in SAT scores — often as a function of the rate of change in the percentage change of the predictors.

*Change Measured Inappropriately.* Kurth measured the change in SAT scores as the percentage change. A 10-point gain for South Carolina, with a mean score of 790 in 1982, represents a 1.27 percent increase, while a 10-point gain for Iowa, with a mean score of 1,088, represents a .92 percent increase. Standardized test scores, however, are interval scores, and it is not appropriate to conclude, for example, that a student with an SAT score of 800 knows twice as much as a student with a score of 400. Similarly, a 10-point gain in Iowa should indicate a change equivalent to a 10-point gain in South Carolina. Test score change or gain scores are usually measured by regressing the initial score — the 1972 SAT score in this case — on the most recent score — the 1982 test (Hamushiek, 1971; Eberts and Stone, 1984).

*Test Takers Inappropriately Defined.* Kurth's definition of change in test takers as the percentage change in the percentage of high school graduates taking the SAT allows states with few test takers (in 1982, in Arkansas, Iowa, Mississippi, North Dakota, South Dakota, and Utah, 4 percent or less of high school graduates took the SAT) to register very large changes in this variable, compared to states with a high proportion of graduates taking the test (in 1982, 11 states had more than half of the graduating class taking the SAT).<sup>1</sup> This criticism applies to most of the independent variables, which should be measured as differences rather than as percentage changes.

At a minimum, *Test Takers* should be specified as a non-linear variable. Powell and Steelman (1984) found that the relationship between the percentage of students taking the test and the test score was non-linear. By adding the square of the percent of students taking the test,  $R^2$  increased from .736 to .819.

*Private Schools Speciously Measured.* For mysterious reasons, Kurth defined private school enrollment as the ratio of graduates from private high schools to the number of graduates from public high schools in 1979-1980. In Delaware, for example, the ratio of private school graduates to public school graduates is .193, even though 16.2 percent of high school graduates came from private schools. Unlike any other variable, *Private Schools* was measured neither as a percentage change nor as a difference. Kurth's private school measure was statistically significant (at the 10 percent level), but the percentage of high school graduates from

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<sup>1</sup>Kurth defined test-takers in his appendix as the change in the number of students, not the proportion of students; but in the text he referred to the proportion of high school students.

## The Impact of Teachers Unions on State-Level Productivity

*Louis J. Pantuosco and Laura D. Ullrich*

### ABSTRACT

Using a reduced form version of a theoretical expansion of Hoxby's (1996) education production model, we investigate whether bargaining teachers unions are a boon or a bust to the economy of the state. We anticipate teachers, being in the public sector veiled from competition, are less likely to be efficient. Yet, their product, education, enhances worker productivity and total output. If teachers are successful at their task of educating society's youth, their added value could be observed in society's production function. In a given state, gross state product (GSP) measures output from the use of capital and labor resources. By using GSP per employee as a measure of productivity, we find a negative correlation between GSP per employee and the percentage of unionized teachers within states where bargaining is permitted. Furthermore, we confirm a positive wage effect of teachers unions on state productivity. In addition, we investigate whether the negative changes in state GSP per employee and the positive wage effect offset each other in states with bargaining teachers unions.

### INTRODUCTION

State and local governments dedicate a large percentage of their financial and human capital toward education. In general, the pledge of resources is more pronounced in states where teachers unions thrive. In 2000, average per pupil spending was over \$7,500 in states where teachers unions were allowed to bargain. In states where unions do not have bargaining power, per pupil spending was only \$6,450.<sup>1</sup> Teachers unions espouse that higher compensated, organized teachers better prepare students for the challenges incumbent on the modern workforce. They rationalize that in return for the states' investment in

1. Data from the NCES School and Staffing Survey

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schools, the union will help produce a well-rounded, socially informed student who makes a positive contribution to society.<sup>2</sup>

However, the wage premium that attracts and maintains high-quality teachers, also allures opponents who question the union's benefit to the production process. For example, a battle has surfaced in New York where lawmakers and the teachers union (NYSUT) find themselves in opposition. The Governor proposed a cap on the growth of school taxes limiting funds earmarked for education. The union responded to the Governors request by withholding their endorsement of 38 senators who supported the Governors idea, and stating that union members, who are also New York taxpayers, do not desire tax relief at the expense of school spending.<sup>3</sup>

There is a dichotomy between how teachers articulate the contributions of their union(s) and how others in society appraise their worth. The unions claim their objective is not to change a test score—it is to change the overall climate of education within the school or school district.<sup>4</sup> However, union opponents contend that unions are simply rent seekers who have no measurable positive impacts on their clientele.<sup>5</sup> With this conflict in mind, we set out to estimate the effects of teachers unions by evaluating whether states with active teachers unions display higher GSP per employee than states where bargaining is not allowed. The GSP per employee instrument of productivity provides a broad measure of the teachers unions' impact on the value added to a state's economy.

While there is much benefit in capturing the immediate effects of education on students, the state's primary objective is to develop a generation of political, government, business, and community leaders who contribute to the greater good of society. In other words, what really matters is the journey of the union-educated students after he/she graduates.

Using a cross-sectional sample of U.S. states for the years 1994 and 2000, we utilize gross state product per employee as a measure of an employee's contribution to society. We recognize and attempt to control for the difficulties of pinpointing the teachers unions' impact on state output per employee. We also take into consideration a multitude of control factors that could contribute to state GSP per employee. Controlling for these factors allows us to more accurately analyze the benefits of teachers unions on worker productivity.

We hypothesize that the enhanced financial commitment of state and local government funds toward education, fostered by teachers unions, should result in a more diverse, better trained student body that is able to adapt more

2. <http://www.nea.org/aboutnea/statement.html>

3. [http://www.silive.com/news/index.ssf?/2008/08/ny\\_teachers\\_union\\_targets\\_lawm.html](http://www.silive.com/news/index.ssf?/2008/08/ny_teachers_union_targets_lawm.html)

4. Hanushek (1986, 2001)

5. See Hoxby (2004), Peltzman (1993), and Jefferson (2005)

## THE POLITICAL ECONOMY OF THE DECLINE OF AMERICAN PUBLIC EDUCATION\*

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### I. INTRODUCTION

THE state of American public education has become something of a national obsession. A mournful consensus seems to have formed around two conclusions: (1) American schools have performed poorly in comparison with schools in other countries, and (2) things have gotten worse over time. As my title indicates, this article is more motivated by recent changes in performance than by its average level. It is also motivated by a fact often neglected in discussions of school performance. The overwhelming majority of American elementary and secondary schools are political creatures. They are publicly owned, operated, directed, and funded. I want to see if the political character of the marketplace within which schools operate has something to do with the way they perform. For reasons elaborated subsequently, the data I analyze are incapable of providing a complete explanation of the decline of public school performance. So, even if this decline is entirely a political phenomenon, I could

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not corroborate that. Accordingly, I pursue the more modest goal of exploring the plausibility of a link between school performance and politics.

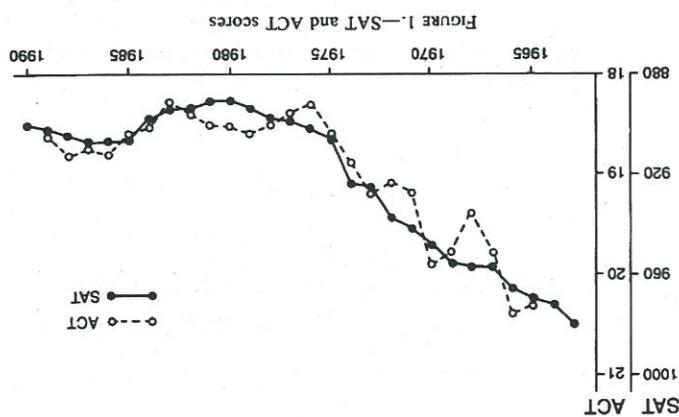
This exploration follows a strain in the economic analysis of politics whose lineage includes Anthony Downs, Mancur Olson, and George Stigler.<sup>1</sup> This emphasizes the political effectiveness of compact, organized groups whose members have large stakes in the outcome of the political process. My approach is straightforward, even crude. I try to identify the politically potent groups with a stake in public school performance. Then I let the data show if declining school performance is related to measures of the strength of these groups or, more precisely, to measures of the change in their strength. My conclusion is that the plausible role of politics is substantial.

This conclusion needs, right at the outset, to be put into context. Declining school performance is in no group's direct interest. There is no Alliance for Terrible Schools. Nor, probably, is there any meaningful Alliance for Good Schools. This is not the sort of issue that is amenable to direct political control. If it were, good performance would win unanimously every time. The plausible sense in which school performance is a political choice variable is the one familiar to economists: other public objectives may compete with it. This is most obvious in public budget allocation decisions. A business group, for example, may care about the quality of its employees' education but also about the quality of the roads and the tax rate. Whether this group's political heft adds or subtracts from the resources devoted to promoting school performance depends on the weight of these competing objectives. Similar trade-offs arise in the allocation of resources (including effort and energy) within school systems. It is naive (and, as shown below, inconsistent with some key results in the literature) to treat school systems as if they seek only to maximize literacy or numeracy.

This article is organized as follows: The next section reviews the evidence on trends in school performance and the results of the social science literature on the same topic. This is followed by an outline of my political-economic approach to analysis of school performance and a description of some of the changes in the political economy of education that motivate it. Then I analyze a specific measure of the trend of school performance—changes in average scores on college entrance tests in a state. The goal is to see if cross-state performance changes are plausibly related to changes in the state's political economy. I find that they are.

<sup>1</sup> Anthony Downs, *An Economic Theory of Democracy* (1957); Mancur Olson, *The Logic of Collective Action* (1965); George Stigler, *The Theory of Economic Regulation*, 2 *Bell J. Econ. & Mgmt. Sci.* 3 (1971).

processes of deterioration that was compressed into a relatively brief period of less than two decades. The meager data available before the 1960s show no deterioration, perhaps even improvement over time. The more voluminous recent data show no further deterioration after around 1980 and some improvement. So today's concerns have to be about the tenuousness of recent improvement or its small size compared to the large differences of the main facts. Figure 1 shows scores on the two college entrance exams taken by most college-bound high school seniors—the Scholastic Aptitude Test (SAT) and the American College Testing (ACT) Programs. ACT Assessment. These scores will form the backbone of the empirical work in this article and are described in an appendix.<sup>3</sup> For present purposes, the notable feature of Figure 1 is that scores decline from the early 1960s to about 1980 and then level off. Pre-1960 data are sketchy and available only for the SAT. But the earliest available data for 1956 would be roughly at the 1962 level. Figure 2 has the disadvantage of coming entirely from one unrepresentative state (Iowa). But the Iowa tests cover virtually all students instead of just those going on to college, and they yield the only annualized data spanning the period of



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## II. THE DECLINE IN SCHOOL PERFORMANCE

Specifically, I find that the growth of teacher organizations, a shift of financial responsibility to state governments, and, more surprisingly, changes in a state's industrial structure all affect school performance. These effects, however, are not always simple or easily reconciled with common intuition. When teacher organizations become more important, school performance is rarely unaffected, but it does not always change the same way. When a state's most politically potent industries demand more highly educated workers, school performance deteriorates. I attempt to illuminate these odd results and then conclude with a summary and discussion of the implications of these cross-section results for national trends in school performance.

I will not review this evidence in detail. What is important about it is its perniciousness and breadth—virtually every available measure of student performance shows lower performance in 1980 than in 1960. The timing is also important. There is no doubt that the American polity is sorely vexed by the sad state of its schools. The business sector complaints about its maleficiated labor force. Proposals abound to permit parents to opt out of traditional public schools. And former President Bush wishes to be remembered as the “education president” who turned things around. But it appears that all this is old news. As nearly as one can tell, things have been slowly illuminating around for over a decade.

The lament that “things are worse than they used to be,” refers to aAccordingly, current concerns have to be put in a temporal context. Applications of Recent Trends (1987), Educational Achievement: Explanations and Implications of Recent Trends (1986). Both have useful summaries of the evidence underlying this conclusion.

The survey goes on to point out that the decline seems to have stopped in the late 1970s or early 1980s, and, in most cases, there has been a partial recovery of the previously lost ground.

I will now review this evidence in detail. What is important about it is its pervasiveness and breadth—virtually every available measure of student performance shows lower performance in 1980 than in 1960. The timing is also important. There is no doubt that the American polity is seriously vexed by the sad state of its schools. The business sector complains about its male educated labor force. Proposals abound to permit parents to opt out of traditional public schools. And former President Bush wishes to be remembered as the “education president” who turned things around. But it appears that all this is old news. As nearly as one can tell, things have been slowly turning around for over a decade.

Accordingly, current concerns have to be put in a temporal context. The lament that “things are worse than they used to be,” refers to a

The conclusion that school performance has declined is based primarily on evidence from standardized tests. A Congressional Budget Office survey summarizes this evidence: "The existence of a sizable drop in test scores during the 1960s and 1970s has been well known for some time. The decline was remarkably pervasive affecting many different types of students in most grades, in all regions of the United States, in Catholic as well as public schools and even in Canadian schools. The drop was apparent in the results of tests covering many subjects."<sup>22</sup>

ceased in this decade. By 1980, most of the shift of financial responsibility from local school boards to state governments had been completed. The growth of teacher unionization had ceased. The racial transformation of southern schools had been completed, and none had begun in the North. Even the growth of inputs slowed markedly.

How did school performance respond to the external environment in this "calmer" period? To get some insight, I repeat the cross-section analysis for 1981-89. One result is that the relative improvement in the 1980s is not due simply to adaptation to the preceding changes in the political environment. For example, the simple correlation between test score changes in the 1970s and 1980s is almost imperceptibly negative (-.12). This means that states that declined most previously did not recover in the 1980s. The first regression in Table 7 shows this another way. It includes all the variables in regression 3, Table 5, as well as updated values of the same variables. If the 1980s were a period of adaptation, the effects of these lagged variables should be opposite to their effects in the 1970s. But, by and large, this is not the case. The one possible exception is that the favorable effects from early success by the NEA seem to disappear in the 1980s: the negative coefficient of the 1967 NEA share in Table 7 is roughly equal in magnitude to the positive coefficient of the same variable in Table 5. This is consistent with the story that the NEA became more like a conventional union over time.

The only notable results from the current period variables concern expenditures and AFT unionization. The regression suggests that, unlike the 1970s, input growth detracted from performance in the 1980s. The absolute value of the coefficient here is around half the magnitude of its counterpart in Table 5. These seemingly contradictory results raise questions that go beyond the scope of this article. They include, Did the rapid previous input growth push to the point of vanishing returns? Are marginal school resources more effective in countering a hostile environment, as in the 1970s, than in producing new gains? The answers to such questions have important implications for research strategy as well as public policy.

As for AFT unionization, the results for the 1980s and 1970s are the same. In the second wave of teacher unionization, where the AFT succeeded, performance declined.<sup>57</sup> And the magnitude of the effect is nearly the same as in the first period.

The other results are negative. Performance is unaffected in states that lagged in assuming a larger financing role or in granting teachers new

<sup>57</sup> I only have the cross-state distribution of unionization for a single year in this period (1982). However, it is a reasonable conjecture from the aggregate data that the cross-state distribution did not change much subsequently.

