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Insider Power and Wage Determination in Bulgaria

An Econometric Investigation

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ABSTRACT

Using a unique 3-digit firm level data set of all medium and large sized manufacturing enterprises in Bulgaria covering the years 1997/1998, we investigate how wage determination is related to ownership status. Building on a slightly modified version of the Right-To-Manage Model, our pooled OLS, panel and first-differences TSLS estimates show statistically significant differences in the share of rents taken by workers employed in state, private domestic and foreign firms. Taking account of firm heterogeneity, we find that rent sharing is nearly non-existent in foreign-owned firms while the level of pay is higher compared to state-owned companies. Further, rent sharing seems to be highly pronounced in state-owned enterprises while on average domestically private-owned companies are characterised by less rent sharing. Overall, our robustness checks confirm these findings.

JEL Classification : C23, D21, J30, P31.

Key Words : Bulgarian Labour Market, Enterprise Behaviour, Insider Effects, Panel Data.

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I. INTRODUCTION

One of the oldest questions in economics is whether the market for labour can be represented satisfactorily by a standard competitive model. The importance of this question, which has implications for macroeconomics as well as labour economics, has stimulated much research and more than a little controversy. In a prominent early attack on traditional analysis, Sumner Slichter (1950) argued that a competitive model fails to explain the empirical evidence that apparently homogeneous types of employees earn significantly different amounts in different industries. His data, drawn from the US manufacturing sector, showed that wages appeared to be positively correlated with various measures of firm's ability-to-pay. Slichter concluded that this correlation provides *prima facie* evidence against a conventional competitive model.

In the literature, there exist three types of rent-sharing models in which the firm's ability-to-pay explains its wage payments¹. In the Modified Competitive Model, the combination of product demand shocks and a strictly upward sloping labour supply curve leads to a positive short-run causality from profits to wages in a competitive framework. (Hildreth, Oswald, 1994) Intuitively, this is the result of temporary frictions causing wages to be bid up by a demand shock. However, there is no long-run or steady-state relation between wages and profit variables. This arises from the fact that in the long run, there should be free entry along a perfectly elastic labour supply curve.

The Optimal Labour Contract Model is a generalisation of the Baily (1974) and Azariadis (1975) optimal contract framework in which firms are allowed to be averse to risk. Intuitively, the firm and the workers reach an implicit contract in which wages are set to provide efficient insurance against random demand shocks, resulting in a long-run co-movement of profits and wages.

In the Rent-sharing Bargaining Model inside forces cause externalities on the labour market². Intuitively, insiders appropriate some of the firm's non-competitive rents, causing a long-run positive partial correlation between wages and profits.

Empirically, there are different approaches to estimate the effect of industry or firm performance on wages within a collective bargaining framework. Each of them focuses on the twin roles of internal pressure from the firm's or sector's product market and external pressure from the geographical labour market in which the firm or sector operates.

First, some studies concentrate explicitly on the impact of profits per employee on the level of pay. Among them are Abowd and Lemieux (1993) [Canada]; Blanchflower, Oswald and Garrett (1989) [UK]; Blanchflower, Oswald and Sanfey (1996) [US]; Christofides and Oswald (1992) [Canada];

¹ For a theoretical framework, see Blanchflower, Oswald and Sanfey (1992, 1996).

² For a theoretical framework, see Section 2.

Goos and Konings (2001) [Belgium]; Hildreth and Oswald (1994) [UK]; Teal (1996) [Ghana] and Van Reenen (1996) [UK].

A second group of papers focuses on the effect of value added or sales per employee together with quasi-rents. Carneiro (1997) [Brazil]; Currie and McConnell (1992) [US]; Grosfeld and Nivet (1999) [Poland]; Lever and Marquering (1996) [the Netherlands]; Luke and Schaffer (1999) [Russia]; Nickell and Kong (1992) [UK]; Nickell and Wadhvani (1990) [UK] and Teulings and Hartog (1998) [the Nordic countries, Germany, US, Canada, Australia] follow this line of reasoning.

