Unions Improve Chinese Workers' Welfare

--- Results from 1,268 Firms

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[Abstract]

Based on a survey of 1,268 firms in 12 Chinese cities, this paper empirically studies the effects of unions on three aspects of workers' welfare, namely, hourly wages, monthly working hours, and pension coverage. Our baseline results show that unionization increases hourly wage rates by 5.6%, reduces monthly working hours by 1.4%, and raises pension coverage by 12.3%. Taking the endogeneity of unionization into consideration, our 3SLS estimation finds larger effects. These results are robust in the subsample of domestic private enterprises where unions are less common than in other types of firms. Further econometric analysis has established two channels for unions to improve workers' welfare, one by encouraging collective wage contracts, and the other by encouraging written contracts.

Key Words: Unionization, workers' welfare, Chinese firms

JEL Classification: J3   J51

1. Introduction

Labor unions in China have made major progresses in terms of membership in recent years. As shown by Figure 1, by the end of 2008, there were 1.725 million grassroots labor unions, a growth of 90% over 2003, and union membership reached 225 millions.[1] Despite this growth, however, doubts are often raised about whether unions in China really improve workers' welfare. At the firm level, unions are often headed by people from the management;[2] at the national level, the All-China Federation of Trade Unions (ACFTU) is a semi-governmental organization under tight government control. That is, unions may not represent workers' interests at either the local level or the national level.

[Figure 1 about here]

With cross-sectional firm-level data from a 2006 survey of 1,268 enterprises in 12 cities, this paper provides an econometric study on whether unionization helps improve workers' welfare in China, and if the answer is "yes", by what mechanisms. As China emerges as the "world's factory", the international communities are increasingly concerned about labor protection in the country. An assessment on the role of unions in raising and maintaining labor standards in China is timely needed.

In our econometric analysis, we estimate a SUR model to study the effects of unionization on three firm-level welfare indicators: average wage, monthly working hours, and pension coverage. While wages and working hours are the most frequently studied welfare indicators in the literature on unionization, fringe benefits are also included in some studies. In particular, Freeman (1981) and Freeman and Medoff (1984) argue that in unionized firms, unions would take into account incumbent workers' preferences, and improve fringe benefits through collective

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[1] Data come from the National Bureau of Statistics official website at www.stats.gov.cn.

[2] Clarke (2005) discusses the changing role of trade unions in the state-socialist economies' integration into the global capitalism. He argues that China's trade unions face a dilemma: to reconstitute their traditional role through collaboration with the management and the state apparatus, or to develop their ability to defend the rights and interests of workers.

bargaining. Their empirical studies (and some subsequent studies such as Buchmueller et al. 2002), find significant and large effects of unions on workers' fringe benefits.

We also explore two possible mechanisms, namely, collective bargaining and written contracts, by which unionization may improve workers' welfare. We first link unionization with collective wage bargaining and written contracts, and then link the latter two with the three welfare indicators.

The most significant challenge for our estimation is to deal with the endogeneity of unionization. It is quite possible that more profitable firms that are able to improve workers' welfare are more likely to allow the establishment of unions, to accept collective bargaining, and to sign written contracts with their employees. Indeed, the literature on unionization has long recognized that the status of unions may be endogenous in a union-wage equation. Since most studies deal with individual data, the key issue in the literature is that a worker's union status and wage rate can be simultaneously correlated with unobserved worker capabilities. Most recent studies have tried to deal with this issue (e.g., Booth and Chaterji, 1995; Lanot and Walker, 1998; Budd and Na, 2000; and Gittleman, 2007). Similar to the studies using individual data, the endogeneity of unionization in our study is likely to be caused by firms' unobserved capabilities that simultaneously determine unionization and workers' welfare. While unionization is encouraged by the government, it depends on both the efforts and bargaining power of the workers and the willingness of the management for a union to appear in a firm. With a large labor reserve in the countryside (45% of China's labor force is in the countryside) and a high worker-dependent ratio (currently it is 2.5),[3] labor supply in China is abundant. As a result, workers are in a disadvantageous position in the labor market, and the willingness of the management is critical for a firm to become unionized. Among many factors determining the management's willingness, a firm's financial performance is likely to be the most important. A firm that has or expects a good

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[3] Both figures come from the official website of the National Bureau of Statistics at www.stats.gov.cn.

performance may be willing to raise employees' welfare and be more congruent with labor unions. In addition, ownership, size, location, market shares, technological levels, and managers' education can also play a role.

To deal with the issue, we do two things. One is to control as many variables as possible to control firm performance and characteristics, and the other is to adopt the instrumental variable (IV) approach for unionization. The IV we use is "union popularity", which is defined by the popularity of unions in solving labor disputes in the local business community (the exact definition will be given later). It affects a firm's chances to set up a union, but does not have direct influences on workers' welfare in a specific firm.

Lu, Tao, and Wang (2010) provide the first published study on the effects of unions in China. Using a 2006 sample of 3,800 private firms, they find several interesting results. First, unionization is significantly correlated with higher labor productivity, but is not correlated with profitability. Second, unionization does not increase wage rates, but improve workers' fringe benefits such as the coverage of health care, pension, and other types of insurance. Third, unionization encourages firms to sign contracts with their employees. They also deal with the endogeneity of unionization using firms' political connections with the government as the instruments. While our results of unions' effects on workers' fringe benefits and written contracts agree with Lu et al.'s, we find that unionization significantly increases wage rates and reduces working hours. In addition, we adopt a system of equation approach to estimate the union effects for the three welfare indicators.

The rest of the paper is organized as follows. In section 2, we introduce the data and discuss related backgrounds and key variables. In section 3, we first estimate the SUR model to provide the benchmark estimates for the effects of unions on the three welfare indicators. Then, we introduce the instrumental variable and estimate the model again by the 3SLS method. Finally, we replicate the 3SLS regression for a subsample of domestic private firms. In section 4, once again adopting a system of equation approach, we test two channels, collective wage bargaining and written

contracts, by which unions may improve workers' welfare in two steps. The first step is that unionized firms are more likely to allow collective wage bargaining and provide written contracts to employees, and the second step is that collective bargaining and written contracts improve workers' welfare. Section 5 concludes the paper.