TABLE 7  
RELATIVE TEST SCORE CHANGES, 1981-89

| REGRESSION AND PERIOD FOR INDEPENDENT VARIABLES | Expenditures | State Revenue Share | Unionization |              | Industry Pressure | $R^2/SEE$ |
|---|--------------|---------------------|--------------|--------------|-------------------|-----------|
|   |              |                     | NEA          | AFT          |                   |           |
| 1a. Current:<br>Form Coefficient                | D7189        | D7189               | D6782        | D6782        | D7284             | ...       |
|   | -70<br>1.6   | .017<br>.6          | -1.15<br>.9  | -4.70<br>2.1 | .017<br>.3        | ...       |
| 1b. Lagged:<br>Form Coefficient                 | D6181        | D6181               | L67          | L67          | L72               | ...       |
|   | -38<br>.9    | -.024<br>1.0        | -1.97<br>1.7 | -2.13<br>.9  | .028<br>.7        | 11/1.39   |
| 2a. Current:<br>Form Coefficient                | D7189        | D7189               | D6782        | D6782        | ...               | ...       |
|   | -75<br>1.9   | .002<br>.1          | -.91<br>1.0  | -3.98<br>2.0 | ...               | ...       |
| 2b. Lagged:<br>Form Coefficient                 | ...          | ...                 | L67          | L67          | ...               | ...       |
|   | ...          | ...                 | -1.67<br>1.8 | -2.18<br>1.1 | ...               | 16/1.35   |
| 3. Current:<br>Form Coefficient                 | D7189        | ...                 | L82          | L82          | ...               | ...       |
|   | -72<br>1.9   | ...                 | -1.20<br>1.8 | -3.38<br>2.9 | ...               | ...       |
| 4. Current:<br>Form Coefficient                 | D7189        | ...                 | L82          | L82          | ...               | ...       |
|   | -59<br>1.4   | ...                 | -1.05<br>1.5 | -3.26<br>2.8 | ...               | 21/1.31   |
|   |              |                     |              |              | D7087             | ...       |
|   |              |                     |              |              | -.28              | ...       |
|   |              |                     |              |              | .7                | .20/1.32  |

SOURCES.—For current independent variables, expenditures, and state revenue share, see note to Table 5. For unionization, see note to Table 2. Sources 3 and 4 in Table 2 provide state data on AFT membership in 1980 and total union density in 1982. I allocate the latter among unions as described in the note to Table 2. For teacher bargaining law, The data base and procedures described in app. B of Richard B. Freeman & Casey Ichinowski, When Public Sector Workers Unionize (1988), are used to construct indexes of teacher bargaining rights as of 1972 and 1984, and the change in these indexes is used in regression 1. For industry pressure index, see note to Table 6 and text. Initial values of the components are from 1970 census of population. Terminal values are from the 1985-88 Current Population Surveys.

Note.—The dependent variable is the coefficient of regression of average test score on time, 1981-89. Lagged independent variables are those used in regression 3. Table 5. Current independent variables are the updated counterparts of these lagged variables. "Form" identifies the type of variable and the time period; D means change or rate of change; L means level. Thus, "D7189" means "change from 1971 to 1989"; L72 means "level as of 1972," etc. SEE = standard error of estimate.

SUMMARY AND EXTENSIONS

ventional story about the source of this pressure is right, there would be implied a trade-off between concern for resource equalization and for performance.<sup>58</sup>

The most interesting slant on the decline in public school performance in this article comes from analysis of the "consumer" interest rather than the interests of education providers. It begins with the fact that as the public schools deteriorated the social importance of formal education rose dramatically. The share of college graduates among adults (parents) more than doubled over the period of declining public school performance. By the end of this period, a college education had become a new middle-class birthright. This juxtaposition of rising parental education attainment and declining school performance suggests that better-educated voters do not constitute a powerful pressure group for better public schools. I was able to confirm this directly: the change in school performance across states is uncorrelated with the change in adult educational attainment. This could be taken as another example of the unimportance of the diffuse interest (here, all parents) in politics.

But there are also concentrated interests among the consumers of public school output. Most of that output is soon hired by businesses, and that interest can be politically important. Indeed, Chubb and Moe<sup>59</sup> argue that the decline in school performance ended because "the business community mobilized [its] formidable political resources behind demands for high-quality academic education—thus focusing and, in effect, serving as a vanguard for the broader, more diffuse constituency for reform at the grassroots." A corollary of this is that some weakening of the business interest in public school quality had something to do with the preceding decline. In the context of my article, this would mean that in states where this interest weakened most school performance declined the most.

I implemented this notion by taking advantage of the geographic concentration of industries. This concentration creates variety in the political role of an industry—the auto industry is more important in Michigan than in Montana. Changes in industrial location also change the distribution of political influence. For example, the auto industry's political importance in Kentucky and Tennessee has likely grown as new plants have been built there. If a politically important industry has an increased demand for public school performance, or, if an industry with a high de-

<sup>58</sup> I tried unsuccessfully to extend the result on financing to another contemporaneous form of centralization, the consolidation of local school districts. When the change in the log of school districts was added to regression 1, Table 6, the resulting *t*-ratio was 0.1. Similar results were obtained for the residual from a regression of the change in log of school districts on initial district size and the change in the rural share of population.

<sup>59</sup> *Supra* note 16, at 9.

mand for performance grows more important politically, school performance should improve. My finding was that where the politically important industries' use of educated labor grew most and where the newly important industries used the most educated labor, school performance deteriorated most. The clear, if counterintuitive, implication is that increased reliance on educated labor weakens the political demand of business for public school performance.

My measure of "educated labor" was the fraction of (value added by) employees with at least four years of college education. That fraction grew as rapidly for the politically important industries as for the others in the period when school performance was deteriorating. And the implied negative correlation in my data between employment of college graduates and the demand for school quality was strongest in this period. (The correlation remains negative but weakens in the 1980s.) One interpretation consistent with all these facts is that in the political market college-educated labor is a substitute for elementary/secondary education. Then, when the local public schools provide a smaller share of the human capital being hired by politically important industries, their stake in, hence their political pressure for, public school quality would diminish. This may be a rational response to the free-rider problem inherent in a college-intensive industry's lobbying for improved local school quality when it draws workers from a national market.

This interpretation implies both good news and bad news for the future performance of public schools. The good news is that credentialization of the American work force has slowed in the last decade. This would mean that the erosion of the share of the public school's claim on the political capital of business has at least abated. The bad news is that this claim is unlikely to grow, let alone return to what it was a generation ago. This means that mobilizing political pressure by employers for improved public school will be harder than a generation ago when local public schools provided the vast bulk of their employees' formal education.

I conclude by grappling with the connection between school performance and social disintegration. I added two social indicators—the 1960–80 growth of crime<sup>60</sup> and of the fraction of children under the age of eighteen not living with both parents to regression 1, Table 6. Neither was conventionally significant, but the family structure variable had a "suggestive" positive coefficient (*t* = 1.6). None of the other coefficients or *t*-ratios were much affected by including these variables.

The appropriate lesson of this exercise is not that broken homes are

<sup>60</sup> I averaged the change in logs of six crimes: murder, rape, assault, burglary, robbery, and auto theft.

<sup>16</sup> For my sample size of forty-four, a correlation over .3 is significant at 5 percent.

(which breed declining school performance) require liberal policy regime). The liberal interpretation might be that hostile environments manue). The liberal interpretation of these facts (and of the decline in school performance roughly from .2 to .6.<sup>16</sup> There is, of course, both a liberal and a conservative teacher union variation. The correlations are all positive and range state and a measure of bedrock "liberalism," in the state's electorate to the teacher union matrix in Table 8, which just adds the two social trends in a correlation characterized as "liberal." All this is summarized by the initial pressure for teacher unionizations. These were environmental farthest in the same political family tended to go rising crime rates and the decline of the nuclear family. As it happens, social trends also helps put other results in sharper focus. As it happens, the absence of a negative association between school performance and supported by my data.

Thus, the view that declining school performance was just another symptom (or a result) of increased social disintegration in the 1960s is not cope with phenomena does not detract from student performance. And crime. My result does suggest that the need of a broken homes are not the ones primarily affected by a rising prevalence of broken homes good for school performance. For one thing, prospective college entrants

NOTE.—*N* = 44 states, as in Tables 5-7.  
1970, 1980; For NEA, AFT, LAW, see note to Table 5.  
family, see U.S. Census of Population, Vol. 1, U.S. Summary, Characteristics of the Population (1960, 1970, 1980). For NEA, AFT, LAW, see Table 5.

| Variable   | 1   | 2   | 3   | 4   | 5   |
|--|-----|-----|-----|-----|-----|
| CORRELATION MATRIX: SOCIAL CHANGE AND POLITICAL ENVIRONMENT, 1961-80   |     |     |     |     |     |
| 1. Liberalism of the electorate: McGovern share in 1964  | .36 |     |     |     |     |
| 2. Family structure: change in share of children born less than eighteen not living with their parents, 1960-80  | .36 |     |     |     |     |
| 3. Crime: average change in logs of crime rates, six successive crimes, 1960-80  | .23 | .28 |     |     |     |
| 4. NEA share 1967  | .47 | .44 | .25 |     |     |
| 5. AFT share 1967  | .36 | .54 | .23 |     |     |
| 6. LAW: index of teacher union bargaining rights, 1972   | .57 | .45 | .29 | .32 | .47 |
| SOURCES.—For liberalism and crime, see Statistical Abstract of the United States (various years); for family, see U.S. Census of Population, Vol. 1, U.S. Summary, Characteristics of the Population (1960, 1970, 1980); for NEA, AFT, LAW, see note to Table 5. |     |     |     |     |     |

My results suggest that neither view is quite right when applied to declining school performance. While social trends and the political environment have dispelated the growth of teacher unions have common elements, these effects argue against my interpretation. These disparate elements have dispelated the growth of teacher unions have common elements, these mon set of characteristics that create a hostile environment for school performance.

## POLITICAL ECONOMY OF PUBLIC EDUCATION: NON-COLLEGE-BOUND STUDENTS\*

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### ABSTRACT

My previous research showed that two important changes in the political environment of public schools—growing teacher unionization and a shift of funding responsibility to state governments—adversely affected the performance of college-bound students. Here I show similar impacts for public school students who do not go to college. These effects are found in analyses of 1971–91 changes in a school performance measure derived from individual scores on the Armed Forces Qualifying Test. Comparative analysis of performance trends in different areas of the same state suggests that the adverse performance effects of teacher unionization and spending centralization stem from their impact on state educational policy rather than on the direct operation of schools. These adverse effects are also found for students in the lower tail of achievement and for black students. They are not plausibly related to broader political and social changes.

### I. INTRODUCTION

THE recent performance of American public education has been disappointing. Over the last 3 decades real spending per pupil has almost tripled, but available measures of student achievement have deteriorated. The most often cited measure is the Scholastic Aptitude Test (SAT). The national average on this widely used college entrance test declined about .4 standard deviations from 1965 to 1980 and has essentially remained at this lower level since then. Scores on the other widely used college entrance test, the American College Testing Program's ACT Assessment, follow a similar pattern. While there is room for quibbling about details, it is reasonably clear that trends on the SAT and ACT are broadly repre-

\* I am grateful to the Defense Manpower Data Center for providing the data on military applicants that provides the basis for this study and for providing data on zip code characteristics from their DORIS database. I also want to thank Derek Neal for making available to me his data from the National Longitudinal Survey of Youth and for his help in understanding these data and for his comments on an earlier draft. Kevin Murphy, Eric Hanushek, Sherwin Rosen, and William Fischel provided valuable comments and suggestions. Jamie Johnson and David Greeley provided invaluable research assistance. Research support from grants to the George J. Stigler Center for the Study of the Economy and the State, University of Chicago, by the Sarah Scaife Foundation and the Lynde and Harry Bradley Foundation is acknowledged with gratitude.

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sentative, at least for the eventful 1965–80 period. The basic literacy and numeracy of public school students waned even as the resources devoted to the enterprise waxed.<sup>1</sup>

In a previous article,<sup>2</sup> I argued that analysis of the performance of American elementary and secondary schools should not ignore the mainly public character of that enterprise<sup>3</sup> and the resulting political context within which most school resources are allocated. Evidence in that article suggested that changes in the political economy of public education—specifically, the growth of teacher unionization, the shift of responsibility for school finance from local school boards to state governments, and the increased reliance of politically influential employers on colleges rather than public schools for employee education—may have contributed to declining school performance. The nature of this evidence was that in states where these trends went furthest performance on the SAT and ACT tended to decline most.

This article extends the analysis to students who do not go on to college. It finds that trends in their school performance have been at least as powerfully affected by changes in the political background as college-bound students.

There are two important reasons for studying the performance of non-college-bound students. First, ignoring them misses much of the story. Fully half of the relevant age cohort typically never enters college. Second, recent trends in the performance of these students seem substantially better than for the SAT and ACT population.<sup>4</sup> This divergence, which began around 1980 when SAT and ACT scores reached a nadir, suggests caution about drawing broad conclusions entirely from the performance of the SAT and ACT population, at least for the last decade or so.

<sup>1</sup> The evidence is summarized in Congressional Budget Office, Trends in Educational Achievement (1986), and analyzed further in Congressional Budget Office, Educational Achievement: Explanations and Implications of Recent Trends (1987).

<sup>2</sup> Sam Peltzman, The Political Economy of the Decline of American Public Education, 36 *J. Law & Econ.* 331 (1993).

<sup>3</sup> Public schools enroll about 90 percent of all students.

<sup>4</sup> Evidence on this point is summarized by Charles Murray & R. J. Herrnstein, What's Really behind the SAT-Score Decline? *Public Interest*, Winter 1992, at 32. In general, results for broad samples of high school seniors and juniors improved after 1980 while SAT and ACT scores have remained flat. For example, results from the Preliminary SAT, which is administered irregularly to a nationally representative sample, show the same decline as the SAT and ACT from 1960 to 1974 but an improvement over the next decade. The Iowa Test of Educational Development which has been administered to virtually all Iowa high school students since the 1950s shows a roughly similar pattern: a substantial decline from the early 1960s to around 1980 just like the SAT, but an equally substantial rise in the next decade.

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2. I focus mainly on a few changes in the political economy of public education without pretending to provide a complete model of changes in school performance. This narrow focus is meant to address a considerable neglect of politics in the extant literature on school performance and to emphasize the existence of interrelated causalities in the 1960s and 1970s and either stopped or reversed thereafter.<sup>8</sup>

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In sum, to investigate why public school performance declined (and subsequently rebounded), I analyze changes in school performance across states over the same time period that these broad trends were disparate. I try to relate changes in a state's school performance to changes in some political background variables in the state (plus a few controls). These variables are chosen because they generally follow a pattern broadly congruent with that of achievement—changes prior to 1980<sup>9</sup> and either changing little or reversing course there-

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<sup>8</sup> This is no hard and fast rule. Models with changing marginal effects of monotonically increasing variables could produce the observed pattern of school performance.

<sup>9</sup> For example, James Hoffer, Thomas Horst, & Sally Klegore, High School Achieve-  
ment: Public, Catholic and Private Schools Compared (1982). More recent work includes Deter-  
mants, Policies, Markets and America's Schools (1990).

<sup>10</sup> In economics, the dominant paradigm has been the dual model of production function  
with inputs like labor and capital, and outputs like each unit produced. This literature,  
which views schools, analogously to firms, as producing an output achievement  
with inputs like teacher time and training, is reviewed in Eric Hanushek, The Economics  
of Schooling: Productivity and Efficiency in Public Schools, 24 J. Econ. Literature 141,  
148-70 (1986).

<sup>11</sup> Some basic research for large is necessary. High school achievement in 1980 is affected by  
education received as far back as 1968.