A third category of studies estimates directly the effect of product market power on wages. For example, Abowd and Lemieux (1993) [Canada]; Budd and Slaughter (2000)³ [Canada]; Konings and Walsh (1994) [UK]; Lever and Marquering (1996) [the Netherlands] and Van Reenen (1996) [Britain] provide evidence that a highly oligopolised market structure may be conducive to rent sharing, hence leading to higher wages.

Considering a range of estimation methods, all these studies strongly support the rent-sharing hypothesis. When using the current or the lagged value of the variables measuring firm/sector performance, the elasticity of wages with respect to the internal variable lies in general between 0.01 and 0.09. Using Lester's (1952) methodology for parameterising the size of rent sharing in labour markets, it is found that 18-36% of wage inequality may be the result of rent sharing. Instrumenting the profit terms by variables capturing truly exogenous profit shocks, increases the importance of the rent-sharing parameter greatly. OLS estimates are typically different from instrumental variable estimates by a factor of ten. For example, Abowd and Lemieux (1993) using a foreign competition measure, Teal (1996) using the share of intermediate input costs in total output and Van Reenen (1996) using innovation measures as instruments find a profitability-wages elasticity of 0.27-0.39. These findings are however criticised by some authors who point to the implausibly high induced Lester's range of wages. Moreover, Blanchflower, Oswald and Sanfey (1996) conclude that using sector-average cost shocks to energy as instruments yields the same results as using the lag procedure although the former estimates are less precise. Most studies -among them Blanchflower, Oswald and Sanfey (1992), Goos and Konings (2001), Hildreth and Oswald (1994) and Teal (1996)- indicate that rent sharing is not solely driven by (highly) unionised sectors.

In this paper, we want to shed light on the economics of wage determination in a reforming country, Bulgaria. Bulgaria can be considered as lagging behind in the transition process: GDP-growth was still negative in 1997 and 1998 and the GDP-level is still far below the pre-transition level. (EBRD, 2000) The analysis draws upon a unique representative panel of firms in manufacturing with detailed information on output and input factors and firm ownership (company accounts data) for the period 1997-1998. We estimate a modified version of the Right-to-Manage model to test the existence of

³ These authors provide evidence of *international* rent sharing and reveal that the organisation structure as well as trade barriers influence the rent-sharing pattern considerably.

non-competitive elements in the Bulgarian labour market. As the prevailing wage setting mechanism reveals to some extent the objectives underlying firm's behaviour, the central question investigated in this paper is whether and how wage determination is related to form of ownership. In particular, the wage formation process in state-owned, private domestic-owned and foreign-owned firms may reflect the relative strength of their insiders and the relative importance given to profitability considerations. We take into account unobserved firm heterogeneity that may have an important impact on the wage formation process.

In the remainder, the paper will first provide a theoretical model and a model in terms of observables. Section III presents the data set and some summary statistics. Section IV discusses the estimation method and confronts the different theoretical hypotheses with Bulgarian firm-level data. Some robustness checks are reported in Section V. Section VI gives an interpretation of the results. Section VII concludes.

II. THEORETICAL AND EMPIRICAL FRAMEWORK

1. Theoretical Framework

Given the important role of insiders especially in the beginning of the transition period, wages are considered to be the result of bargaining between the workers and the firm represented by its manager. Using this framework, we want to investigate one aspect of enterprise behaviour -wage determination- somewhat further on the transition path.

Right-To-Manage Model. In attempting to model how labour unions/insiders may raise their wage above the outside option or the alternative wage, the literature developed two basic models of rent sharing in a collective bargaining framework⁴. In the Right-To-Manage model (Nickell, Andrews, 1983), the union and the firm bargain over wages in the first stage. In the second stage, the firm unilaterally determines its optimal level of employment subject to constraints implied by the labour demand function, taking the wage rate as given. In the Efficient Bargaining model, both parties determine simultaneously wages and employment⁵. For our purpose, we use the Right-To-Manage model adjusted to a transition context.

In its general form, the Right-To-Manage model has a generalised Nash bargaining solution which is the product of each agent's gain from reaching an agreement, weighted by their respective bargaining

⁴ For a good summary of the issues, see Booth (1995).