2. Data and Descriptive Analysis

2.1 The Data

The data we use comes from a survey conducted by the International Finance Corporation (IFC) on the corporate social responsibility (CSR) of Chinese firms in the spring of 2006. The survey was conducted on 1,268 firms in 12 Chinese cities (from north to south): Changchun, Dandong, Chifeng, Beijing, Shijiazhuang, Xi'an, Zibo, Chongqing, Shiyan, Wujiang, Hangzhou, and Shunde. The choice of the 12 cities was based on the principle of representation rather than on a random basis. Beijing and Chongqing are two provincial-level cities. Changchun, Shijiazhuang, Xi'an, and Hangzhou are provincial capitals of Jilin, Hebei, Shannxi, and Zhejiang, respectively. Wujiang and Shunde are county-level cities. The other cities are medium-sized prefecture-level cities.[4] Beijing, Wujiang, Hangzhou, and Shunde are located on the coast; Chifeng, Xi'an, Shiyan, and Chongqing belong to the country's western region; and the rest belong to the central region. Changchun, Xi'an and Chongqing used to be among China's industrial powerhouses, but had to go through a painful transformation in the last two decades because of the shifting of the economic gravity from the inland to the booming coastal regions in the east and south. Beijing, Hangzhou, Wujiang, and Shunde are experiencing fast growth in industries and services. Zibo is catching up in industrial development, but its service sector is relatively lagging behind.

The National Bureau of statistics (NBS) was commissioned to carry out the survey. In each city, 100 firms were planned to be randomly selected from firms that

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[4] There are three categories of cities in China: provincial level, prefectural level, and county level. Shunde is currently a district in Foshan city, but was an independent city until 2003.

had an annual sales volume larger than 5 million yuan.[5] But some cities surveyed more than 100 firms. A stratified sampling strategy was adopted to select the sample firms. The first stratum was firm ownership. Firms were divided into three categories: state-owned enterprises (SOEs), domestic private enterprises (DPEs), and foreign-invested enterprises (FIEs).[6] The shares of these three categories of firms in a city were used in the sampling. The second stratum was firm size, which also included three categories: large, medium, and small firms. The definitions of these three size categories were the same as those used by NBS in its routine statistics, which were defined by the State Economic and Trade Commission (SETC, 2003). The shares of firms of these three size categories in a city were used in the sampling.

A questionnaire was administered by NBS's local personnel on the firm managers. Training was provided before the survey. The questionnaire mainly asked questions related to firms' CSR awareness and performance in labor protection, quality control, corporate governance, and environmental protection. It also asked questions about market conditions, management composition, and external finance. In addition, the NBS provided data for the sample firms' annual financial performance between 2001 and 2005.

2.2 Unionization and Workers' Welfare in the Sample

According to the 2006 bluebook of ACFTU (ACFTU, 2006), the major tasks of labor unions in China include "promoting collective bargaining, protecting workers' economic and political rights, meeting workers' cultural needs, participating in labor dispute arbitrations, protecting the legal rights of migrant workers, promoting gender equality, ..." However, those tasks have not been carried out evenly among the sample firms.

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[5] This is because the NBS only maintains a database for firms with a sales volume larger than this level.

[6] SOEs were firms in which the state had controlling shares. DPEs included companies with mixed ownerships but with majority private shares as well as purely privately owned firms. FIEs were firms that had foreign shares including shares held by Hong Kong, Macao, and Taiwanese businesses. There were also collectively owned enterprises, but their number was relatively small, so they were combined with SOEs.

China's *Labor Law* has detailed stipulations on regular working hours, overtime, and wage payments for overtime. "The regular working hours should not be more than 8 hours a day and 44 hours a week"; "overtime should not exceed 3 hours a day, and 36 hours a month, and overtime wages should not be less than 150%, 200%, and 300% of the normal wages on a week day, a weekend, and a national holiday, respectively." Despite of these stipulations, large variations exist in the sample firms. The lowest average hourly wage paid by the sample firms is merely 1.19 yuan.[7] The highest, in contrast, reaches 51.25 yuan while the average hourly pay is 5.90 yuan. [8] As for working hours, the average working hours in the sample is 181 hours a month. However, the most demanding firm asks its employees to work for 336 hours a month, or more than 80 hours a week. In contrast, the most benevolent firm requires just 80 hours of work in a month.[9]

Firms provide pension and other fringe benefits to selective employees although the law requires them to do that for every employee. Pension coverage was recorded in the survey by a variable whose values range from 1 to 5, representing a coverage of less than 20%, 20%-40%, 40%-60%, 60%-80%, and 80-100%, respectively. The average pension coverage of the sample firms is 3.89, or about

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[7] Andrews Stewart, Swaffield, and Upward (1998) find that union wage differentials are higher when measured in terms of hourly earnings than when measured in terms of weekly earnings. This is because union workers work fewer hours per week than non-union workers on average. In our study, however, hourly wages are converted by dividing the monthly average wages by monthly average working hours, both provided by the firm managers. Therefore, our study does not suffer the problem pointed out by Andrews et al. (1998). As a complement, we study monthly working hours when it comes to the union's effect on working time.

[8] The national average of annual salary in 2007 was 20,856 yuan (the NBS official website: http://www.stats.gov.cn/tjsj/ndsj/2007/indexch.htm). If we assume 22 working days in a month and 9 working hours a day, then the national average hourly wage was 8.78 yuan, much higher than that in our sample. This gap may be caused by the fact that our sample firms are all in the manufacturing sector, which pays lower wages than other sectors.

[9] This is a smelting plant in Jining. It is not like an idle plant because its monthly wage is 900 yuan/worker, which is 85% of the average monthly wage in the sample.

77.8%, which is very close to the national figure of 2006.[10] It is noteworthy that the proportion of local workers getting pensions is much higher than migrant workers. The ratio of firms paying most (more than 60%) of the local workers' pensions is 63.7%, while only 47.6% of the sample firms do so for migrant workers.