In sum, to investigate why public school performance declined (and subsequently rebounded), I analyze changes in school performance defined (and controls) in some political background variables in the state (plus a few time period broad controls). These variables are chosen because they generally follow a pattern broadly congruent with that of achievement—changes prior to 1980<sup>11</sup> and either changing little or reversing course there-

2. I focus mainly on a few changes in the political economy of public education without pretending to provide a complete model of changes in school performance. This narrow focus is meant to address a considerable backlog of politics in the existing literature on school performance and to facilitate comparison with my previous research on college-bound students. With the notable exception of a few comparisons of private and public schools,<sup>9</sup> the literature essentially ignores the mainly public character of American elementary and secondary education.<sup>10</sup> However, my previous research uncovered important effects of changes in the political landscape on the performance of college-bound stu-

den ts. Those results motivate extending the inquiry to non-college-bound students.

### III. ANALYTICAL FRAMEWORK AND PREVIOUS RESULTS

POLITICAL ECONOMY OF PUBLIC EDUCATION

which is to "try" a plausible explanation. A more feasible, if more modest, strategy is permitted by the constitutional evolution of responsibility for public education to the states. We can ask why schools in some states did better or worse than others. More specifically, to gain insight into the broad trends we should focus on cross-state differences in the changes in school performance over time. This strategy is pursued here as it was in the predecessor study. Some restraint in pursuing this strategy is needed, because so little is known about the sources of the broad trends. Even a plausible model of what went wrong in the 1960s and 1970s and what might happen after is lacking. Accordingly, there is little to bound the domain of inquiry. Two considerations provide such bounds here:

1. If an analysis of cross-state differences in school performance trends is to shed light on the national trends, the candidate explanations should follow broadly comparable trends. For example, the Congressional Budget Office's 1987 study showed that television watching peaked well

*see Countylessional Budget Office, supra note 1.*

one parent, and crime rates. And some of these—for example, crime and divorce—peaked or flattened around 1980, just when the school performance decline ended.

The political context also has a broader dimension that I have so far ignored. The growth of teacher unions and the push for centralizing school finance began in a climate generally favoring “liberal” social policies like the War on Poverty, Medicare, and widespread unionization of public employees among others. Moreover, growth of teacher unions and the state spending share went further in more liberal states.<sup>63</sup>

This history arouses suspicion that my results, based on a narrow focus on the politics of education, may be obscuring effects of broader social and political forces. The suspicion, however, receives little statistical support. When I added two measures of social disintegration—the growth of crime and of children from broken homes<sup>64</sup>—and a measure of the liberalism of a state’s voters<sup>65</sup> to the regressions in Table 6, none yielded significant effects no matter what permutations were used,<sup>66</sup> and all the other results remained intact. There is, however, a significant effect in the expected direction (partial correlation = −.45) between the residual measure of left-tail performance (see Table 7, panel B) and the broken-home variable. These results suggest some appropriately tentative conclusions. One is that the systemic effects of social disintegration may be overrated. Broken homes are indeed not good for school performance. But the result on left-tail performance implies that broken homes mainly hurt those who live in them, not the entire school system.<sup>67</sup> The results also suggest that the details of education politics really matter; they are not proxies for some more general aspect of a state’s politics. This point

<sup>63</sup> A commonly used indicator of a state’s bedrock liberalism is George McGovern’s share of the vote in the 1972 presidential election. This is correlated .27, .47, and .39 with the state spending, NEA, and AFT variables, respectively. All are significant at  $P < .10$ .

<sup>64</sup> More specifically, (1) the average of the change in logs of the murder, rape, assault, burglary, robbery, and auto theft rates and (2) the change in share of children under 18 not living with both parents. The changes are measured from 1960–80 to allow for lags in response.

<sup>65</sup> The aforementioned McGovern vote share.

<sup>66</sup> For example adding all three yielded partial correlations of −.14, −.08, and +.20 (1971–91 regression) or −.09, −.03, and +.13 (1976–91 regression) for crime, broken homes, and liberalism, respectively. Similar results are obtained from regressions with trends in state fixed effects as the dependent variable except that the negative effect of the crime variable becomes significant at  $P(.07)$  in the 1971–91 regression.

<sup>67</sup> Recall that the performance measure is purged of at least some student-specific disadvantages from broken homes, poverty, residential segregation, and so on. See discussion surrounding Table 2 and Appendix B. If the student-specific effect of these variables has indeed been removed, only system-wide effects (for example, the need to divert resources to remedial work) would remain to be revealed by the tests in this section.

is clear from previous results: granting legal rights to teacher unions helps school performance, while actual organization hurts. Yet liberal states tend to have more of both.<sup>68</sup>

#### E. A Comprehensive Measure of School Performance

One motive to this research was to gain insight into the forces impinging on public school performance generally, not just the performance of college-bound or non-college-bound students. That insight can be sharpened by combining the available data on the two groups.

I calculated a comprehensive index of the change in state school performance from the two (1971–91 and 1976–91) measures for non-college-bound students analyzed in here and the two college-bound student measures (for 1972–81 and 1981–89) used in my 1993 paper. Each of the four was converted to a standardized (0, 1) normal deviate. The four deviates were averaged, and the resulting average was restandardized to yield a comprehensive measure which gives equal weight to each group and to each time period. It is an index (U.S. average = 0) characterizing the relative change in state school performance over the 2 decades of available data.

Table 12 shows that the comprehensive measure as well as the two components respond similarly to the same set of variables. However, the coefficients in the regression on the comprehensive measure seem closer to those for the non-college-bound than the college-bound regression. Indeed, only the AFT unionization coefficient attains significance in the college-bound regression. Nevertheless, there is a substantial and significant positive correlation (.65) between the fitted values of the regressions on the two components. This correlation accounts for all of the weak (.22) positive correlation between the two components. Moreover, the data fail to reject the restriction, implicit in the first regression, that the coefficients on the components are the same for the two groups. Thus these two more or less independent components are telling much the same story. And, by averaging over them, the comprehensive measure puts that story in sharper focus: complete unionization lowers overall performance by 1.6 to over 3 standard deviations; moving from −2 to

<sup>68</sup> The following correlation matrix provides a concise summary:

|                | AFT  | NEA | LAW |
|----------------|------|-----|-----|
| NEA share 1982 | −.12 | ..  | ..  |
| LAW            | .34  | .62 | ..  |
| McGovern share | .39  | .47 | .59 |

By 1982, the NEA and AFT had little geographic overlap, but both tended to gravitate toward politically hospitable states.

TABLE 12  
OVERALL SCHOOL PERFORMANCE TRENDS AND COMPONENTS, 1971-91

| REGRESSION               | EXPENDITURE GROWTH | CHANGE IN UNION SHARE |      | CHANGE IN FEMALE LABOR FORCE PARTICIPATION |         | $R^2/\text{SEE}$ |
|--------------------------|--------------------|-----------------------|------|--|---------|------------------|
|                          |                    | NEA                   | AFT  | LAW  | 1960-80 |                  |
| <b>I. Overall index:</b> |                    |                       |      |  |         |                  |
| Coefficient              | 6.9                | -.02                  | -1.6 | -3.4                                       | .06     | .42              |
| <sup>t</sup>             | .2                 | 2.1                   | 2.6  | 4.1  | 2.3     | .76              |
| <b>II. Components:</b>   |                    |                       |      |  |         |                  |
| A. SAT/ACT:              |                    |                       |      |  |         |                  |
| Coefficient              | 2.1                | -.01                  | -.7  | -2.9                                       | .01     | .21              |
| <sup>t</sup>             | .1                 | .7                    | .9   | 3.0  | .3      | .89              |
| B. AFQT:                 |                    |                       |      |  |         |                  |
| Coefficient              | 12.5               | -.02                  | -1.8 | -2.4                                       | .08     | .35              |
| <sup>t</sup>             | .4                 | 2.2                   | 2.7  | 3.0  | 1.4     | .6               |
|                          |                    |                       |      |  |         | .82              |

Note.—All dependent variables are standardized (0, 1) normal deviates. Overall index is standardized average of standardized trends for 1972-81 and 1981-91. AFQT is standardized average of standardized trends in 1971-91 and 1976-91.

<sup>69</sup> Adding the business pressure indexes to any of the regressions proved unavailing.

While there are subtle differences in timing, two results consistently cut through the data: teacher unionization and increased reliance on state government funding of schools are associated with declining student achievement. The negative effects seem to show up first in the performance of college-bound students then spread to the non-college-bound. My results also yield a clue about the path by which these negative effects are transmitted. They imply that the primary effects are exerted in state capitals on the policy-making process rather than inside schools.

The most dramatic, perhaps, is my finding of substantial within-state per-student differences across disparate groups. As just one example of a pervasive tendency, consider the 19 states with large ( $>1$  million) SMSAs, and compare students in the rural areas of those states with students in the inner city of the SMSAs. In 16 of the 19 states—a proportion too large to have arisen by chance—the two seemingly dissimilar groups found that a major source of such patterns was common responses to the key variables. For example, the negative unionization effect is as strong in rural areas as in cities, though unions came later and remain weaker in rural areas. One plausible path for such common effects would be through state education policy, which both groups share.

Further evidence consistent with this interpretation is found in the performance of two groups with below-average performance: students in the lowest quartile and black students. Neither group did better in states which most centralized school financing, though one ostensibly purpose of centralization was to equalize educational resources. At the same time, blacks implies either a failure to equalize resources or centralization of the negative effects of centralization.

My results imply that education outcomes are affected importantly by state policies which are shaped by interest groups organized at the state level. This, for one, reflects the failure of spending centralization to help blacks do better. Thus, the failure of spending centralization to help blacks implies either a failure to equalize resources or centralization of the negative effects of centralization.

## VII. SUMMARY AND CONCLUSIONS

+2 SD on the state spending share (+55 points) costs 1.1 SD, and a similar shift in the bargaining rights index adds 1.6 SD. The regression on the overall index also confirms the absence of total spending effects and the probable negative effect of growing female labor force participation (a 1.4 SD performance loss for a -2 to +2 SD change).<sup>69</sup>

level. However, the mechanisms providing these linkages remain to be uncovered by future research. The methodological implication of my results is that economists may have overinvested in the study of educational production—the direct link between inputs and outputs. The political context in which the inputs are used deserves more attention than it has received.

My results also have implications for some of the broad trends in student achievement. They suggest that the rise of teacher unions and the shift of financial responsibility to the states which began in the early 1960s set off forces which contributed to the decline in achievement which began shortly thereafter. Similarly, the abatement of those forces may have contributed to the end of declining performance around 1980. (The growth of unionization slowed markedly in the 1980s and the state spending share stopped rising.) My results imply that these forces operated more or less equally on college-bound and non-college-bound students. So, I make no progress on understanding the recent narrowing of the performance gap between the two. There are, however, insights into the narrowing racial differential. My results suggest that the approximate tripling of real per-student spending since 1960, desegregation of schools in the South, and, to some extent, the growth of teacher unions each contributed. But recent trends suggest more modest contributions from all these sources in the future.

Finally, some negative results deserve emphasis. The notion that a broader process of social disintegration is responsible for the decline of public education receives no support from my data. Two measures of social change—growth of crime rates and of children living in single-parent households—had scant marginal explanatory power. I was also able to dismiss the possibility that the unionization and spending effects are proxies for broader political forces. These two forces did tend to make more headway in “liberal” states. But adding a direct measure of a state’s political liberalism to the regressions proved uninformative.

These negative results add weight to the conclusion that the politics of public education has important effects on the way public schools perform.

#### APPENDIX A

##### AFQT SCORES AND BACKGROUND VARIABLES

The Defense Manpower Data Center (DMDC) provided an extract from their COHORT database. For every individual inducted from 1971 to 1975 and every applicant to the military from 1976 to 1991, I have the individual’s

1. AFQT percentile score (1–99);
2. zip code of residence (plus state and county IDs);
3. age;

4. sex;
5. race/ethnic category: Black, White, Hispanic, and Other; Hispanic is a subset of White;
6. marital status (not used, married applicants are rare); and
7. years of education (in 12 categories).

The DMDC also provided an extract from its DORIS database, which contains 1980 census data (and sometimes 1980–90 changes) by zip code on a wide variety of socioeconomic characteristics. The DORIS and COHORT data were merged so that we have a set of characteristics of the zip code of residence of each AFQT taker. The specific characteristics ultimately used were the zip code’s

1. racial composition and 1980–90 change;
2. average household income separately for blacks, whites, and Hispanics;
3. 1980–90 growth of per capita income;
4. households in poverty;
5. households headed by females; and
6. workers in “executive, professional, technical” occupations.

Item 2 was matched to the individual’s race/ethnic identifier to yield an estimate of each test taker’s household income. Items 4, 5, and 6 were converted into estimated probabilities for each test taker from regression estimates of

$$y_{ij} = a_j + b_j X_{ij} + u_{ij},$$

where

$y_{ij}$  = characteristic of zip code  $i$  in state  $j$  (for example, the percentage of households in poverty),

$X_{ij}$  = percentage of population black in zip code  $i$ ,

$a_j, b_j$  = state-specific parameters, and

$u_{ij}$  = zip code error term.

(There are over 30,000 zip codes, so there are on average around 600 observations in each state regression.)

Then the probability that an individual from  $i$  has the characteristic (for example, comes from a poverty household) is estimated as  $(a_j + b_j + u_{ij})$  for blacks and  $(a_j + u_{ij})$  for whites. The estimates are truncated to lie within  $(0, 1)$ .

Finally, the Bureau of Labor Statistics provided estimates of unemployment rates for each state for 1976 on and for groups of states for prior years. I used the 1971–76 annual changes in the group to estimate pre-1976 state unemployment rates.

#### APPENDIX B

##### ESTIMATION OF AFQT RESIDUALS AND STATE FIXED EFFECTS

From the full database I extracted the records of all 17–20-year-olds. This group typically comprises 70+ percent of the full sample. For each year, 1971–91, I use the national sample (excluding observations from Alaska, Hawaii, and the District of Columbia) to regress the individual AFQT scores on a set of background characteristics. The set of characteristics on the right-hand side of these



# Employee Financial Participation and Productivity: An Empirical Reappraisal

Andrew M. Robinson and Nicholas Wilson

## Abstract

Aymer Ben-Ner and Derek Jones cast doubt on the notion of a simple causal link between financial participation (FP) and productivity, and consequently on the validity of much of the empirical literature that has sought to quantify this relationship. This paper is an attempt to investigate this proposition. Our empirical reappraisal revealed that the route through which employee share ownership and profit-sharing schemes achieve these gains is quite separate and more involved than either the theory or prior empirical research suggests. This is particularly evident by extending the complementarities thesis beyond purely participatory bundles to embrace firm-specific and organizational variables. Our analysis also addressed recent calls to aid the interpretation of the observed effects of FP by creating a link between the use and operation of FP and its impact on productivity.

## 1. Financial participation (FP) and organizational performance

The growing body of empirical work on the relationship between FP and firm-level productivity indicates that the adoption of schemes which allow for employee participation in profits and/or equity ownership is often associated with improving productivity levels and, at worst, with no costs in terms of productive efficiency (Perotin and Robinson 2003). However, such unambiguous support for FP has not gone unchallenged. In an important paper, Ben-Ner and Jones (1995) cast doubt on the notion of a simple causal link between FP and productivity, and consequently on the validity of much of the empirical literature that has sought to quantify this relationship.