⁵ Both models produce the same wage equations and predict that unions with any bargaining power will lift the wage rate above the competitive level, whether along the labour demand curve or along the contract curve (rent sharing). The two models are however characterised by fundamental differences regarding employment. First, the Right-To-Manage model predicts that unions can only raise wages above the market equilibrium at the cost of reducing employment whereas in the Efficient Bargaining model unions will raise wages as well as employment above the competitive level. Second, in the Right-

strengths. In case no bargain is reached with the unionised workforce, the fall-back position of the firm equals zero because it cannot obtain other workers since -by assumption- there are no non-union workers in the sector. As a result, the firm's net gain is equal to its profit function $\pi = Y(N) - WN$, with π real profits, W the real wage, N the employment level and $Y(N)$ a twice differentiable real value added function characterised by $Y'(N) > 0$, $Y''(N) < 0$ and $Y(0) = 0$. The status-quo position for a representative union member amounts to $u(A)$, with A a weighted average of the unemployment benefit and the wage that a worker would obtain elsewhere with weights being determined by the probability of finding another job. Using the expected utility representation, the union's net gain amounts to $[u(W) - u(A)] \frac{N}{L}$, with L membership, $W > A$ and $0 < N \leq L$.

When β represents the bargaining strength of the employees, the generalised Nash bargaining problem can be written as:

$$\begin{aligned} \max_w \Phi &= \left\{ U[W, N(W), A] \right\}^\beta \left\{ \pi[W, N(W)] \right\}^{1-\beta} \\ &\Downarrow \\ \max_w \Phi &= \left\{ \frac{N}{L} [u(W) - u(A)] \right\}^\beta \left\{ Y(N) - WN \right\}^{1-\beta} \end{aligned} \quad (1.1)$$

Modified Right-To-Manage Model. What is the impact of labour market conditions on wage determination at the firm level? Can we observe upward responsiveness of wages to labour productivity? Is this effect differentiated according to insider power? To study these questions, we modify the basic Right-To-Manage model slightly.

First, union members are regarded as being risk neutral. Second, we assume that in the short run employment is not an argument in the union's utility function. In other words, the median worker is considered to be certain of his job such that utility is only affected by the wage rate in the short run. Algebraically, the real wage W is assumed to result from the maximisation of the following Nash-bargaining maximand:

$$\begin{aligned} \Phi &= \left\{ U[W, A] \right\}^\beta \left\{ \pi[W, N(W)] \right\}^{1-\beta} \\ &\Downarrow \\ \Phi &= \left\{ W - A \right\}^\beta \left\{ Y - WN \right\}^{1-\beta} \end{aligned} \quad (1.2)$$

with A the outside option expressed in real terms, π real profits and Y real value added.

Rewriting (1.2) in logs, we obtain:

$$\ln \Phi = \beta \ln (W - A) + (1 - \beta) \ln \pi \quad (1.3)$$

For a maximum of this function with respect to the wage, it is required that:

$$\begin{aligned} \beta \frac{\partial \ln(W - A)}{\partial \ln W} + (1 - \beta) \frac{\partial \ln \pi}{\partial \ln W} &= 0 \\ \Downarrow \\ \beta \frac{W}{W - A} + (1 - \beta) \frac{\partial \pi}{\partial W} \frac{W}{\pi} &= 0 \end{aligned} \quad (1.4)$$

Since $\frac{\partial \pi}{\partial W} = -N$, equation (1.4) can be written as:

$$W = A + \frac{\beta}{1 - \beta} \frac{\pi}{N} \quad (1.5)$$

Third, value added is used to capture the firm's good fortune. Our motivation is twofold. The first reason is that it can be argued that accounting profits may bear little resemblance to economic profits or the size of rents. This is especially the case when economic and accounting rates of depreciation differ significantly. Hence, the value-added variable might be a better proxy for economic rents. A second reason is that although the profits per worker variable has the advantage that it controls for all costs, it has the disadvantage that it is negatively related to wages by construction, hence creating a severe endogeneity bias. Switching to value added per employee eliminates the direct endogeneity problem⁶.