[Table 1 about here]

As for the role of the union, the descriptive analysis presented in Table 1 strongly supports the thesis that unions improve workers' welfare. Because we do not have data on individual workers, "unionization" is defined by the observation that a firm has a union, and workers' welfare is measured by firm-level aggregate indicators. In the sample, 69% of the firms are unionized. The table shows that workers in unionized firms are treated much better than in non-unionized firms. The average wage rate offered by unionized firms is 17.3% higher than that offered by non-unionized firms while the average monthly working hours in unionized firms are 9 hours less.[11] When it comes to pension and unemployment insurance coverage, the gaps between unionized firms and non-unionized firms are even larger: unionized firms lead non-unionized firms by more than 20 percentage points in both cases. Consistent with the better treatments, employees in unionized firms stay much longer in their firms. The average job tenures of blue-collar workers and clerks are 7.7 and 8.5 years, respectively, in unionized firms whereas the corresponding figures are only 3.4 and 4.1 years in non-unionized firms. Further analysis suggests the possible channels through which unions improve workers' welfare. For instance, Row 7 of Table 1 shows that unionized firms have had significantly more wage negotiations in the past three years than non-unionized firms; Rows 8 and 9 show that a larger proportion of unionized firms allow for collective wage bargaining and have collective wage contracts; and Rows 10 and 11 show that a larger proportion of

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[10] The national figure was 76%. See CNpension.net at:

http://www.cnpension.net/index_lm/2010-01-26/1034775.html.

[11] We study monthly working hours because many firms arrange their production cycles by months and give workers the number of days that they are allowed to take breaks.

unionized firms sign written contracts with their employees. Those results lay a foundation for our econometric study that we are about to introduce in the next section.

3.   Baseline Results

3.1 The Econometric Model and Variables

Let W_i, H_i, and P_i be the average hourly wage rate (yuan), monthly working hours (hours), and pension coverage of firm i, respectively. Pension coverage is defined as in the previous section. That is, P_i is a continuous variable taking values 1 to 5 representing a coverage of less than 20%, 20%-40%, 40%-60%, 60%-80%, and 80-100% of the employees, respectively. Summary statistics of those three variables can be found in Table 2. Taking the natural logarithm for wage and working hours, we estimate the following SUR model of three equations for the effects of unionization:

$$\log(W_i) = \beta_{w1} + \beta_{w2}U_i + \beta_{w3}Z_i + \beta_{w4}D_i + \varepsilon_{wi} \tag{1}$$

$$\log(H_i) = \beta_{h1} + \beta_{h2}U_i + \beta_{h3}Z_i + \beta_{h4}D_i + \varepsilon_{hi} \tag{2}$$

$$P_i = \beta_{p1} + \beta_{p2}U_i + \beta_{p3}Z_i + \beta_{p4}D_i + \varepsilon_{pi} \tag{3}$$

Where U_i is a dummy variable for unionization (unionized = 1, otherwise = 0), Z_i are a set of continuous control variables, D_i are a set of dummy control variables, the β's are parameters to be estimated, and the ε's are error terms that are distributed by a trivariate normal with mean zero.

We should point out that equation (1) is not a conventional wage equation because the left-hand side variable is the average wage in a firm, not individual workers' earnings. In the same vein, equations (2) and (3) cannot be interpreted at the individual level. Admittedly, this ignores the individual variations within a firm. However, unionization is a decision made at the firm level, and a worker becomes unionized as long as his firm is unionized. Therefore, we would estimate the average effect of unionization at the firm level even if we had individual-level data. Focusing

on firm-level aggregate indicators thus does not cause large distortions to our estimates of the effects of unionization as long as we have good firm-level controls.

In the literature studying individual data, it is found (e.g., Andrews et al., 1998) that failing to control some key variables would significantly bias the estimates of the effect of unionization. Because workers' welfare is measured by firm-level aggregate indicators in our study, it is important for us to control as many firm-level variables as possible. This also serves the purpose to reduce the endogeneity problem of unionization caused by omitted variables. The following is a description of the control variables.

Education of workers and the management. The quality of workers affects both their wages and fringe benefits. The questionnaire asked the sample firms to choose from four ranges of ratio of employees with college or higher diplomas: 0-20%, 20-40%, 40-60%, and above 60%. Here we simply assign 1 to 4 to those four ranges to denote the educational level of employees. Since competition tends to equate workers' wages with their marginal products, we naturally expect firms with more educated workers to pay higher wages. What is more, because better educated workers have stronger bargaining power, we also expect firms with such types of workers to require shorter working hours. In addition to employees' educational levels, the educational attainment of the management can also influence workers' welfare by raising firm performance (Mengista and Xu, 2004). The questionnaire used the same question for employees to ask for the educational attainment of the management team, so we index it the same way as we index employee education. The questionnaire had a separate and finer question for the educational attainment of the general manager. It gave the manager five choices: junior high or below, senior high, college, master, and doctor. We give them the values of 1 to 5 to index the educational attainment of the general manager.

Migrant workers. Migrant workers may be discriminated in terms of wages and other forms of welfare. Even in the absence of discrimination, migrant workers themselves may actually want to work longer because their family members are not

around and they want to send more money home. In addition, most of them are young and may prefer cash income than pension. Lastly, migrant workers may have lower levels of productivity than their urban counterparts because of, e.g., the lack of proper training. Therefore, we expect that a higher proportion of migrant workers would lead to a decrease in average wages and pension coverage, but longer working hours. The questionnaire provided five categories of answer for the ratio of migrant workers: lower than 20%, 20%-40%, 40%-60%, 60%-80%, and 80-100%. Similar to the other cases of categorical answers, we assign the values 1 to 5 to those answers.

Firm size and capital intensity. We use the number of workers and per-worker fixed capital (1,000 Yuan) to control for the effects of firm size and capital intensity. The literature (e.g., Andrews *et al.*, 1998) points out that, in estimating the role of unions, firm size is a very important variable. Large firms have a longer planning horizon than smaller firms, so they are more likely to offer better welfare and to establish a union. In China, specifically, large firms are more likely to receive favorable treatments from local governments as well as more attention from the media. More capital-intensive firms are also more likely to get favor from local governments in the name of technological upgrading. In addition, high capital intensities raise workers' marginal products, and so their wage rates. In sum, we expect that compared with labor-intensive and smaller firms, capital-intensive and large firms would perform better in terms of workers' welfare.

Financial performance. We use per-worker sales (1,000 Yuan) and pre-tax profit rate (profits/sales) to control firms' financial performance. Higher values of these variables reflect more efficient operation, so we expect that they improve the chances of workers to get better treatments.