Previous studies have sought to establish the FP–productivity differential by estimating a production function model that includes a dummy variable measure of FP (representing the existence of an FP scheme in the firm) as a determinant variable. The sign and size of the estimated coefficient on the

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dummy variable then indicate the direction and magnitude of the productivity differential between FP and non-FP firms. However, this interpretation is problematic if the different types of FP schemes are not clearly delineated, and if firms with FP simultaneously adopt other policies or introduce technology that may independently affect productivity because FP may 'act as a proxy for these variables and attract a positive significant estimate even if FP itself has no effect on performance' (Kruse 1993: 83). Foremost in this regard is the tendency of many studies to focus only on measures of *either* employee FP or employee participation in the control of the firm (such as joint consultative committees, quality circles and workforce meetings), but not both (Ben-Ner and Jones 1995), even though survey evidence indicates the coexistence of these arrangements (for the UK, see Addison and Beifield 2000; McNabb and Whitfield 1998). However, the potential for omitted variable bias is also evident in a wider range of workplace practices, the choice of technology, workforce composition and management quality; issues whose continuing omission casts doubt on even the most recent of research findings (as recognized by Sesil *et al.* 2002).

There is also a growing recognition among researchers that changes in productivity may depend on how FP and employee participation in control (PC) are combined. Indeed, the introduction of FP in the absence of regular briefings and worker-management communication on those factors affecting performance may act to undermine trust and has been seen as divisive. Yet, the existing studies that find a positive correlation between measures of FP and productivity (for the UK, see Blanchflower and Oswald 1988; Cable and Wilson 1989, 1990; FitzRoy and Kraft 1987; Poole 1986) are unable to determine whether or not FP will *only* improve productivity when combined with PC or whether PC works to improve productivity *without* financial incentives. Even if such complementarities do exist, little is known about which specific combinations of the different FP and PC systems are best suited to improving firm-level productivity.

There may, of course, be further 'complementarities' between FP and 'individual factors and structural organisation variables' (Ben-Ner and Jones 1995) that intervene in the basic FP–productivity relationship, but as yet these have not been explored. This is most recently expressed in Godard's (2004: 355) critique of the high-performance paradigm where he states that 'little attention has been paid to whether the performance effects of high-performance practices may also be contingent on more structural variables'. For example, Cable and Wilson (1989) suggest that the introduction of profit-sharing (PS) was often a side product of the introduction of new production processes in the engineering industry, and particularly the replacement of 'one man and machine' technology with 'integrated computer numerically controlled machinery' where output can no longer be related to one individual. Such changes in technology, they argued, necessitated a shift from piece-rate bonuses to group-based bonuses, and raised the possibility that any productivity improvements were not attributable solely to the impact of the bonus scheme.

In this paper, we attempt to investigate the FP–productivity relationship in a way that addresses some of these potential flaws in the existing empirical methodologies. Our main aim is to address the following questions: Does FP in its different forms affect productivity? Does the introduction of measures of PC alter the FP effects? Are there complementarities between FP and PC, and if so which combinations are most effective and how does this affect the estimated productivity differential? Finally, does this complementarities thesis extend to interactions between FP, workforce characteristics and other technology/structural/organizational variables? These questions are tested empirically by establishing inter-firm differences in productivity on a unique sample of FP and non-FP firms whilst controlling for a rich array of other firm-specific characteristics.

## 2. FP and productivity: theory and empirical evidence

It is generally viewed that the growth of FP and PC arrangements is a response by employers to the agency problem inherent in the employment relationship (McNabb and Whitfield 1998). Particularly where there is poor monitoring and observability of employees' actions, employees have more scope to shirk and follow their own individual objectives rather than those of their employers, thus trapping the firm in an underperforming conflict-based equilibrium. The alternative to this situation is for workers and employers to have the will and incentive to co-operate. However, in order for conflict to give way to co-operation, both workers and employers must be convinced that their individual returns, both financial and non-pecuniary, will be higher under co-operation than conflict (Levine and Tyson 1990). FP and PC are mechanisms that can move the firm into cooperative relationships that are mutually beneficial for all the firms' stakeholders. However, the different institutional features of extant FP and PC schemes suggest that the higher aggregate benefits of co-operating may vary according to the type and combination of the participation schemes adopted. Thus, this paper investigates the impact of FP in the absence of PC, the sole influence of PC and the joint effectiveness or complementarity of FP and PC 'bundles'.

### FP

Giving employees a stake in the returns of the firm in which they work is primarily intended to motivate employees to act in accordance with the wishes of the firm's equity owners. By transferring some of the risk from profits onto pay, the firm increases the cost to employees of shirking and provides workers with an incentive to police their own actions (Perotin and Robinson 1998). Workers in 'PS' firms will endeavour to improve the organization of work, human capital and replace managerial monitoring and control with peer-group monitoring and self-policing. In this scenario,

productivity will increase through effort that is volunteered rather than coerced, and employees will no longer have an incentive to 'hoard information' as a means of extracting monopoly rents, but share information and improve organizational lines of communication for the benefit of all.

Set against these positive expectations is a belief that the motivational influence of FP has been overplayed. In contrast to strictly individualized incentives that link each worker's remuneration to their marginal product, group incentive schemes give each worker only a tiny fraction of any additional benefit due to their effort, the so-called  $1/n$  problem. These create an incentive for some employees to 'free ride' and enjoy the full benefits of shirking, thus weakening firm productivity. Added to this is uncertainty about how employees will respond to bearing some of the risks associated with the business (Meade 1986). Workers may react negatively to the way that FP confers 'responsibility without power' particularly when corporate performance is unsatisfactory. Sharing in returns may also dilute owners and their representatives' incentive to monitor employee performance (Jensen and Meckling 1979). Overall FP has both positive and negative effects on productivity, but the relative impact of these effects cannot be predicted precisely by the theory (Ben-Ner and Jones 1995).

FP also has many dimensions that have not often been distinguished in previous empirical studies. The most obvious is the distinction between cash- and share-based schemes. Both types of schemes are expected to change the behaviour of employees so that they are more closely aligned with the needs of their firm. Further, because both are group based they are subject to the free-rider problem that may counteract the positive effects of inducing collaboration and peer-group monitoring. It is our assertion that cash-based arrangements offer a more direct causal link between employee efforts and profits, one that has a strong (short-term) productivity impact. Share-based schemes, on the other hand, because of the deferred nature of their rewards, have a less direct link back to employee actions and a longer-term effect on employee commitment and loyalty manifested in job satisfaction and lower labour turnover, absenteeism, and so on.

#### PC

Despite obvious differences with FP, PC can be viewed as influencing productivity along broadly similar lines: increased motivation, trust and commitment; the freeing up of informational asymmetries and easier conflict resolution; and the substitution of hierarchical control and monitoring systems for peer-group pressure and horizontal monitoring. Indeed, both theoretical arguments (Ben-Ner and Jones 1995) and empirical evidence (Levine and Tyson 1990) point to PC having a greater potential for boosting productivity than FP, although more recent evidence is less supportive (see Delbridge and Whitfield 2001; Freeman and Kleiner 2000; Goddard 2004). This is offset against the belief that PC increases the cost of decision making and may alienate management, notably those at a supervisory level, where it is

TABLE 3  
Continued

| Variable            | Share schemes (SH)  |                     |                     |
|---------------------|---------------------|---------------------|---------------------|
|                     | Model 3             | Model 4             | Model 5             |
| In (capital)        | 0.3203*** (0.0340)  | 0.3185*** (0.0336)  | 0.3247*** (0.0347)  |
| In (labour)         | 0.6754*** (0.0487)  | 0.6732*** (0.0493)  | 0.6619*** (0.0488)  |
| SH                  | 1.9585*** (0.6193)  | 1.8346*** (0.6571)  | 2.3999*** (0.8130)  |
| SH-labour           | 0.1368** (0.0687)   | 0.1409** (0.0672)   | 0.1072 (0.0729)     |
| SH-capital          | -0.1700*** (0.0560) | -0.1623*** (0.0577) | -0.1871*** (0.0698) |
| SH-representative   | -0.074 (0.0466)     | 0.0794 (0.0542)     |                     |
| SH-consultative     | 0.0372 (0.0539)     | 0.1194** (0.0582)   |                     |
| SH-work groups      | -0.0285 (0.0446)    | -0.1180** (0.0524)  |                     |
| SH-small/job batch  |                     | -0.0050*** (0.0018) |                     |
| SH-technology       |                     | 0.3563 (0.2391)     |                     |
| SH-skill/unskilled  |                     | 0.0021 (0.0023)     |                     |
| SH-proportion       |                     |                     |                     |
| mate                |                     |                     |                     |
| SH-new work org.    |                     |                     |                     |
| SH-trade union      |                     |                     |                     |
| SH-span of control  |                     |                     |                     |
| SH-white collar     |                     |                     |                     |
| PS                  | 0.0001 (0.0487)     | -0.0026 (0.0487)    | -0.0013 (0.0016)    |
| Representative      | 0.0714*** (0.0256)  | 0.0793*** (0.0288)  | 1.3157*** (0.4572)  |
| Consultative        | -0.0301 (0.0308)    | -0.0372 (0.0361)    | -0.1816 (0.2732)    |
| Work groups         | 0.0025 (0.0223)     | 0.0155 (0.0334)     | -0.0444 (0.0559)    |
| Constant            | 5.9065*** (0.4152)  | 5.9199*** (0.4083)  | 0.0856*** (0.0305)  |
| Augmenting vars.    | Yes                 | Yes                 | Yes                 |
| Time                |                     |                     |                     |
| Adj. R <sup>2</sup> | 0.8775              | 0.8768              | 0.8784              |
| LL                  | -197.0451           | -196.5119           | -190.3172           |
| F                   | 121.84***           | 106.64***           | 84.75***            |

literature does, that we do not 'confound the effects of FP schemes with the reasons for their adoption' (Ben-Ner and Jones 1995: 552). The richness of our data set means that we are uniquely able to explore these issues with regard to FP.

In order to profile the type of firms that adopt such schemes, we estimated a multinomial logit model that characterizes key internal and external features of firms according to whether they choose to have a PS scheme only, a share-based scheme only, both types of schemes or no FP scheme (see Appendix B). The lack of productivity effects from PS equates with its use in a more risky and competitive market-place and crucially a more demanding internal environment than that found for SH. PS firms appear to be older and smaller, operate in a more technologically challenging environment (technology changes more frequently and production is biased towards small/job batch production) and the workforce is predominantly low skilled. They appear to face highly competitive domestic markets and operate in declining industry sectors. One interpretation of these results based on the work of

Cable and Wilson (1990) is that PS has been introduced in these firms primarily to facilitate the adoption of new technology because its group-based incentives are more appropriate to the changing patterns of work organization. PS facilitates the adoption of new technology, and it is this that has improved productivity rather than PS directly. Support for this proposition can be seen in Table 3 with the positive and statistically significant coefficient on the technology variable, but no significant coefficient on the measure of PS.

In contrast, share-ownership schemes are unlikely to be linked with the adoption of new production technology, and represent a much broader employee incentive scheme. Firms with SH apart from being larger and more internationally focused do not operate in a highly pressurized environment, internal or external, and thus a more performance-based agenda and outcome may be expected. Indeed, given the skilled nature of its workforce, the introduction of less direct and coercive schemes which promote workers' feelings of ownership and integration is much more likely to be successful, particularly where it signals some long-term commitment to employees on behalf of the firm.

We can also give some contextual backdrop to our interpretation of the PC effects. Appendix C indicates the extent to which democratization is facilitated by the formal PC schemes. This suggests that only representative forms of PC offer a real voice for employees, although this is often constrained to low-level non-strategic issues and pay. Linking this evidence with the representative coefficient values in the production models indicates that representative mechanisms (which give greater influence) register a positive and significant productivity effect. Conversely, consultation schemes and work-groups give no productivity effects, suggesting that where employees are offered a means of participating but real involvement is not forthcoming, the potential benefits do not materialize.

### 5. Conclusion

Our analysis assesses some of the 'flaws' in the research on FP, and advances new insights into its ability to alter firm-level productivity. Broadly, what emerges from our analysis is that while having the right variables in the equation is important, what is more valuable is how these variables combine to reveal new pathways by which FP affects the productive process. Notably, this approach reveals that while both employee share ownership and PS schemes have the potential to improve productivity, the route to achieving these gains is quite separate and more involved than either the theory or prior empirical research would suggest.

Two advances have been central to developing this better understanding of FP. One is the extension of the complementarities thesis beyond purely participatory bundles to embrace firm-specific and organizational variables. First-time estimates of these interactions indicate that the closer monitoring and supervision of employees may alleviate some of the free-rider problems

associated with both group-based incentive schemes and so improve productivity. Equally, changes to the organization of work and one's choice of technology may hamper the productive potential of SH, while PS has a detrimental effect on productivity where it operates in a largely male and white-collar environment. This contrasts with the evidence on participatory bundles, which as with Addison and Belfield (2000) are not as extensive as the theory would suggest, their effects being limited to SH.

The other unique feature of our analysis has been to establish a link between the use and operation of FP and its observed effects on productivity. This helps explain the relative ineffectiveness of PS schemes in enhancing productivity given the technologically challenging, low-skilled and uncertain business environment in which they operate. SH, on the other hand, operates in a more-skilled and less-pressurized workplace environment, one that helps foster the productivity-enhancing properties that we observe.

Whilst there is still some way to go before we understand the full extent of the relationship between FP and productivity, we feel that the advances we have made in this paper are a move in the right direction and have established an approach to research of this kind which improves our understanding of the potential outcomes of FP and the process by which this is brought about.

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#### Notes

1. We recognize the potential endogeneity of the labour input (confirmed by Hausman tests), and therefore, the labour input variable  $L_t$  is instrumented on  $L_{t-1}$ , workforce characteristics, industry, region and time, correcting for auto-regressive error terms.
2. Clearly, we do not have measures of all the potential determinants of performance (e.g. management quality and corporate strategies), and thus, while our models offer an improvement on what has gone before, it is equally true that our analysis may suffer from omitted variable bias.
3. Evidence of this effect is found if we estimate the model using each cross section from 1988 to 1991. In doing so, we obtain similar results to the pooled model — the PS variable is not significant in any period and the significant SH coefficient varies between 0.276 and 0.399 across periods. Thus, pooling the data averages out these effects over time and overcomes the problems of limited degrees of freedom.
4. Further, by estimating our base specification in differences, we find that the magnitude of the FP effect is in line with the majority of previous studies, notably in the UK (Cable and Wilson 1989, 1990), and suggest a productivity differential in the range of 4–8 per cent for firms with one or other, or both schemes in place.

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# Do unions impede or accelerate structural adjustment? Industrial versus company unions in an industrialising labour market

Guy Standing\*

## 1. Introduction

An extraordinary amount has been written about the impact of trade unions on industrial labour markets, but remarkably little empirical work exists on their impact in the context of industrialisation. There are two main schools of thought. The first, and more influential, is that unions raise costs, impose rigidities and are a threat to management, so deterring foreign investment. This view is part of the 'supply side' perspective that has shaped the orthodox structural adjustment strategy, which tends to see all institutional mechanisms as rigidities and market distortions. It has been used to justify anti-union legislation and their blatant suppression in many low-income countries, and most of all to justify denial of union recognition in firms operating in export processing zones. The second school of thought depicts unions as a source of 'dynamic efficiency', obliging enterprises to pay efficiency wages rather than 'market clearing' wages and inducing management to raise productivity by technological innovations and cost-saving practices rather than reliance on low-paid labour.<sup>1</sup>

Overlaying this debate has been a growing one on the desirability of the 'Japanese model' of labour relations, based on 'company unions'. These are depicted as consistent with decentralised, flexible labour markets, less conflictual than industrial or craft unions and more geared to the maintenance of wage differentials between firms able to pay higher wages and those that are not. Company unions—sometimes called 'house' unions—have been presented as promoting 'company solidarity' rather than the 'class solidarity' or 'worker solidarity' that have been the traditional principles of trade unions. Critics argue that company unions are easily co-opted to become agents of management or merely mediators, lack the expertise that comes in part from national-level involvement with diverse types of firms and working practices, and lack an independent base from which to develop bargaining capacity.

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<sup>1</sup> Cross-national analyses in industrialised countries have suggested an inverse relationship between union strength and strikes and wage demands. See e.g. Cornwall (1983, p. 251); Freeman and Medoff (1984).

Some researchers contend that company or plant-level unions are more independent than industry unions, on the grounds that they are less inclined to follow a national politico-economic strategy and are less 'bureaucratic'. Thus, a Mexican study argued that plant unions secured higher wages than the 'official' unions (Roxborough, 1984). And a study in Bombay argued that company unions (defined as 'independent') achieved higher wages than unions 'externally affiliated to federations that are trade union wings of established political parties' (Bhattacharjee, 1987, p. 256). The latter was based on a sample of 119 plant-level collective agreements, so did not measure the effect of unionisation *per se*. Nevertheless, the evidence should have encouraged employers to prefer to deal with external unions, and workers to prefer plant-level unions, which may have reflected the circumstances in Bombay in the early 1980s.

The opposite is what one would expect in a country like Malaysia, the site of the present study. Malaysia is an intriguing economy in which to assess the alternative perspectives, and the following is the first attempt to do so, based on a survey of 2682 manufacturing firms drawn from all states of Peninsular Malaysia, carried out in August–September 1988. This was a propitious moment, in that it came just after the country's most severe recession since Independence in 1957 and during the early stages of the most extraordinary spurt in the country's rapid long-term rate of economic growth. In 1988–1989 manufacturing output expanded by no less than 19%, based on exports, mainly electronics, garments and textiles.

This paper examines the incidence and labour market impact of unionisation in manufacturing. Methodologically, it is similar to empirical studies in the USA, the UK and elsewhere, but within the limitations of the data, it may be the first to provide an assessment of the impact of unions in the context of industrial restructuring.

## 2. Unionisation in Malaysian manufacturing

In 1988–1989, about 10% of the million or so workers in Malaysian manufacturing were members of trade unions and covered by some form of collective bargaining. The union movement had been through a difficult time, put on the defensive by massive retrenchments during the recession of 1985–1986, Government actions, including the imprisonment without trial of the Secretary-General of the Malaysian Trades Union Congress (MTUC), widespread pressure on workers to take wage cuts, and strenuous attempts to promote company unions in place of either industrial or craft unions.<sup>1</sup> The Malaysian Employers' Federation and the Federation of Malaysian Manufacturers were pressing the Government to revise the 1955 Employment Ordinance (as amended in 1980) to reduce the already limited employment protection, to weaken other protective regulations, to lower statutory overtime rates and to revoke the 1980 amendments to the Employment Act that had made it harder and more costly for employers to retrench regular workers.

With official unemployment still over 9%, and the Government eager to attract more foreign investment, unions and workers in general were on the defensive. A common view among politicians was that unions were disruptive to the economy's progress and, as one Minister put it, even 'alien to the country's culture'. However, there was one relevant

<sup>1</sup> Before becoming Prime Minister, Mahathir Mohamed had argued that 'trade unions are superfluous' in Malaysia (Mohamed, 1970, p. 108). As Prime Minister he launched a 'Look East' policy and argued that to copy Japan, there should be 'in-house unions' (*The New Straits Times*, March 6, 1983, cited in Wad, 1988, p. 219). Others have suggested that the Registrar of Trade Unions has pressed for in-house unions because this promotes Malay-led unions (O'Brien, 1988, pp. 158, 167).

Table 19. Percentage of non-regular employment, 1988, by whether production workers unionised, and type of union

|            | % Employment |           |       |          |         |
|------------|--------------|-----------|-------|----------|---------|
|            | 0            | 0-01 < 10 | 10-20 | 20-01-50 | Over 50 |
| Unionised  | 60.9         | 19.7      | 7.8   | 9.5      | 2.1     |
| Industrial | 59.2         | 19.6      | 8.9   | 10.3     | 2.0     |
| House      | 70.7         | 15.4      | 3.2   | 7.3      | 3.2     |
| Non-union  | 46.9         | 10.4      | 8.5   | 15.3     | 18.7    |

Management were asked to estimate the share of total production costs consisting of labour costs for the year of 1987. To test for any union association, a regression function was estimated in which the dependent variable was the logarithm of the labour share of total costs. Although the results in Table 20 must be treated with caution, they support the dynamic efficiency view, and industrial unions rather than company unions. If anything, the coefficients suggest that the presence of an industrial union lowered labour costs. By contrast, the coefficient for house unions was positive and statistically significant, implying that labour costs were higher in firms with company unions. Although this evidence is not conclusive, it is far stronger than any known or so far presented to support the conventional view in the structural adjustment debate. A final piece of evidence relates to labour productivity, as proxied by the value of total sales for the preceding year divided by the workforce size at the time of the survey. That is only a crude proxy for labour productivity.<sup>1</sup> Nevertheless, although Table 21 does not present a standard production function in that there is no direct measure of 'capital', one could if one wished interpret the size, industry and ownership control variables as proxies for that.

What is clear is that unionised establishments had higher productivity and that this was primarily the case in those with industrial rather than house unions. Once again, the data give strong *prima facie* evidence that industrial unions have been associated with dynamic efficiency and were a positive factor in productive performance.

## 12. Concluding points

Unions have many potential roles, not the least being to provide a sense of collective identity and labour security, as well as a working-class consciousness that can be translated into political agendas. Even if unions were shown to have 'negative' labour market effects, there would be reasons for promoting an environment in which they could operate as instruments of democracy. Yet in recent years the rhetorical and political opposition to unions in many countries has rested largely on claims that they constitute rigidities to efficiency, impeding economic growth and structural adjustment, while being inflationary and job destroying, directly or indirectly. The preceding empirical assessment may be only a tentative examination of the effects of unions in an industrialising labour market where they have to operate in a different environment. Yet the overall evidence is rather positive. It certainly does not provide support for those who wish to oppose unions on economic grounds. While unions, particularly independent unions, have probably raised labour productivity.

<sup>1</sup> Freeman and Medoff (1984, pp. 162-180) discuss the conceptual problems with alternative measures of labour productivity.

Table 20. Labour cost share of production costs, 1987 (OLS regression coefficients)

| Variable         | Log Lab. share | t-Ratio             |
|------------------|----------------|---------------------|
| Intercept        | 2.3714         | 44.8512***          |
| Size             |                |                     |
| 21-50            | -0.1523        | -3.3056***          |
| 51-100           | -0.2216        | -4.4744***          |
| 101-250          | -0.3632        | -6.9333***          |
| 251-500          | -0.2249        | -3.0513***          |
| 501-1000         | -0.2240        | -2.2022**           |
| 1001+            | -0.2290        | -1.8721*            |
| Industry         |                |                     |
| Textiles         | 0.4447         | 6.5569***           |
| Wood             | 0.5600         | 9.3984***           |
| Paper            | 0.4782         | 6.9155***           |
| Chemicals        | 0.1609         | 3.1011***           |
| Electronics      | 0.3613         | 2.9391***           |
| Non-met. min.    | 0.5419         | 7.6982***           |
| Basic metals     | 0.1793         | 1.8820*             |
| Fabric. metals   | 0.4419         | 9.1289***           |
| Other manuf.     | 0.5042         | 4.3124***           |
| Ownership        |                |                     |
| Foreign          | -0.1909        | -3.8311***          |
| % Exported       | -0.0012        | -2.3035**           |
| % Emp. casual    | -0.0014        | -0.8470             |
| % Emp. contract  | 0.0043         | 4.4533***           |
| % Emp. female    | 0.0051         | 6.9299***           |
| % Unskilled      | -0.00003       | -0.0051             |
| % Semi-skilled   | 0.0022         | 2.8263***           |
| Industrial union | -0.0127        | -0.2852             |
| House union      | 0.1585         | 2.0922**            |
| R <sup>2</sup>   | 0.14           | F = 17.48, n = 2550 |

wages, they seem to have been a factor promoting dynamic efficiency and have been a source of labour market equity, in that they seem to have been a mechanism reducing wage differentials, benefiting women and those in low-skilled jobs.

For workers, it would seem rational to prefer independent unions, since they have had a more positive effect on wages and fringe benefits than house unions. Companies may not like independent unions, but there is no evidence that they harm the long-term prospects of firms in which they exist.

The debates in Malaysia are being replicated in other industrialising economies. Thus, in South Korea, leading labour analysts have recently been arguing that industrial unions impede structural adjustment and that company unions along the Japanese model would promote flexibility.<sup>1</sup> Ostensibly for similar reasons, in Costa Rica and other parts of Latin America there is a USAID-funded campaign to promote 'solidarismo associations',

<sup>1</sup> See, for instance, *The Financial Times*, March 7, 1990.

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*Do Teacher Unions Hinder Educational  
Performance?  
Lessons Learned from State SAT and ACT  
Scores\**

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**Abstract**

Teacher unions have been demonized by their critics and canonized by their advocates

for years, but the actual relationship between teacher unions and educational performance has received very little empirical scrutiny. In this article, Lala Carr Steelman, Brian Powell, and Robert Carini examine the question, "Do teacher unions hinder educational performance?" Focusing on two of the best-known standardized tests, the Scholastic Assessment Test (SAT) and the American College Test (ACT), the authors examine whether interstate variation in standardized test performance is negatively linked to interstate variation in teacher unions. They find a significant and positive relationship: that is, the presence of teacher unions appears to be linked to stronger state performance on these exams. These findings challenge the position that teacher unions depress student academic performance, and in so doing invite further empirical scholarship on this topic from a range of academic disciplines. (pp.437-466)

### Do Teacher Unions Hinder Educational Performance?

Although teacher unions have been demonized by their critics and canonized by their advocates, little empirical research has been conducted to investigate the question: Do teacher unions hinder educational performance? In this article, we attempt to answer this question by using an analytical strategy that we introduced in two previous articles in this journal (Powell & Steelman, 1984, 1996). Focusing on two well-known standardized tests, the Scholastic Assessment Test (SAT) and the American College Test (ACT), and highlighting state differences, we examine whether interstate variation in standardized test performance is negatively linked to interstate variation in the presence of teacher unions, as asserted by some critics of teacher unions. Our goals are to address the question at hand and to seek more empirical scholarship on this topic from a range of academic disciplines.

### Background

The first collective teacher organization, which eventually became known as the National Educational Association (NEA), was founded in Chicago in 1857. Today there are two major unions, the NEA and the American Federation of Teachers (AFT), which was established in 1916. The use of collective bargaining, however, is a fairly recent development for teacher organizations. Since the 1960s, an increasing number of states have passed legislation permitting collective bargaining by teacher unions. Concurrently, the transformation of teacher unions from relatively passive organizations to organizations willing to assert the rights of their constituency has been spectacularly swift and represents one area in which unions, against a backdrop of anti-union sentiment, have thrived (Murphy, 1990; Streshly & DeMitchell, 1994; Urban, 1982). In the midst of labor union retrenchment in the private sector, teacher unions have continued to grow and to gain political strength (Eberts & Stone, 1984; Murphy, 1990;

# AN EMPIRICAL ANALYSIS OF AUSTRALIAN LABOUR

## PRODUCTIVITY\*

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This study presents a model capturing sources of Australian aggregate labour productivity using annual time series data from 1970 to 2001. Labour productivity, or real output per hour worked, in this model is determined by real net capital stock in information technology and telecommunications (ITT), real net capital stock in the non-ITT sector, trade openness, human capital, the wage rate, international competitiveness, and the union membership rate. Given the lack of long and consistent time series data, multivariate cointegration techniques are inappropriate as the cointegration results will be sensitive to the lag length, the inclusion or exclusion of the intercept term, or a trend in the cointegration equation and/or the vector autoregression (VAR) specification. Therefore, the Engle-Granger representation theorem and the Hausman-weak exogeneity test have been employed to determine the short and long-term drivers of Australian productivity. Empirical estimates indicate that, in the long-term, policies aimed at promoting various types of investment, trade openness, international competitiveness and the use of wage as a stimulant in a decentralised wage negotiation system, will improve labour productivity. In the short term, all the above variables except for human capital and labour reforms, which both need more time to evolve, determine productivity performance.

### I. INTRODUCTION

There is a consensus among economists that productivity growth plays a substantial role in enhancing standards of living and international competitiveness. According to econometric studies based on growth-accounting models, it is argued that increased productivity over the last three decades has contributed to two-thirds of the 80 per cent rise in *per capita* income in Australia (Industry Commission, 1997). As higher productivity translates into higher *per capita* income, Australians benefit from higher standards of health care, better education and public welfare. However, while productivity contributes to at least fifty per cent of total real income growth, it should be borne in mind that the empirical estimates based on growth-accounting models underestimate the actual contribution of productivity to economic prosperity (Dowrick and Nguyen, 1989 and Dowrick, 1998).

For instance, Romer (1990) demonstrates the way in which public and private resources devoted to the development of new ideas and new products can accelerate economic growth. On the other hand, the neo-Schumpeterian models of Aghion and Howitt (1998) analyse the economic impact of research into product improvement rather than product diversity. Nevertheless their overall conclusions are the same as those of Romer. That is, increases in productivity, brought about by new or improved products and processes, such as information and communications

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technologies (ICTs), will directly and indirectly result in increased returns to capital investment and consequently lead to a sustained level of growth of GDP. Therefore, it can be stated that the estimates based on growth-accounting procedures underestimate the true contribution of productivity growth.

In order to address this theoretical pitfall, new growth theories identify the channels through which economic institutions and reform processes can stimulate the rate of investment in physical capital, human capital, technological know-how and knowledge capital. These factors exert a sustained and positive effect on the long-run growth of the economy (Rebelo, 1991). Unlike the traditional neo-classical growth models of Swan (1956) and Solow (1956), in the new endogenous growth models institutions and policy arrangements do matter and can impact not only on the level of economic activity but also on its long-run growth path. Undoubtedly higher productivity growth leads to more sustainable long-term economic prosperity, but the main issue is "how can productivity be further stimulated?"

Over the last two decades there has been considerable interest in determining the sources of productivity in Australia. Within the Productivity Commission, these in-depth studies have resulted in a number of publications such as Industry Commission (1997), Productivity Commission (1999, 1998) and Parham *et al.* (2000, 2001). Dawkins and Rogers (1998) review a wide range of productivity studies in the post-1980 period, ranging from survey based firm-level case studies to aggregate macroeconomic time-series analyses. According to their comprehensive review of the productivity literature, the major determinants of productivity at the national level are capital intensity, international openness, factor prices, the union membership rate (as a proxy for labour reforms), international competitiveness, human capital investment, and infrastructure.

Dowrick (1990), in his empirical examination of labour productivity, identified the major determinants of the 1980s productivity slump. His econometric results indicate that the labour productivity slowdown after 1983 was mainly associated with capital dilution, reflecting a small fall in investment as well as a sharp expansion of hours worked between 1983 and 1988. Given the cyclical variation in productivity levels due to "hoarding" of capital and labour in downturns, his study concluded that "underlying multifactor productivity growth had not declined subsequent to the introduction of centralised wage setting in 1983. Rather, it was the wage restraint of the Accord which had contributed to high employment growth and the consequent slowdown in labour productivity" (Dowrick, 1998, p. 4).