Market power and export. We have two measures for market power. One is firms' answer to the question whether the markets are competitive for their major products, and the other is their major products' shares in the respective national markets. A firm operating in a market of less intensive competition or having a larger market share is more likely to enjoy monopoly profits, and hence, offer better

welfare. For market competition, we index the three answers provided by the questionnaire, fierce, moderate, and low, by the values 3, 2, and 1. In the same vein, we index the six categorical answers specified by the questionnaire for market shares, 0-1%, 1-3%, 3-5%, 5-10%, 10%-20%, and above 20%, by the values 1-6. In addition, we also consider the role of export. On the one hand, exporters may be required by their customers, especially those in developed countries, to meet certain labor standards (e.g., SA8000). On the other hand, competitive foreign markets impose downward pressures on wage rates and welfare towards those found in the poorest countries. Among the 1,268 sample firms, 524 are exporters, and 744 are non-exporters. Exporters treat their workers slightly better than non-exporters in terms of wage payments and pension coverage, but ask their workers to work slightly longer than non-exporters. For the exporters, the average wage is 6.1 Yuan/hour, average working hours are 182 hours/month, and average pension coverage is 80%. The corresponding figures for non-exporters are 5.78 Yuan/hour, 180 hours/month, and 75%, respectively. The questionnaire asked firms to provide their shares of export in their sales and gave them six answers: 0%, 0-20%, 20-40%, 40-60%, 60-80%, and 80-100%. We assign the values 1 to 6 to those answers to create a continuous variable for export.

Ownership. We distinguish four types of ownership: SOEs, DPEs, FIEs, and Hong Kong, Macao and Taiwanese enterprises (HMTs). In our regressions, SOEs are taken as the reference type, and the other three types enter as dummy variables. We separate HMTs from other FIEs because they behave differently. The average hourly wages paid by the four types of firms are 7.82, 6.68, 7.14, and 5.39 Yuan, average monthly working hours are 162, 176, 183, and 183 hours, and average pension coverage is 91.0%, 86.8%, 90.4%, 72.6%, respectively, all in the order of SOEs, FIEs, HMTs, and DPEs. Parallel to the four types of ownership, we also control two features of the sample firms. One is privatization and the other is public listing. Among the DPEs, there are firms that are privatized SOEs. Compared with original private firms with similar performance, these firms are more likely to provide employees with better welfare. For example, on average they cover 70% of their

employees in pension and 62% in medical insurance, much higher than the figures in the DPEs. This agrees with the broad findings on the effects of privatization in China (e.g., Dong and Xu, 2008). Thanks to public monitoring and tightening government regulation, listed firms tend to pay more attention to workers' rights. As a result, workers in these firms are expected to get better welfare. The questionnaire gave the sample firms four choices of answer regarding their status of public listing: already listed, in the process of listing, plan to be listed, and no such a plan. We simply assign the value 4 to 1 for those four answers because the impact of listing is expected to follow that order.

City and industrial dummies. China is an economically decentralized country and different cities may have different policies toward labor protection and may implement the national laws differently. We use the city dummies to control those heterogeneities. In addition, different industries may compensate their workers differently due to the factors that are not represented by firm-level characteristics. The industrial dummies are meant to control those factors. Detailed information about the industries will be provided when we discuss our instrumental variable.

[Table 2 about here]

Table 2 presents the summary statistics of the above variables. We want to emphasize that our intention is not to measure their exact impacts on workers' welfare. Indeed, many of them are created from categorical answers and the magnitudes of their estimates are not easy to interpret. We add them in our regressions to get more accurate estimates for the effects of unionization. In particular, we mean to use them to control the heterogeneities of unionization. Duncan and Stafford (1980) argue that, (individual) union status is a response by workers to the characteristics of their jobs or occupations. To the extent that unionization is mainly a decision at the enterprise level, it is important to control firm characteristics to avoid the omitted variable issue. The city and industrial dummies provide further help by accounting for government efforts and industrial features regarding unionization.

3.2 Benchmark Results

We first estimate the equation system comprised of equations (1) - (3) by the SUR model. Capital intensity, firm size, and per-worker sales enter the regressions in logarithmic terms for scaling purposes. The results are reported in Table 3. The estimated coefficients of the union dummy in the three equations are 0.056, -0.014, and 0.615, respectively. That is, unionization increases hourly wage rates by 5.6%, reduces monthly working hours by 1.4%, and raises pension coverage by about 12.3% (converted by the scale implied by the categorical answers). In the wage and pension equations, unionization is significant at the 5% level, while in the working hour equation, it is not significantly different from zero. While our result on hourly wage rates is new, our estimate for unions' effect on pension coverage is almost identical to Lu et al. (2010)'s estimate, which is 12.4%.

[Table 3 about here]

The correlation matrix of the residuals of the three equations is:

$$\begin{bmatrix} 1.0000 & & \\ -0.4878 & 1.0000 & \\ 0.1757 & -0.2354 & 1.0000 \end{bmatrix}$$

All the three correlation coefficients are statistically significant, indicating that the SUR model does improve asymptotic efficiency. The correlation between working hours and wages and the correlation between working hours and pension coverage are both negative, and the correlation between wage rates and pension coverage is positive. Those results are consistent with the expectation that firms improve on one aspect should also improve on other aspects in terms of workers' welfare.

The estimates for the control variables generally make sense. Here we only offer some discussions on the variables that have significant results. Better education of the management team increases hourly wages and pension coverage, and reduces working hours. More capital-intensive firms offer better salaries and pension coverage and shorter working hours than less capital-intensive firms. Exporting firms offer smaller salaries and ask slightly longer working hours. FIEs, HMTs, and

DPEs all offer much smaller salaries than SOEs; HMTs and DPEs also require significantly longer working hours and DPEs have significantly smaller pension coverage. Consistent with this pattern, privatized SOEs do much better than DPEs in wage offers and pension coverage although they are not significantly different from DPEs in working hours. The better performance of SOEs, however, may be a result of their role assigned by the government to maintain social stability. Dong and Putterman (2003) find evidence of labor redundancy in SOEs and attribute it to the social burdens that SOEs have to foot.

Two variables that have somewhat conflicting results are firm size and per-worker sales (labor productivity). Larger firms pay workers much better than small firms; a one percent increase of employment increases hourly wage by 4.5%. Labor productivity has exactly the same size of effect. However, both firm size and labor productivity increase working hours. Although their effects are economically small, more research is deserved to find out the underlying mechanisms.