Barro (1991) and Barro and Lee (1994) in their seminal work echoed the importance of human capital or a better educated labour force as a major determinant of economic growth and productivity. Other studies, *inter alia*, Aschauer (1989) and Otto and Voss (1994), provided empirical evidence that specific types of investment in the core public infrastructure of transport and communication and water systems can also stimulate productivity and growth. Similarly, according to Greenstein and Spiller (1995), Karunaratne (1995), Parham *et al.* (2001), investment in information technology and telecommunications (ITT) should also be regarded as an important stimulant of productivity. They demonstrate that investment in ITT results in curtailing transport and transactions costs, facilitating the process of technological diffusion, accelerating the diffusion of knowledge and providing better marketing information. In a comparative study of nine OECD countries (including Australia) Coleccchia and Schreyer (2001) have recently found that, depending on the country, ITT has contributed between 0.2 and 0.5 percentage points per year to economic growth. It is interesting to note that in the context of Australia during the 1980–1985 period this contribution was, on average, 0.27 per cent but it rose to 0.79 per cent during the 1995–2000 period. See Coleccchia and Schreyer (2001). Therefore, it can be concluded that the impact of ITT on output growth and productivity has demonstrated



an accelerating pattern over time. This result is also consistent with the empirical findings of Parham *et al.* (2001).

DeLong and Summers (1991) believe that a change in the composition of investment (more capital expenditure on machinery and equipment rather than construction) can accelerate productivity due to technological and learning externalities which place the social return to physical investment above the private return.

Furthermore, Dowrick (1994) finds that increased openness to trade stimulates productivity growth through increased competition, specialisation and transfer of knowledge. Dowrick (1994) found that the recent trade openness experienced in Australia may have been responsible for approximately one-fifth of a percentage point in the productivity surge of the 1990s. Microeconomic reforms in Australia have also substantially contributed to increased productivity by reducing institutional and regulatory barriers to the flow of foreign goods and providing businesses with greater flexibility to adjust to a more competitive environment. Moreover, these reforms have been pivotal in the uptake of ICTs. The degree of trade openness, and the uptake of ICTs as quantifiable proxy variables, can reflect, in part, the impacts of Australian microeconomic reforms.

Lowe (1995) examines the relationship between real wages' growth and labour productivity at the industry level and his research indicates that a positive relationship between these two variables exists. More recently a study by Madsen and Damania (2001), using annual manufacturing data for 22 OECD countries for the 1960–1993 period clearly indicates that an increase in the real wage rate can steepen or even reverse the slope of the demand for labour. They argue that rising real wages "give firms incentives to innovate and to invest in newer and more efficient vintages of capital and to utilise labour more efficiently; thus rendering labour and capital productivities positive functions of real wages" (Madsen and Damania, 2001, p. 324).

Freeman and Medoff (1984) in their discussion of the effect of unions on labour productivity, argue that there are two faces of unions: the 'monopoly face' and the 'collective voice face'. The former could result in decelerating productivity through restrictive work practices and industrial action, whereas the latter could lower labour turnover and improve communications, and thus give a rise to higher productivity performance (Metcalfe 1990). Dawkins and Rogers (1998), in their survey of the literature, reach the conclusion that the positive or negative impact of unionisation on productivity is an empirical matter. There are two Australian studies that have already examined this issue, namely Crockett *et al.* (1990) and Drago and Wooden (1992). Adopting a multivariate analysis, both of these studies used the 1990 Australian Workplace Industrial Relations Survey (AWIRS). These studies present some evidence of negative union effects on productivity.

Finally, Madden and Savage (1998) employ a multivariate cointegration technique to determine the short- and long-term sources of Australian labour productivity during the 1950–1994 period. Their results indicate that, in the short term, Australian labour productivity is mainly determined by the real capita stock per worker, investment in ITT (as proxied by telephones *per capita*), trade openness (real exports plus imports per worker), international competitiveness, and human capital (proxied by tertiary student enrolment per worker). However, in the long term, fixed capital accumulation and investment in ITT are the only significant determinants of productivity improvement.

All the above-mentioned studies of productivity and economic growth have been instrumental in identifying sources of Australian labour productivity in this paper. The present study makes a contribution to the literature in relation to the specification of an aggregate productivity model as well as the use of a new database which was not available earlier. These issues are discussed in the next section.

The structure of this paper is as follows. In Section II a theoretical model is postulated which explains the long-term and short-term factors affecting Australia's labour productivity since 1970 using the Engle-Granger representation theorem. Section III discusses the types and sources of the data employed in this study. In this section three unit root tests are utilised to determine the time series properties of the data. This section also presents the empirical econometric results for the short and long-term labour productivity models, as well as policy implications of the study. Section IV provides some concluding remarks.

## II. THEORETICAL FRAMEWORK

As seen from the previous section there is an existing research literature on the sources of Australia's labour productivity both at the micro and macro levels. Following Madden and Savage (1998), the supply side approach of Aschauer (1989) and Romer (1989) is used to specify a production function for aggregate output, *viz.*

$$Y_t = f(L_t, K_{1t}, K_{2t}, S_t) \quad (1)$$

Where  $Y$  is aggregate output (real GDP),  $L$  is labour,  $K_1$  is the real non-ITT capital stock,  $K_2$  is the real stock of capital in the ITT sector, and  $S$  is a proxy for human capital.

One may argue that the parameter estimates from a Cobb-Douglas production function can be biased if the aggregate production function is homogenous of degree greater than one. Therefore it is very important to test if the assumption of constant returns to scale applies for an aggregate production function. There is a recent study by Connolly and Fox (2001, p. 18) that tests the assumption of constant returns to scale (the null) for various sectors of the Australian economy. They conclude that this restriction is not rejected for the following sectors: Construction; Electricity, Gas and Water; Transport and Storage; Retail Trade; and the Market sector. However their Wald test results also indicate that the null hypothesis is rejected for all other sectors. At an aggregate level, using the data employed in this study, the constant returns to scale assumption has been tested and the results (not reported here but available from the author upon request) indicate that the null hypothesis (the sum of all production input elasticities with respect to output is equal to 1) cannot be rejected. This assumption has also been adopted in a number of other studies in the analysis of productivity in Australia. See, *inter alia*, Industry Commission (1997, Appendix B), and Lowe (1995).

By dividing both sides of equation (1) by  $L$ , one obtains the following relation which is used to measure labour productivity

$$Y_{t/L_t} = \varphi(K_{1t}/L_t, K_{2t}/L_t, S_t/L_t) \quad (2)$$

In addition to physical capital stock (both in ITT and non-ITT) per worker and human capital per worker, Dowrick (1994) has already shown that trade openness and international competitiveness are also two important sources of Australia's productivity miracle. As discussed earlier, Madden and Savage (1998) have incorporated these two important factors in their productivity model. However, they calculate labour productivity by dividing real GDP by total participants in the labour force. It is argued that as the composition of the labour force, in terms of the number of part-time and full-time workers, varies over time, output per worker becomes an inadequate or misleading measure of labour productivity. In other words, if productivity is defined as output per worker, an increase in the number of part-time workers (while output and

**Table V** Empirical results for the nominal wage rate,  $\ln(W_t)$ , model

| Variable   | Estimated elasticities | t-statistics       | Prob.   | Expected signs |
|--|------------------------|--------------------|---------|----------------|
| Intercept  | -11.1                  | -15.9              | [0.000] |                |
| $\ln(GDP_t/L_t)$                                     | 2.41                   | 11.6               | [0.000] | +              |
| $\ln(U_t)$   | 0.48                   | 9.7                | [0.000] | +              |
| $\ln(P_t)$   | 0.63                   | 15.3               | [0.000] | +              |
| Order of integration of stochastic residuals: $I(0)$ |                        |                    |         |                |
| Goodness-of-fit statistics:                          |                        |                    |         |                |
| Adjusted $R^2 = 0.9988$                              |                        |                    |         |                |
| Overall F statistic $F(3, 28) = 8425$                |                        |                    |         |                |
| Diagnostic tests:                                    |                        |                    |         |                |
| DW   | 1.70                   |                    |         |                |
| AR 1-2   |                        | $F(2, 26) = 0.29$  | [0.74]  |                |
| ARCH 1   |                        | $F(1, 26) = 0.40$  | [0.53]  |                |
| Normality  |                        | $\chi^2(2) = 1.64$ | [0.43]  |                |
| White $X_i^2$  |                        | $F(6, 21) = 0.87$  | [0.53]  |                |
| White $X_i * X_j$                                    |                        | $F(9, 18) = 0.76$  | [0.65]  |                |
| RESET  |                        | $F(1, 27) = 0.23$  | [0.23]  |                |

Notes: a) figures in square brackets show the corresponding probabilities; and b) the estimation method is 2SLS.

According to Table V, both the union membership rate and particularly labour productivity have a significant positive impact on the nominal wage rate with estimated elasticities of 0.50 and 2.4, respectively. The estimated elasticity of  $\ln(P_t)$  is highly significant but far below unity, indicating that with a 10 per cent rise in the consumer price index, *ceteris paribus*, the nominal wage rate will increase by only 6.3 per cent.

#### IV. CONCLUSION

In this paper the short-term and the long-term drivers of Australia's labour productivity surge have been examined by using consistent, and in some cases recently compiled, annual time series data from 1970 to 2001. The Engle-Granger two-step procedure and the Hausman weak exogeneity test are employed to estimate and validate empirically the short- and long-term productivity models.

The empirical results are broadly consistent with previous studies. It is found that in the long-term policies aimed at: a) accelerating various types of investments in human capital, the ITT and non-ITT sectors; b) promoting trade liberalisation, and international competitiveness; and c) using the wage rate as a stimulant in a decentralised wage bargaining system, will improve labour productivity. For example, *inter alia*, it is also found that an increase of say 10 per cent in the real wage rate, *ceteris paribus*, can boost productivity by 1.7 per cent.

It seems that in the long-term a move towards a decentralised enterprise bargaining system, where unions play no active role in setting wages, has been a significant source of productivity, particularly after 1992. Australia's labour productivity growth in the short-term is mainly determined by the growth rate of the real stock of capital in the ITT and non-ITT sectors, trade openness, international competitiveness, the real wage rate, as well as an error correction mechanism. However, the long-term productivity performance depends, not only on these short-term determinants, but also on the effectiveness of the educational system and the government's success in undertaking consequential reforms in the labour market.

In sum, if Australia is to continue experiencing a high productivity growth at its 1990s rate, the economy should invest more in human, physical and IT capital. Microeconomic reforms can also make the economy more adaptable and less vulnerable to any external shocks. The reduction of barriers to competition and removal of impediments (e.g. the impact of unionisation) to innovation will pave the way for a long-term sustainable growth of productivity.

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Elke Wolff/Thomas Zwick\*

## REASSESSING THE PRODUCTIVITY IMPACT OF EMPLOYEE INVOLVEMENT AND FINANCIAL INCENTIVES \*\*

### ABSTRACT

*Employee involvement* and financial incentives are often praised as effective means for increasing firm productivity. We assess the productivity effects of these human resource practices by accounting for the main sources of estimation bias – unobserved heterogeneity and endogeneity – and by using representative establishment panel data for Germany. We show that employee involvement raises establishment productivity, but financial incentive systems do not. An important result is that accounting for unobserved heterogeneity and endogeneity reverses the conclusions on the estimated productivity effects obtained from simple cross-sectional regressions.

JEL-Classification: C23, D23, D24, M12.

Keywords: High Performance Workplaces; Microeconometric Evaluation; Productivity.

### 1 INTRODUCTION

In this paper, our first goal is to test competing hypotheses derived from influential theories on the productivity effects of employee involvement and financial incentives. Our second goal is to illustrate the potential consequences of ignoring the estimation problems set out in the literature in the assessment of the impact of employee involvement and financial incentives on establishment productivity.

An impressive body of theoretical literature claims that establishments can gain structural competitive advantages and create additional value by increasing employee involve-

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ment and offering financial incentives to their employees (Becker and Gerhart (1996); Huselid, Jackson, and Schuler (1997); Ichniowski, Shaw, and Prennushi (1997); Appelbaum et al. (2000)), but another strand of the literature is more skeptical about the positive effects of these measures (Hannan and Freeman (1984); Meyer and Rowan (1977)). Hence, the empirical assessment of employee involvement and financial incentives is an important topic in organizational studies and the industrial relations literature (March and Sutton (1997); Shaver (1998)). The aim of this literature is to detect a causal relation between different types of work organization or their changes and firm performance (see Wolf and Zwick (2003) and Addison (2005) for surveys on the results of the empirical literature). During the last decade, researchers have become increasingly aware of the sources of estimation bias and several critical literature surveys have pointed to flaws in the empirical literature and the conclusions obtained in those papers (Huselid (1995); Becker and Gerhart (1996); Ichniowski et al. (1996); Capelli and Neumark (2001)). Hence, the first aim of this paper is to test these competing hypotheses.

Usually, researchers assess the productivity effects of employee involvement and financial incentives by regressing a measure of performance on organizational change or strategy choice of firms using a preferably representative data set. There are good reasons to believe that this estimation procedure might yield biased coefficients due to two different issues.

The first type of potential misspecification results from ignoring the so-called unobserved heterogeneity between establishments. In the organizational literature, a growing list of contributions points out that intangible factors such as establishment capabilities, management quality, industrial relations, perceived organisational reputation or innovative capacity have an important impact on both establishment performance and on the choice of the organizational strategy (Addison et al. (2000)). If this is the case, then the evaluation of human resource practices requires more than just simple cross-sectional regressions.

The second source of estimation bias may arise from the endogeneity of measures, also denoted as reversed causality. Studies on organization consistently show that the choice of management strategies often depends on demand shocks, the appointment of a new CEO, the introduction of works councils, changes in the legal form, innovations in the industry, pursuit of legitimacy, organizational inertia, etc. The OECD (1999) comments on the endogeneity problem as follows: "If firms only began to experiment with new forms of working practices when they faced dire trouble, the existence of practices might be associated with poorer performance, at least over the short-term. On the other hand, if flexible practices were introduced mainly by firms with more highly skilled workforces, there is the danger that higher performance may be attributed to the working practices rather than the higher skills." Hence, a convincing test on whether or not innovative human resource practices boost productivity must take into account that these measures are not exogenous determinants in the production function. Thus, to accomplish the second aim of this paper, we use a unifying framework that accommodates both sources of misspecification. Our analysis demonstrates the size and the sign of the estimation bias caused by ignoring unobserved heterogeneity and endogeneity.

## THE LINKAGES BETWEEN TEACHER UNIONS AND STUDENT ACHIEVEMENT

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### ABSTRACT

Over the past decade, researchers have uncovered a positive teacher union productivity effect in the public schools and have further demonstrated that the benefits of unionized schooling accrue primarily to the average student, possibly at the expense of other students. At present, however, the moderators of the union-achievement relationship have not been definitively identified. After surveying literature from the fields of education, industrial relations, and organizational theory, a model of how teacher unions influence student achievement was constructed and tested. The teacher union productivity effect was found to be primarily generated by organizational changes in response to unionization rather than by specific union bargaining gains.

What variables affect the achievement of elementary and secondary school students? The most intuitive responses would probably include factors such as the student's innate ability, student effort, the support and economic status of the family, the quality of teaching, and the school's resources. Typically, a teacher union is not a variable that immediately surfaces in such a discussion. However, a consensus appears to be emerging in the industrial relations literature that teacher unions indeed have a positive effect on achievement. What is not understood are its causal connections. This article attempts to uncover some of these connections in an effort to inform the debate over educational reform.

### LITERATURE REVIEW

To date, a few researchers [1-6] have quantitatively linked unions to student achievement. Eberts and Stone broke new ground by comparing the mathematics achievement of public school students in union versus nonunion schools [1].

Fourth graders at both types of schools took a math examination at the beginning (pretest) and the end (posttest) of the school year. The individual's score improvement served as the authors' measure of student achievement. Constructing an "educational production function" for each type of school, the authors attempted to estimate the productivity differential between union and nonunion schools [7]. Their study revealed a positive and significant effect of teacher unions on the order of 7 to 8 percent; that is, students in union schools demonstrated greater score improvement relative to those in nonunion schools, other things being equal. Eberts and Stone published a similar study in 1987 that reported a positive productivity effect of 3 percent [2].

Looking across student ability groups also yielded an interesting and informative result: Average-ability students improved more in unionized schools, while above- and below-average students improved more in nonunion schools. Eberts and Stone speculated that this phenomenon is produced by a "standardization" of educational procedures and practices that accompanies unionism, but they did not provide any general theory supporting this contention [2].

Milkman replicated the Eberts and Stone methodology to analyze secondary school student achievement [3]. Using an individual's improvement in score from sophomore to senior year on a standardized math test as his measure of achievement gain, Milkman estimated the union productivity differential at a positive and significant 2 percent of the average achievement test score [3].

Analyzing the differential across ability groups again proved illuminating. Otherwise identical students of average ability indeed appeared to benefit more from the unionized school environment than did their peers in nonunion schools. Gains of above- and below-average students in different school types, however, were not significantly different [3].

Three other studies have also attempted to link teacher unions with student achievement. All used SAT scores as their outcome measure. Kurth analyzed the decline in SAT scores from 1972 to 1983 with respect to the rapid growth of teacher unionism during this time [4]. Specifying SAT scores as a function of changing social conditions (divorce rate, labor force participation rate of women, and increasing prevalence of drugs, crime, and promiscuity), financial resources devoted to education (per pupil spending, teacher pay, percentage of school resources from local sources, and school district consolidation), and bargaining variables (percentage of teachers bargaining and percentage of teachers permitted to meet and confer), Kurth estimated the bargaining variables explained more of the decline in both verbal and math scores than any other variables. This, he concluded, was evidence of a negative union productivity effect [4].

Nelson and Gould reanalyzed Kurth's data using a more conventional educational production function [5]. They found the increasing incidence of collective bargaining had a *positive* rather than negative effect on SAT scores and reasoned the disparity in results stemmed from Kurth's misspecified model and poorly constructed variables [5]. In reply, Kurth retorted that Nelson and Gould,

administrations need to pay attention to both setting educational policy and to its implementation. Typically, the latter is neglected in the name of teacher autonomy or professionalism. With respect to teacher unions, although they champion both autonomy and professionalism, the existence of a teacher union in a school appears, paradoxically, to induce the heightened scrutiny of classroom practice that in turn facilitates positive achievement effects.

## CONCLUSION

I have attempted to identify the linkages between teacher unions and student achievement and have found that the historically observed positive relationship is a function of 1) management intervention into classroom practice in response to unionization and 2) union political successes in securing more educational funding. Future research should address whether union-induced tighter coupling of the school is also responsible for the disparate achievement effects across students.

## APPENDIX A

Perrow [31], in summarizing the work of Simon [42] and March and Simon [43], discussed the effect of the more rigid bureaucratic form on the member of the organization. Organizations, in an effort to ensure that members make decisions in a rational manner, seek to control their discretion through hierarchy, rules, and standards of output. In this way, the organization encourages decisions that are consistent with organizational rather than with member goals. Individual members in this type of environment meet organizational expectations of output by engaging in "satisficing" behavior: they maximize the utility of their decisions given the cost of searching for another solution. Decision making, in essence, becomes a constrained optimization problem for the individual: one wants to gain as much utility from one's job as possible but must simultaneously meet organizational requirements (which are often greater than they would be under a traditional bureaucracy).

When a school is unionized, the power of school management and its ability to unilaterally carry out its central educational mandate is threatened. Management not only tightens its own ship, but also seeks to safeguard its control over the educational process. This may manifest itself as the codification of standards of "output," the enforcement of previously unenforced rules and regulations, or heightened regulation of instructional practices, teaching techniques, homework load, student discipline, and other classroom activity.

Teachers who work in rational-legal environments can be expected to engage in more satisfying behavior than their counterparts in traditional environments. Given their more regulated work life and the formal enforcement of production standards, they begin to focus on the objectives rather than the process of education. Because these objectives often entail improving the achievement of as many

were simply picking up the effect of any set of moderators, the coefficient would go to zero when those moderating variables are included in the EPF. However, UNION remains positive in all equations in Table 3, implying that no individual set of moderators fully explains the effect.

It is logical, then, to explore whether combinations of these moderators explain away the union effect. Table 4 reports estimates specified accordingly.

Equation 7 is most noteworthy because the union parameter is indistinguishable from zero. The inclusion of both union political success and coupling measures in the model is responsible for this result. Bargaining gains, by contrast, do not appear to be a critical linkage between unions and student achievement, as their insertion (equations 5 and 6) fails to make the UNION variable insignificant.

It is possible the decline in sample size from equations 5 to 7 (due to missing data as more variables are included) has created a spurious result that coupling and political successes indeed moderate the union-achievement relation. If adding variables produced a nonrandom exclusion of observations, the union variable might lose its significance for reasons unrelated to the moderators. To investigate this possibility, equations 5 and 6 were reestimated using only the sample from equation 7. Equations 8 and 9 in Table 5 illustrate that the coefficient on UNION remains significant when these models use only the restricted sample. It would appear, then, that equation 7 indeed offers evidence about the important moderators of the union-achievement relation.

These findings have implications for bargaining, for educational funding, and for the effective organization of schools. Measured outcomes of bargaining, either individually or collectively, do not positively affect achievement. Arguments that higher salaries and more teacher schooling have an impact on teacher quality and, thereby student performance, are not supported by this research. One cannot infer from this, however, that the growth in school funding should necessarily be curtailed. Juxtaposing equations 4 and 7 strongly suggests that greater expenditures on non salary budgetary items may be an important path by which unions influence achievement. A possible conclusion then, but one that requires more research, is that educational funding should be weighted more heavily in favor of nonsalary expenditures [39].

The result that tighter coupling significantly moderates the union-achievement relation suggests unionization somehow facilitates a more efficient organization. This may in part by a shock effect [40, 41], insofar as school management becomes more efficient. However, because the coupling variables in this study primarily measure connections between management and classroom rather than within management itself, it seems more likely that the school as *an organization* is shocked into greater efficiency by the introduction of a union. In essence, it becomes a better bureaucracy.

How does this point inform the educational reform debate? This "better" bureaucracy entails tighter linkages between management's goals and classroom practices, ultimately generating desired classroom outcomes. Thus, school



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## Employee participation and productivity

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### Abstract

This paper measures the productivity impact of shop-floor employee involvement. On the basis of a representative German establishment data set, the study finds that the introduction of teamwork and autonomous work-groups, and a reduction of hierarchies in 1996/1997 significantly increased average establishment productivity in 1997–2000. The estimation strategy controls for unobserved invariant establishment heterogeneity by using a two-step system GMM panel regression approach. It simultaneously takes account of endogeneity of participative work organization by instrument variable regressions. It is also shown that the productivity effect of shop-floor employee involvement is stronger in establishments with works councils.

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*JEL classification:* C23; D24; J50; M12

*Keywords:* Employee participation; Works council; Establishment productivity; Panel regression

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### 1. Introduction

Participative establishment practices are praised as suitable and effective means to increase the competitiveness of firms (Ichniowski et al., 1997; Godard and Delaney, 2000; Black and Lynch, 2001; Wolf and Zwick, 2003). In order to assess their impact on the productivity of German firms, this paper distinguishes between shop-floor employee involvement, such as teamwork, flat hierarchies or autonomous work groups, and works councils, which are a well-established instrument of top-level employee participation in Germany (Rogers and Streeck, 1995). In contrast to shop-floor employee involvement that usually is induced by the management, the initiative for the introduction of a works council comes from the employees.

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Although there are some studies on the separate productivity impacts of shop-floor participation and works councils, it is completely unclear so far if the presence of a works council in an enterprise hampers the effects of shop-floor participation or improves them. In the theoretical literature, arguments for positive and for negative spill-over effects can be found. However, empirical research on the interaction between shop-floor participation and works councils is virtually absent. The obvious gap in the literature is an important motivation to analyse empirically if shop-floor participation and top-level participation hamper or support each other with respect to establishment productivity.

It is not easy to detect empirically if organizational changes increase firm productivity, because firms may tend to introduce innovations depending on their economic situation. This contribution shows indeed that selectivity of organizational forms caused by temporary shocks (endogeneity) and unobserved structural differences (unobserved time-invariant heterogeneity) have an impact on the estimated productivity effects of participation. In addition, this paper assesses the productivity effects of reorganization that increase the participation of employees with lags up to 3 years. This is important because the effects of changes in the work organization are smaller during than after their implementation (Kato and Morishima, 2002).

Also, the productivity impact of works councils is not easy to capture because it is difficult to establish a unilateral causal link between productivity and the presence of works councils. The introduction of works councils is endogenous, and there are systematic and probably unobserved differences between enterprises with and without works councils (Frick and Sadowski, 1995; Addison et al., 1997; Hübler and Jirjahn, 2002). For that reason, the paper takes account of the endogeneity of works councils in an endogenous switching regression model and measures the productivity impact of shop-floor employee participation separately for establishments with and without works councils.

The remainder of this paper is structured as follows: in the next section, the impact of shop-floor employee participation and works councils on establishment performance is discussed. In Section 3, the German data set used (the IAB establishment panel) is presented. Then follows a description of the incidence of reorganizations and their correlation with works councils in Germany. The fifth section presents the empirical estimation strategy and the estimation results. The last section concludes.

## 2. Background discussion

The main principle behind management-led initiatives in improving shop-floor employee participation is to get lower-level staff more involved in the decision and work process and to grant these employees greater autonomy and control over job tasks and methods of work (Cappelli and Rogovsky, 1994). This increases the necessity of horizontal communication between front-line employees (Ichniowski et al., 1997). Both intensified communication and autonomy of non-managerial staff are supposed to be improved if the work organization is characterized by (autonomous) teams and flat hierarchies (Appelbaum et al., 2000). But how may increased employee involvement raise firm productivity? First, this strategy takes advantage of the specific knowledge non-

Table 4  
Productivity effects of participation on average productivity 1997–2000, participation dummy

|                                      | Works council not present<br>(endogenous switching<br>regression model, treatment<br>effect estimates) | Works council present<br>(endogenous switching<br>regression model, treatment<br>effect estimates) |          |
|--------------------------------------|--|--|----------|
| Coefficients                         | z-values   | Coefficients   | z-values |
| Participation dummy                  | 0.06   | 0.18   | 0.19*    |
| Strict hiring rules                  | -0.11  | -1.62  | 0.04     |
| Assessments                          | 0.04   | 0.72   | 0.04     |
| Branches                             | -0.02  | -0.27  | 0.10     |
| Share female employees               | -0.39***   | -3.13  | -0.38**  |
| ICT investment                       | 0.02   | 0.46   | 0.17***  |
| Training                             | 0.08   | 1.53   | 0.12     |
| Share qualified employees            | 0.37***  | 3.65   | 0.24*    |
| Exporter                             | 0.21***  | 2.83   | 0.07     |
| State-of-the-art technical equipment | 0.14***  | 2.82   | 0.21***  |
| Collective bargaining                | 0.05   | 0.94   | -0.05    |
| Individual establishment             | -0.23***   | -3.94  | -0.02    |
| Partnership                          | -0.08  | -0.98  | -0.02    |
| Publicly listed establishment        | 0.13   | 0.76   | 0.11     |
| Establishment size 20–49             | 0.21***  | 3.81   | -0.59*** |
| Establishment size 50–99             | 0.50***  | 5.72   | -0.62*** |
| Establishment size 100–249           | 0.37***  | 2.40   | -0.66*** |
| Establishment size 250–499           | 0.30   | 1.47   | -0.34*** |
| Establishment size 500+              | 0.28   | 1.55   | -0.30*** |
| East German establishment            | -0.25***   | -4.86  | -0.37*** |
| Constant                             | -1.19***   | -3.61  | 1.82***  |
| $-\phi/\Phi$                         |  | 0.76***  | 6.48     |
| $\phi/(1 - \Phi)$                    |  | 0.65***  | 5.74     |
| 13 Sector dummies                    | yes<br><i>N</i> =1219  | yes<br><i>N</i> =864   |          |

Significance levels: \*\*\*<1%, \*\*<5%, all values are for 1997, except works council, the value of which is only available for 1998. Standard errors are heteroscedasticity robust.

Source: IAB establishment panel, waves 1997–2001, own calculations.

employee participation, and the positive collective voice effect of works councils is more important than the negative management restriction effect. A comparable result is derived by Hübler and Jirjahn (2002) for teamwork and autonomous work groups (while the productivity impact of the reduction of hierarchies is negatively influenced by works councils in their study). Cooke (1994) also finds on the basis of US data that the productivity effects of participation are larger in unionized firms than in non-unionized firms. He argues that unionized firms provide a better environment for tapping the benefits of employee participation than non-union firms.<sup>16</sup> However, note

<sup>16</sup> His result may be biased, however, because neither the endogeneity of the presence of unions nor of participative workforms is controlled for. The production functions are estimated jointly for unionized and non-unionized firms although large differences between both groups of firms are revealed in the descriptive analysis.

Table 5  
Productivity effects of participation on average productivity 1997–2000, participation factor

|                                      | Works council not present<br>(endogenous switching regression<br>model, IV estimates) |          | Works council present<br>(endogenous switching regression<br>model, IV estimates) |          |
|--------------------------------------|---|----------|---|----------|
|                                      | Coefficients  | z-values | Coefficients  | z-values |
| Participation factor                 | 0.03  | 0.28     | 0.11  | 1.49     |
| Strict hiring rules                  | -0.12   | -1.27    | -0.03   | -0.36    |
| Assessments                          | 0.04  | 0.48     | -0.01   | -0.09    |
| Branches                             | -0.02   | -0.24    | 0.09  | 1.39     |
| Share female employees               | -0.39***  | -3.07    | -0.38**   | -2.14    |
| ICT investment                       | 0.02  | 0.23     | 0.13*   | 1.77     |
| Training                             | 0.08  | 1.39     | 0.11  | 1.29     |
| Share qualified employees            | 0.38***   | 3.45     | 0.21  | 1.49     |
| Exporter                             | 0.20**  | 2.55     | 0.10  | 1.15     |
| State-of-the-art technical equipment | 0.14***   | 2.68     | 0.20***   | 3.25     |
| Collective bargaining                | 0.05  | 0.88     | -0.04   | -0.34    |
| Individual establishment             | -0.23***  | -3.82    | -0.04   | -0.15    |
| Partnership                          | -0.07   | -0.95    | -0.01   | -0.07    |
| Publicly listed establishment        | 0.13  | 0.75     | 0.09  | 0.97     |
| Establishment size 20–49             | 0.21***   | 3.49     | -0.55***  | -4.10    |
| Establishment size 50–99             | 0.50***   | 5.27     | -0.53***  | -4.18    |
| Establishment size 100–249           | 0.37**  | 2.36     | -0.56***  | -4.76    |
| Establishment size 250–499           | 0.31  | 1.50     | -0.28***  | -2.96    |
| Establishment size 500+              | 0.27  | 1.55     | -0.18***  | -2.77    |
| East German establishment            | -0.25***  | -4.26    | -0.33***  | -4.96    |
| Constant                             | -1.16***  | -3.57    | 0.62  | 1.24     |
| $-\phi/\Phi$                         |   |          | 0.73***   | 6.11     |
| $\phi(1 - \Phi)$                     | 0.65***   | 5.60     |   |          |
| 13 Sector dummies                    | yes   |          | yes   |          |
|                                      | $R^2 = 0.38$  |          | $R^2 = 0.42$  |          |
|                                      | $N = 1219$  |          | $N = 864$   |          |

Significance levels: \*\*\*<1%, \*\*<5%, \*<10%, all values are for 1997, except works council, the value of which is only available for 1998. Standard errors are heteroscedasticity robust.