One more variable that is worth discussion is pre-tax profit rate. Higher profit rates lead to higher hourly wages but do not have significant impacts on working hours and pension coverage. The effect on wage is large: if the profit rate increases by one percentage point, hourly wage increases by 0.44%. The standard deviation of profit rates is 11%, so workers in a firm with one standard deviation higher profit rate above the average would enjoy 4.4% higher hourly wages than their peers in the average firm. This finding shows that there is profit-sharing within the sample firms. A sensible explanation is that this is taken by firms as an incentive scheme to boost labor productivity.

3.3 The 3SLS Estimation

The consistency of the estimates for union effects depends on the assumption that unionization is independent of the error terms, which, according to our discussions in the introduction, may not hold in reality. To solve this problem, we introduce an IV for unionization and estimate our model again by the 3SLS method.

The IV is "union popularity" defined on unions' role perceived by sample firms

in solving labor disputes. In the questionnaire, there was a question: "Among other local firms in your industry, how often are the following ways used to deal with labor disputes: management deliberation, the union, local labor arbitration commission, other local government agencies, and the court?" Three answers were provided: often, moderate, rare. We construct the variable "union popularity" by the answers given on the union. We assign the following scores to the answers: often = 3, moderate = 2, rare = 1. In our sample firms, the three answers are distributed quite evenly with 36% scoring 3, 33% scoring 2, and 31% scoring 1. Our premise is that firms learn from their peers. That is, a firm is more likely to establish a union to resolve labor disputes if its manager believes that this practice is more prevalent in the same industry. On the other hand, there is no apparent reason to believe that other firms' using the union to resolve labor disputes has a direct effect to press a specific firm to improve its workers' welfare.[12] As a test for this claim, we add union popularity in the left-hand sides of the three equations in the system of equations (1)-(3) and find that its coefficient is not significant in any of the three equations.

With union popularity as the IV, we establish the union status equation as:

$$U_i = \delta_1 + \delta_2 R_i + \delta_3 Z_i + \delta_4 D_i + e_u \tag{4}$$

In the equation, R_i represents union popularity, and Z_i and D_i are the continuous and dummy control variables, both defined before. Following the literature (e.g., Buchmueller et al., 2002), we adopt the linear probability model to estimate the equation.

The most efficient way is for us to estimate equations (1) – (4) as a system of equations by 3SLS. [13] But before doing that, we perform a test of weak instrument

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[12] This claim, of course, depends on the condition that firm managers' answers to the question were not correlated with the levels of welfare their firms offered to their workers. But this condition is likely to hold because labor disputes have many forms and may not be related to the three welfare indicators we have considered.

[13] This is consistent with Booth and Chatterji (1995)'s behavioral model for simultaneous-equation estimation of union wages and membership.

in a 2SLS framework. The minimum eigenvalue statistic of equation (4) (the first-stage regression) is 27.93, which exceeds the 5% critical value of 16.38. That is, union popularity is not a weak IV (Stock and Yogo, 2005).

[Table 4 about here]

We then present the 3SLS results in Table 4. In the union equation, the IV is very significant and has the expected sign. The coefficients of unionization in the wage and pension equations agree qualitatively with those in the benchmark regressions although their magnitudes are much larger. But this is consistent with the results of Budd and Na (2000) and Hildreth (2000). In both studies, 2SLS estimates of the union wage effect are much larger than their OLS estimates[14]. The larger estimates imply that the union status is negatively correlated with unobserved firm capabilities influencing wages and pension coverage --- firms with lower capabilities are more likely to have unions. Considering that unions in China for a long time have been semi-government organizations, it is fairly possible that firms with closer connections with the government but lower efficiency (such as SOEs) are more likely to set up unions.

The estimate of unionization in the working hour equation has been improved. While it is insignificant in the benchmark model, it is now significantly negative at the 1% significance level. That is, holding other factors affecting unionization constant, unions can effectively reduce workers' monthly working hours. Again, this more significant result means that the union status is negatively correlated with firms' unobserved capabilities.

3.4 The DPE Subsample

The above results show significant variations of performance across ownerships; in particular, DPEs perform the worst in every aspect. It is thus of interests to see

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[14] In Budd and Na (2000), for example, the OLS estimates of the membership wage premium are 12%-14%. Allowing membership to be endogenous, the two-stage least squares estimate of the effect is much larger, 0.573 with a p-value of .007.

how significant unionization is in this subsample. In Table 5 we present the results of the 3SLS regression. The coefficients of unionization remain significant although their magnitudes decline relative to those obtained with the whole sample. That is, unions in DPEs still improve workers' welfare although their functions are not as effective as in other types of firms.

[Table 5 about here]

4. Unionization, Collective Bargaining, and Written Contracts

The results of the above analysis strongly support the thesis that unions improve workers' welfare in China. In this section we study two of the channels by which unions work, i.e., whether unions are effective in organizing collective wage bargaining and whether they encourage written contracts. Our premise is that collective bargaining and written contracts increase workers' welfare. Collective bargaining is regarded as one of the most important ways for unions to increase workers' wages in developed economies (e.g., Leontief, 1948; Blair and Crawford, 1984). For written contracts, early works (such as Gustman and Segal, 1976; and Chambers 1981) have studied the wage gap due to written contracts in the United States.[15] In current China, written contracts increase the legal protection that workers may resort to when disputes arise. That is, employees with written contracts may enjoy better treatments. Moving one step further, unionization may force firms to offer more written contracts that provide better deals for workers.

We will try to establish two sets of relationship in this section: the first is that unionized firms are more likely to allow collective bargaining and to sign written contracts with their employees; the second is that collective bargaining and written contracts significantly improve workers' welfare.