Source: IAB establishment panel, waves 1997–2001, own calculations.

that the participation factor does not have a significant impact on productivity (see Table 5).

## 6. Conclusions

This contribution shows that the introduction of shop-floor employee participation in 1996 or 1997 significantly increased average total factor productivity of establishments in Germany by 28% in 1997–2000. Teamwork, autonomous work groups and the reduction of hierarchies provide establishments with an additional productivity advantage. A second regression using a synthetic participation factor that takes into account which (bundle of) measures has been implemented by each establishment indicates that the productivity impact increases with the number of measures introduced.

In this paper, selectivity in the introduction of shop-floor employee participation is controlled for by using four external instruments for participative work organizations. The instrumental variables indicate if the establishment expects skill shortages and an increase in continuing training demand. Expected skill shortages and expected higher demands for continuing training are positively correlated with the introduction of shop-floor participation but they are not correlated with average productivity in the following years. A comparison between the simple OLS production function estimation and the instrumental variable regressions shows that especially establishments with productivity gaps introduce shop-floor employee participation and that the instrumental variable regressions reduce measurement errors when estimating participation in the OLS production function. Time-invariant unobserved heterogeneity of the establishments is controlled for by using a two-step procedure proposed by Black and Lynch (2001). In the first estimation step, the establishment fixed effect (or total factor productivity) is estimated using a system GMM panel production function that contains the variable production inputs. In the second estimation step, the average fixed effects are explained by a large vector of quasi-fixed establishment and employee characteristics including the participation dummy or the participation factor.

In an endogenous switching regression model, it is demonstrated that works councils have a positive impact on the productivity effects of shop-floor participation. Establishments with a works council, i.e. top-level participation, can derive a higher productivity effect from shop-floor employee participation. The endogeneity of the introduction of works councils again is taken into account by using an instrumental variable approach with one external instrument, the presence of profit sharing and employee share ownership.

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### Appendix A

Table A1  
Descriptive statistics of variables used

| Variables              | 1997  | 1998  | 1999  | 2000  | Comments  |
|------------------------|-------|-------|-------|-------|---|
| Value added            | 12.90 | 12.85 | 12.99 | 13.07 | Turnover minus inputs, in DM, logs                        |
| Capital                | 12.44 | 12.45 | 12.38 | 12.44 | Constructed by perpetual inventory method, in DM, in logs |
| Number of employees    | 1.95  | 1.95  | 1.97  | 1.96  | Number of employees, in logs                              |
| Branches               | 0.27  |       |       |       | Establishment has at least one branch                     |
| Share female employees | 0.35  |       |       |       | Share of female employees on all employees                |

(continued on next page)

Table A1 (*continued*)

| Variables  | 1997 | 1998 | 1999 | 2000 | Comments   |
|--|------|------|------|------|--|
| Share qualified employees                            | 0.66 |      |      |      | Share of employees with professional degree on all employees   |
| Exporter   | 0.17 |      |      |      | Establishment exports, yes = 1, no = 0   |
| State-of-the-art technical equipment                 | 0.68 |      |      |      | Technical state of equipment is modern or state-of-the-art, yes = 1, no = 0  |
| Participation  | 0.27 |      |      |      | Establishment introduced participative work form in 1996 or 1997, yes = 1, no = 0                                    |
| Works council  |      | 0.29 |      |      | Establishment has works council, yes = 1, no = 0   |
| Collective bargaining                                | 0.74 |      |      |      | Establishment is subject to or orients itself on sector- or establishment-specific collective wages, yes = 1, no = 0 |
| Individual establishment                             | 0.14 |      |      |      | Establishment is an individual firm, yes = 1, no = 0   |
| Partnership establishment                            | 0.08 |      |      |      | Establishment is a partnership, yes = 1, no = 0  |
| Publicly listed establishment                        | 0.05 |      |      |      | Establishment is publicly listed, yes = 1, no = 0  |
| Limited (reference)                                  | 0.63 |      |      |      | Establishment is a public limited company, yes = 1, no = 0   |
| Profit sharing and employee share ownership          | 0.14 |      |      |      | Establishment grants profit sharing and/or employee share ownership, yes = 1, no = 0                                 |
| Strict hiring rules                                  | 0.31 |      |      |      | Establishment has strict hiring rules, yes = 1, no = 0   |
| Assessment   | 0.32 |      |      |      | Establishment regularly assesses the performance of the employees, yes = 1, no = 0                                   |
| Expected skill shortage                              | 0.24 |      |      |      | Establishment expects skill shortages in next 2 years, yes = 1, no = 0   |
| Expected large demand for training and qualification | 0.15 |      |      |      | Establishment expects large demand for training and qualification in next 2 years, yes = 1, no = 0                   |
| Expected increase in job rotation                    | 0.09 |      |      |      | Establishment expects increase in job rotation in next 2 years, yes = 1, no = 0                                      |
| Expected increase in quality circles                 | 0.12 |      |      |      | Establishment expects increase in quality circles in next 2 years, yes = 1, no = 0                                   |

Averages derived from cross-section samples and weighted.

Source: IAB establishment panel, waves 1997–2001, own calculations.

Table A2  
Rotated component matrix of factor analysis

| Factor                          | Variables               | Factor loadings |
|---------------------------------|-------------------------|-----------------|
| Participative work organization | Shift responsibilities  | 0.82            |
|                                 | Teamwork                | 0.80            |
|                                 | Independent work groups | 0.73            |

The factors have been rotated by promax.

Source: IAB establishment panel, wave 1999, own calculations.

# The Impact of Training Intensity on Establishment Productivity

THOMAS ZWICK\*

The empirical literature on productivity effects of continuing training is constantly increasing. However, the results on this subject differ widely. Explanations for this worrying diversity seem to lie in differences between countries, labor market institutions, and data generation on one hand, and in differences between the underlying estimation techniques on the other (Bartel, 2000). This paper concentrates on the latter problem and shows how results vary with different estimation techniques.

THE CENTRAL ESTIMATION PROBLEM IS ENDOGENEITY of continuing training and other production inputs such as labor and capital. Firms do not decide randomly how many employees need to be trained, and therefore training is not a strictly exogenous variable in the productivity equation. The decision to increase or decrease other input factors is also inseparably linked to fluctuations in output and productive efficiency influenced by unobservable elements. The endogeneity problem may therefore be the source of two distinct biases (Kruse 1993; Dearden, Reed and Van Reenen 2000; Black and Lynch 2001; Caroli and Van Reenen 2001). First, firms that offer training may be structurally more or less productive due to time-invariant unobserved factors such as management quality, the exposition to long-term technical change, personnel department activity, or management-employee relations. This source of estimation bias is called unobserved time-invariant heterogeneity. Second, transitory shocks, such as the introduction of a new technology or a change in product or labor market conditions, could change output and input decisions and induce changes in training efforts at the same time. This source of estimation bias is called endogeneity bias of training intensity.

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The main contribution of this paper is to present representative estimations of the impact of training intensity on establishment productivity in Germany. It simultaneously addresses both potential sources of estimation bias and estimates the productivity impact of the share of trained employees divided by the total number of employees. For that purpose, a standard panel production function estimation on the basis of representative German establishment data is used. Additionally, an innovative two-step instrumental variable and panel estimation technique is employed. A broad range of establishment and employee characteristics is taken into account. By comparing the estimation results obtained by this approach with the uncorrected ordinary least squares (OLS) estimates, the paper reveals the sign and the size of the sources of estimation bias mentioned above.

#### Literature

Although continuing training plays a central role in a firm's skill provision and competitiveness, the evidence on productivity effects of training is thin and partly contradictory. A growing number of papers tried to capture the effect of employer-provided training on productivity by using representative firm-level data from several sectors in the economy. The estimation results vary strongly, however, depending on the estimation technique used. In this section, a short survey of studies that use firm- or establishment-level data from several economic sectors is provided. Focusing on the data and the estimation techniques used, their possible shortcomings are highlighted.

In one of the first contributions to this topic, Holzer et al. (1993) estimated the effect of training on the scrap rate. The data consisted of 390 applicants for the Michigan Job Opportunity Bank-Upgrade between 1987 and 1989. The authors estimated the variables in differences in order to avoid unobserved heterogeneity bias and include indicators for industrial relations and reasons for training. They found that a change in the annual hours of training per employee has a significant and substantial positive impact on product quality. This effect vanishes, however, when lagged changes in training are added.

Bartel (1994) first estimated a simple cross-section production function including a dummy for formal training programs in the effective labor term. She did not find an effect of formal training on productivity in the same year. The estimation may be biased, however, because unobserved heterogeneity between firms leads to a correlation between the formal training measure and the error term (Griliches and Mairesse 1998). In order to avoid this bias, she estimated a first difference model where the change in labor productivity between 1983 and 1986 is regressed on changes in the incidence

of training programs. This change in the estimation method increases the measured productivity impact of training. She found that businesses operating below their expected labor productivity levels in 1983 implemented new employee training programs afterwards. That brought productivity up to the level of comparable businesses by 1986.

Barrett and O'Connell (2001) applied the same estimation strategy, but they regressed the level of training intensity on the change in productivity instead of the change in training intensity. They used data from two waves of Irish firms surveyed in 1993 and 1995, where the response rate of the second wave was only one-third of the initial firms. The effect of training days/total employment was positive and significant on changes in labor productivity. The studies by Bartel (1994) and Barrett and O'Connell do not address selectivity of the introduction of training programs.

Black and Lynch (1996) estimated a standard Cobb-Douglas production function including training intensity, three specific types of training activities, and several controls for other workplace practices. The estimations are based on a data set from the 1994 U.S. National Center on the Educational Quality of the Workforce (EQW). They find no impact of the share of trained employees on sales, while a high percentage of formal training outside working hours has a positive impact on productivity in manufacturing, and computer training has a positive impact on productivity in non-manufacturing. However, their cross-section study is prone to unobserved heterogeneity bias, and they take training as an exogenous variable in their regression.

In order to correct for unobserved time-invariant heterogeneity between firms, Black and Lynch (2001) supplemented their data on training and other workplace practices with panel data from the Longitudinal Research Database (LRD). In the first estimation step, they calculated the average firm-specific, time-invariant residual in a fixed effects Cobb-Douglas production function without the almost time-invariant workplace practices, training methods, and other firm and employee characteristics. In a second step, they regress the average establishment residual on training and the other quasi-fixed factors. In this regression, training intensity still has no impact on productivity, irrespective of whether unobserved time-invariant heterogeneity is corrected for or not. Black and Lynch (2001: 443) admitted that their estimation techniques only correct for endogeneity in the time-variant parameters included in the first step, while the second step estimates (including training intensity) are prone to selectivity bias.

Ballot, Fakhfakh, and Taymaz (2001) found that the impact of training hours per employee on firm productivity depends strongly on the underlying estimation technique. A system generalized method of moments (GMM-SYS)

estimation takes account of possible endogeneity of labor, capital, training, and research and development (R&D) in the productivity estimation. They found that training has a positive and significant impact on value added in France, while in Sweden the effect is insignificant. Their instruments (values of the explanatory variables lagged by 1 or 2 years) may be weak because all instrumented variables and the dependent variable may be affected by shocks that take longer than 1 or 2 years (Dearden, Reed, and Van Reenen 2000). Their panel includes 6 years and is too short for designing longer lags. In addition, their specification is very parsimonious and takes only tangible assets and their interactions into account, while further firm and personnel characteristics are absent. Finally, their sample of 90 firms in France and 270 firms in Sweden was small and specific.

Bassi et al. (2001) correlated training expenditures with indicators for the firm performance a year later. They found that training expenditures have no correlation with total sales per employee and a negative impact on income and profits in the next year. The long-run impact of training on firm's profitability as captured by changes in Tobin's Q and share prices are positive. They even measured a super-normally high rate of return—\$1 invested in training gives more than \$33 in benefits to the firm—and this leads the authors to conclude that firms are under-investing in training. As they use only a very limited set of additional control variables, Bassi et al. (2001) mentioned that training may serve as a marker for other unmeasured firm-level attributes that are correlated with a firm's long-term profitability. In other words, the estimation might suffer from omitted variable bias.

Dearden, Reed, and Van Reenen (2000) present a study on the productivity impact of training intensity on the industry level in Great Britain. They use a long-panel data set between 1983 and 1996 that entails information on training in every year. They address unobserved heterogeneity as well as selectivity of training simultaneously by using a system GMM estimation including levels, first differences and lags of capital, labor, as well as training intensity (Blundell and Bond 1999). In addition, they calculated the impact and the sign of the biases incurred when training is taken as exogenous in the estimation. They found a positive and significant effect of training intensity on sector productivity, which increases significantly when endogeneity of training is considered. Still, several drawbacks of their approach have to be mentioned. They combined data on different aggregation levels that may lead to aggregation bias. Lagged variables might be weak instruments for current levels of training intensity, capital, and labor (Griliches and Mairesse 1998). Finally, their information on training covered only 4 weeks per year, and service firms have been dropped due to concerns over data quality (Dearden, Reed, and van Reenen 2000, p. 33) in most regressions.

function are added. This approach is frequently used in comparable settings (Huselid 1995; Bresnahan, Brynjolfsson, and Hitt 2002). In accordance with most of the literature (Huselid 1995; Delaney and Huselid 1996, Huselid and Becker 1996), no significant interaction term could be identified; however, neither if the interaction terms were added individually nor jointly. Reasons for the insignificant complementarities found may be that the establishments already successfully exploit them and that there are strong collinearities between training and ICT investments or participative human resource measures.

### Conclusions

This paper shows that increasing the training intensity has a positive and significant effect on establishment productivity in Germany. We know from other studies, however, that not all training forms increase productivity (Zwick 2005). In addition, we can assume that the training effect is lower for those establishments that decided not to invest in training. Therefore no firm conclusions can be obtained if more establishments should offer continuing training or if the training establishments should increase their training intensity.

This paper takes account of selectivity in training by using expected skill shortages and personnel department activity as instruments that identify the training decision. In addition, unobserved heterogeneity is corrected by estimating a fixed-effects panel estimation. If both sources of estimation bias are controlled simultaneously, it is found that an increase in training intensity in the first half of 1997 by one percentage point increases average establishment productivity in the period 1998–2001 by around 0.76 percentage points.

The estimations demonstrate that selectivity bias reduces the measured productivity impact. Therefore, establishments strategically intensify training when they expect qualification gaps in the future and cover their qualification demand mainly by own training efforts instead of hiring qualified labor from the labor market. It can be concluded that one motivation of establishments to increase training intensity is an attempt to regain competitiveness and to close qualification gaps because training is a suitable means to reduce these gaps with respect to competitors.

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