To measure the existence of collective bargaining, we refer to a question asked in our questionnaire referring to a concrete event, namely, whether a firm offers

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[15] Written contracts have not been studied in more recent times possibly because they are now quite standard practice in developed economies. In China, however, they are more recent.

collective wage contracts. We construct a binary variable "collective wage contracts" G_i, with value 1 denoting that the company had collective wage contracts and value 0 denoting that it did not (statistical description is shown in Table 2). Then we estimate the following recursive equation system:

$$\log(W_i) = \beta_{w1} + \beta_{w2}G_i + \beta_{w3}Z_i + \beta_{w4}D_i + \varepsilon_{wi} \tag{5}$$

$$\log(H_i) = \beta_{h1} + \beta_{h2}G_i + \beta_{h3}Z_i + \beta_{h4}D_i + \varepsilon_{hi} \tag{6}$$

$$P_i = \beta_{p1} + \beta_{p2}G_i + \beta_{p3}Z_i + \beta_{p4}D_i + \varepsilon_{pi} \tag{7}$$

$$G_i = \alpha_1 + \alpha_2 U_i + \alpha_3 Z_i + \delta_4 D_i + e_u \tag{8}$$

$$U_i = \delta_1 + \delta_2 R_i + \delta_3 Z_i + \delta_4 D_i + e_u \tag{9}$$

The last equation is the union equation copied from equation (4) to take care of the endogeneity of unionization. Equation (8) establishes the relationship between unionization and collective wage contracts. Like in the union equation, we estimate this equation by the LPM. Equations (5)-(7) then establish the relationship between collective wage contracts and the indicators of workers' welfare.

[Table 6 about here]

The system is estimated by 3LSL and the results are reported in Table 6. Unionization increases a firm's probability to have collective wage contracts by 72.2%.[16] In the three equations concerning workers' welfare, collective wage contracts have the expected signs and are significant at the 10% or 5% significance level. The effects are large. Having collective wage contracts increases the hourly wage by 41.3% and pension coverage by about 39%, and reduces monthly working hours by 29.8%. Therefore, we have established the first channel of unions' role, that is, they improve workers' welfare through collective wage bargaining.

For written contracts, we construct from the answers to a question in the questionnaire "does your company sign written contracts with workers?" a variable

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[16] The union equation yields slightly different estimates than those presented in Table 4. The variations are created by a slightly different sample used here because of the adjustment of missing values.

$C_{i,}$ that takes three values: 3 = all workers, 2 = some workers, and 1 = no workers. Statistical description of $C_{i,}$ is reported in Table 2. Written contracts are weaker than collective wage bargaining in measuring the strength of unionization. While only 29% of our sample firms had collective wage contracts, most of them offered written contracts to at least some workers.

[Table 7 about here]

Replacing G_i by C_i in the equation system (5)-(9), we then estimate the effects of written contracts. The results of the 3SLS estimation are presented in Table 7. Unionization has a strong effect on written contracts: it prompts a firm either to leap from offering no written contracts to offering some workers contracts, or to leap from offering some workers contracts to offering all workers contracts. One step further, written contracts significantly increase workers' wages (by 31.1%) and pension coverage (by about 28%) and decrease workers' working hours (by 21.7%). Thus, we establish the second channel of unions' role, namely, they improve workers' welfare through written contracts.

5. Conclusions

As a result of fast development of the private economy and the privatization of SOEs, the relationship between workers and employers has changed dramatically in China. While workers by design were protected in the old-style SOEs, unions are now expected to play a more active role. This paper offers a set of empirical results to show that unions do raise workers' wage rates, protect them from overtime work and improve their pension coverage. Our baseline results show that unionization increases hourly wage rates by 5.6%, reduces monthly working hours by 1.4%, and raises pension coverage by 12.3%. Those effects are smaller than what are typically found in advanced economies,[17] but are significant considering the fact that independent unions are quite new in China. Taking possible endogeneity of unionization into consideration, our 3SLS estimation finds larger effects. Further

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[17] For example, the union wage premium is frequently found to be higher than 10%. See, e.g., Budd and Na (2000).

econometric analysis has established two channels for unions to improve workers' welfare, one by encouraging more collective wage contracts, and the other by encouraging more written contracts.

Our study shows that in China unions are experiencing a critical transition from a functional wing of the government to a more independent institution representing independent interests of the workers. Our study shows the significance as well as the meanings of this transition. What is more, considering the fact that collective wage bargaining and written contracts are still not common, one suggestion for the ACFTU is to continue to encourage unions to put those two items on top of their agendas.
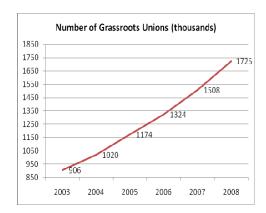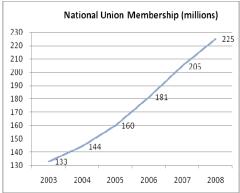
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Figure 1 Recent development of unions in China

Table 1. Welfare Comparison of Unionized Firms with Non-unionized Firms

	Items	Unionized firms	Non-unionized firms
1	Average hourly wage (Yuan)	6.1	5.2
2	Average monthly working hours (hours)	178	187
3	Pension Coverage (%)	76.7	55.9
4	Unemployment Insurance Coverage (%)	69.2	45.8
5	Average tenure of blue-collar workers (years)	7.7	3.4
6	Average tenure of clerks (years)	8.5	4.1
7	Number of negotiations on wages in the past three years	0.81	0.44
8	Firms allowing collective bargaining (%)	56.4	46.7
9	Firms allowing collective contracts (%)	34.4	18.9
10	Firms signing written contracts with blue-collar workers (%)	83.5	63.2
11	Firms signing written contracts with clerks (%)	83.4	68.8

Notes: Figures are for April 2006.

Table 2 Summary Statistics

Variables	Obs.	Mean	St. dev.	Min	Max
Dependent variables					
hourly wage (Yuan)	1230	5.90	3.01	1.19	51.25
Monthly working hours (hours)	1248	181	28.44	80	336
Pension coverage (1 - 5)	1162	3.89	1.58	1.00	5.00
Explanatory variables					
Unionization (0, 1)	1236	0.69	0.46	0.00	1.00
Control variables					
Employee education (1 - 4)	1241	3.37	0.95	1.00	4.00
Management education (1 - 4)	1248	2.35	1.28	1.00	4.00
Manager education (1 - 5)	1239	2.85	0.73	1.00	5.00
Migrant workers (1 - 5)	1191	2.07	1.33	1.00	5.00
Capital intensity (1,000 Yuan)	1180	173	554	1	17347
Employment (persons)	1180	744	3464	2	86991
Per-worker sales (1,000 Yuan)	1180	462	660	3	6603
Pre-tax profit rate	1178	0.08	0.11	-0.78	0.77
Market competition (1 - 3)	1228	1.26	0.47	1.00	3.00
National market share (1 - 6)	1115	2.82	1.89	1.00	6.00
Export (1 - 6)	1197	0.96	1.61	0.00	6.00
Privatization (0, 1)	1248	0.10	0.29	0.00	1.00
Listing (1 - 4)	1268	1.42	0.74	1.00	4.00
SOEs (0, 1)	1268	0.10	0.30	0.00	1.00
FIEs (0, 1)	1180	0.12	0.32	0.00	1.00
HMTs (0, 1)	1180	0.09	0.28	0.00	1.00
DPEs (0, 1)	1180	0.69	0.46	0.00	1.00
Instrumental Variable					
Union popularity (1-3)	935	2.06	0.82	1.00	3.00
Other variables					
Collective wage contracts (0, 1)	1179	0.29	0.46	0.00	1.00
Written contracts (1-3)	1247	2.73	0.54	1.00	3.00

Table 3 Benchmark Results

	Log (hourly wage)	Log (monthly working hours)	Pension coverage
Unionization	0.056**	-0.014	0.615***
	[0.026]	[0.011]	[0.115]
Employee education	-0.017	-0.002	-0.029
	[0.011]	[0.005]	[0.049]
Management education	0.044***	-0.012***	0.206***
	[0.010]	[0.004]	[0.043]
Manager education	0.028	-0.029***	0.279***
	[0.017]	[0.007]	[0.074]
Migrant workers	-0.01	0.010**	0.016
	[0.010]	[0.004]	[0.045]
Log (Capital intensity)	0.045***	-0.014***	0.120**
	[0.011]	[0.005]	[0.048]
Log (Employment)	0.043***	0.007*	0.002
	[0.010]	[0.004]	[0.046]
Log (Per-worker sales)	0.043***	0.014**	-0.053
	[0.014]	[0.006]	[0.059]
Pre-tax profit rate	0.439***	-0.022	0.259
	[0.105]	[0.044]	[0.464]
Market competition	0.03	-0.013	-0.092
	[0.023]	[0.010]	[0.103]
National market share	0.007	-0.001	0.015
	[0.006]	[0.003]	[0.027]
Export	-0.020**	0.008**	-0.039
	[0.008]	[0.003]	[0.035]
Privatization	0.073**	-0.024	0.518***
	[0.036]	[0.015]	[0.158]
Listing	0.000	-0.006	0.044
	[0.015]	[0.006]	[0.067]
FIEs	-0.129***	0.022	-0.264
	[0.048]	[0.020]	[0.213]
HMTs	-0.119**	0.054**	-0.178
	[0.054]	[0.023]	[0.238]
DPEs	-0.222***	0.052***	-0.652***
	[0.039]	[0.016]	[0.173]
Observations	858	858	858
Pseudo R-squared	0.475	0.244	0.317

Notes: Figures in the brackets are standard errors. City dummies and industrial dummies are included in the regressions but their results, together with the constant, are not reported. *, **, and *** indicate, respectively, the significance levels of 10%, 5%, and 1%. Same for the subsequent tables.

Table 4 Results of the 3SLS Regression

	Unionization	Log (Hourly wage)	Log (Monthly working hours)	Pension coverage
Unionization		0.292*	-0.209***	1.323**
		[0.153]	[0.073]	[0.660]
Union popularity	0.102***			
	[0.019]			
Employee education	0.034**	-0.033**	0.011	-0.055
	[0.016]	[0.014]	[0.007]	[0.062]
Management education	-0.019	0.053***	-0.014**	0.218***
	[0.014]	[0.012]	[0.006]	[0.050]
Manager education	0.005	0.03	-0.028***	0.285***
	[0.023]	[0.020]	[0.009]	[0.084]
Migrant workers	-0.051***	0	0	0.038
	[0.014]	[0.015]	[0.007]	[0.063]
Log (Capital intensity)	0.041***	0.039***	-0.01	0.128**
	[0.015]	[0.015]	[0.007]	[0.063]
Log (Employment)	0.066***	0.029*	0.021***	-0.051
	[0.015]	[0.017]	[0.008]	[0.071]
Log (Per-worker sales)	-0.039**	0.053***	0.005	-0.02
	[0.019]	[0.017]	[0.008]	[0.074]
Pre-tax profit rate	0.119	0.360***	-0.015	0.027
	[0.151]	[0.128]	[0.061]	[0.552]
Market competition	0.039	0.012	-0.007	-0.177
	[0.034]	[0.028]	[0.013]	[0.121]
National market share	0.014	0	0.001	0.017
	[0.009]	[0.008]	[0.004]	[0.032]
Export	-0.011	-0.018*	0.005	-0.038
	[0.011]	[0.010]	[0.005]	[0.041]
Privatization	0.117**	0.035	-0.004	0.510***
	[0.049]	[0.044]	[0.021]	[0.189]
Listing	0.018	-0.011	-0.002	0.009
	[0.022]	[0.018]	[0.009]	[0.080]
DPEs	-0.033	-0.192***	0.024	-0.477**
	[0.056]	[0.047]	[0.022]	[0.203]
HMTs	0.093	-0.083	0.046	-0.085
	[0.076]	[0.064]	[0.030]	[0.275]
FIEs	-0.008	-0.100*	0.005	-0.12
	[0.070]	[0.059]	[0.028]	[0.253]
Observations	698	698	698	698

Table 5 The DPE Subsample

	Unionization	Log (Hourly wage)	Log (Monthly working hours)	Pension coverage
Unionization		0.247*	-0.193***	1.104*
		[0.139]	[0.073]	[0.664]
Union popularity	0.124***			
	[0.023]			
Employee education	0.025	-0.037**	0.016**	-0.054
	[0.020]	[0.015]	[0.008]	[0.073]
Management education	-0.038**	0.051***	-0.014**	0.271***
	[0.017]	[0.013]	[0.007]	[0.063]
Manager education	0.018	0.03	-0.031***	0.265***
	[0.028]	[0.021]	[0.011]	[0.102]
Migrant workers	-0.040**	0.016	0.001	0.034
	[0.017]	[0.014]	[0.007]	[0.067]
Log (Capital intensity)	0.045**	0.040***	-0.014*	0.130*
	[0.018]	[0.015]	[0.008]	[0.073]
Log (Employment)	0.059***	0.028*	0.022**	-0.01
	[0.019]	[0.017]	[0.009]	[0.080]
Log (Per-worker sales)	-0.033	0.042**	0.01	-0.046
	[0.022]	[0.018]	[0.009]	[0.085]
Pre-tax profit rate	-0.105	0.356**	-0.037	0.931
	[0.215]	[0.160]	[0.083]	[0.763]
Market competition	0.087**	-0.021	0.005	-0.237
	[0.042]	[0.032]	[0.017]	[0.154]
National market share	0.017	-0.001	0.001	0.02
	[0.011]	[0.009]	[0.004]	[0.041]
Export	-0.007	-0.003	-0.002	-0.024
	[0.015]	[0.011]	[0.006]	[0.055]
Privatization	0.165***	0.038	-0.001	0.644***
	[0.057]	[0.047]	[0.025]	[0.225]
Listing	0.034	-0.003	0.001	0.055
	[0.027]	[0.020]	[0.011]	[0.097]
Observations	501	501	501	501

Table 6 The Role of Collective Wage Contracts

	Unionization	Collective Wage Contracts	Log (Hourly wage)	Log (Monthly working hours)	Pension coverage
Unionization		0.722***			
		[0.240]			
Collective Wage Contracts			0.413*	-0.298**	1.871*
			[0.230]	[0.121]	[1.044]
Union popularity	0.102***				
	[0.019]				
Employee education	0.032**	-0.01	-0.031**	0.008	-0.028
	[0.016]	[0.022]	[0.015]	[0.008]	[0.066]
Management education	-0.017	0.029	0.040***	-0.004	0.153**
	[0.014]	[0.018]	[0.013]	[0.007]	[0.061]
Manager education	0.002	-0.009	0.036*	-0.033***	0.300***
	[0.024]	[0.031]	[0.021]	[0.011]	[0.097]
Migrant workers	-0.059***	0.016	-0.006	0.004	0.022
	[0.015]	[0.024]	[0.015]	[0.008]	[0.067]
Log (Capital intensity)	0.040**	-0.041*	0.059***	-0.023***	0.208***
	[0.016]	[0.023]	[0.014]	[0.007]	[0.064]
Log (Employment)	0.071***	-0.054**	0.045***	0.008	0.046
	[0.015]	[0.027]	[0.013]	[0.007]	[0.061]
Log (Per-worker sales)	-0.034*	0.019	0.039**	0.011	-0.054
	[0.019]	[0.027]	[0.017]	[0.009]	[0.078]
Pre-tax profit rate	0.118	0.048	0.352**	0.003	-0.074
	[0.152]	[0.200]	[0.140]	[0.074]	[0.637]
Market competition	0.045	-0.005	0.01	-0.008	-0.189
	[0.034]	[0.044]	[0.030]	[0.016]	[0.138]
National market share	0.014	-0.005	0.003	-0.001	0.027
	[0.009]	[0.012]	[0.008]	[0.004]	[0.036]
Export	-0.013	-0.007	-0.016	0.003	-0.023
	[0.011]	[0.015]	[0.011]	[0.006]	[0.049]
Privatization	0.118**	-0.029	0.037	-0.008	0.551***
	[0.050]	[0.069]	[0.046]	[0.024]	[0.208]
Listing	0.018	0.009	-0.007	-0.002	-0.015
	[0.022]	[0.029]	[0.021]	[0.011]	[0.094]
DPEs	-0.027	0.013	-0.211***	0.03	-0.504**
	[0.057]	[0.074]	[0.051]	[0.027]	[0.231]
HMTs	0.09	-0.048	-0.082	0.038	0.007
	[0.078]	[0.100]	[0.069]	[0.036]	[0.314]
FIEs	0.011	0.006	-0.122*	0.009	-0.156
	[0.072]	[0.092]	[0.064]	[0.034]	[0.290]
Observations	682	682	682	682	682

Table 7 The Role of Written contracts

	Unionization	Written contracts	Log (Hourly wage)	Log (Monthly working hours)	Pension coverage
Unionization		0.941***			
		[0.267]			
Written contracts			0.311*	-0.217***	1.364*
			[0.172]	[0.080]	[0.731]
Union popularity	0.101***				
	[0.019]				
Employee education	0.034**	0.012	-0.037**	0.014*	-0.074
	[0.016]	[0.025]	[0.016]	[0.007]	[0.068]
Management education	-0.021	0.035*	0.042***	-0.006	0.169***
	[0.014]	[0.020]	[0.012]	[0.006]	[0.053]
Manager education	0.008	0.008	0.026	-0.025***	0.261***
	[0.023]	[0.034]	[0.021]	[0.010]	[0.088]
Migrant workers	-0.054***	0.028	-0.009	0.007	-0.004
	[0.014]	[0.026]	[0.013]	[0.006]	[0.056]
Log (Capital intensity)	0.041***	0.031	0.029	-0.003	0.084
	[0.015]	[0.025]	[0.018]	[0.009]	[0.078]
Log (Employment)	0.064***	-0.031	0.039***	0.014**	-0.004
	[0.014]	[0.028]	[0.014]	[0.007]	[0.060]
Log (Per-worker sales)	-0.038**	0.041	0.042**	0.012	-0.063
	[0.019]	[0.029]	[0.016]	[0.008]	[0.070]
Pre-tax profit rate	0.052	0.255	0.292**	0.027	-0.191
	[0.154]	[0.222]	[0.145]	[0.067]	[0.615]
Market competition	0.036	0.01	0.009	-0.005	-0.191
	[0.034]	[0.048]	[0.029]	[0.014]	[0.125]
National market share	0.015*	-0.015	0.005	-0.002	0.034
	[0.009]	[0.013]	[0.007]	[0.003]	[0.032]
Export	-0.013	0.023	-0.025**	0.009**	-0.062
	[0.011]	[0.017]	[0.010]	[0.005]	[0.042]
Privatization	0.117**	-0.039	0.047	-0.013	0.569***
	[0.049]	[0.075]	[0.044]	[0.020]	[0.186]
Listing	0.019	0.026	-0.018	0.002	-0.016
	[0.022]	[0.032]	[0.020]	[0.009]	[0.087]
DPEs	-0.034	0.034	-0.203***	0.032	-0.534***
	[0.055]	[0.081]	[0.048]	[0.022]	[0.205]
HMTs	0.096	-0.105	-0.046	0.024	0.041
	[0.077]	[0.110]	[0.067]	[0.031]	[0.286]
FIEs	0.002	0.037	-0.116*	0.018	-0.213
	[0.070]	[0.101]	[0.061]	[0.028]	[0.259]
Observations	695	695	695	695	695