As real profits equal real value added minus the wage bill ($\pi = Y - WN$), the term $\frac{\beta}{1 - \beta} W$ should be added to both sides of equation (1.5) to obtain an expression for the equilibrium wage in function of real value added per worker:

$$\begin{aligned} W + \frac{\beta}{1 - \beta} W &= A + \frac{\beta}{1 - \beta} \frac{[\pi + WN]}{N} \\ \Downarrow \\ W &= A' + \beta \frac{Y}{N} \quad \text{with } A' = (1 - \beta) A \end{aligned} \quad (1.6)$$

⁶ This does however not imply that endogeneity is not an issue anymore. For example, wage shocks affecting productivity may cause endogeneity problems when using real value added per employee.

According to this model, real firm-level wages are affected by both internal conditions or inside forces (represented by value added per employee) and external factors or outside forces (taken up by the outside option or the alternative wage) and the bargaining power of the employees. Most studies measure the latter parameter explicitly by variables such as union density/coverage or strike intensity. In this study, the correlation between real wages and variables measuring firm performance is taken to be indicative of insider power.

As we are particularly interested in the impact of ownership form on wage formation, the fourth modification consists in adding an extra dimension to the original Right-To-Manage model. More specifically, the ownership status of the firm is expected to be a potential determinant of insider power. Therefore, in the estimations we allow both for ownership-specific (state-owned, private domestic-owned and foreign-owned) coefficients on the proxy for internal factors and ownership intercept coefficients.

2. Empirical Model

The specification that acts as the bedrock for our regressions is given by:

$$W_{it} = \alpha + \alpha_{privd} PRIVD_{it} + \alpha_{for} FOR_{it} + \delta A_{it} + \gamma valad_{it} + \gamma_{privd} PRIVD_{it} valad_{it} + \gamma_{for} FOR_{it} valad_{it} + \epsilon_{it} \quad (1.7)$$

where subscript i is used to index observations on individual firms, r denotes region and t represents year (1997 and 1998 respectively). The dependent variable is the annual real wage per worker in firm i . In our main results, real value added per worker ($valad$) is used to capture the internal conditions of the firm. To check robustness, we will later proxy inside forces by the impact of real profits or real sales per worker on real firm-level wages.

The variables $PRIVD$ and FOR refer to the fraction of shares held by private domestic owners and foreign owners in the firm at time t . The ownership category that is left out is the state, which refers to the fraction of shares in the firm held by the state, municipalities or Treasury.

The conditions on the labour market (external conditions or indicators of the workers' fall-back utility) are represented by different variables (denoted by A in specification (1.7)). First, we incorporate regional dummies to capture regional effects. These dummies can be interpreted as a very crude measure for outside pressure because they are likely to reflect some of the geographical element of excess labour supply. Controlling for region-specific effects is in the context of Bulgaria particularly important as there are considerable disparities between the regions in which the firms are located (see below). Second, we take the running average regional wage per worker as a proxy for the outside option or alternative wage. Third, the regional unemployment rate, which takes into account low mobility of labour, is used. Finally, the external factors are captured by the average two-digit sectoral wage, reflecting relative conditions of labour demand and supply. After all, wage bargainers are expected to take account of industry-wide wage agreements in their own wages. Next to it, the

specifications combine the average sectoral wage with either the regional unemployment rate or the regional dummies⁷.

ε represents a white noise error term. All specifications include a year dummy to capture possible unobservable aggregate shocks. Finally, we control for unobserved firm heterogeneity by including a firm level fixed effect, even within the separate ownership groups. With a view to really testing the basic Right-To-Manage model, we do not take the logarithm of the variables under consideration.

Hypotheses. When the outside forces are proxied by either the average regional wage or the average sectoral wage per worker, the bargaining framework predicts a positive coefficient of δ . In case A is measured by the regional unemployment rate, the sign of δ is expected to be negative since regional unemployment signals labour market tightness to the insiders. The higher the regional unemployment rate, the lower the probability of finding an alternative job in the same region. As a result, the insiders will moderate their wage claims.

Based on efficiency-wage considerations, the level of inside wages in private firms is expected to be higher than the wage level in state firms, i.e. α_{privd} and α_{for} are expected to be positive. Next to it, it is often argued that foreign firms have superior technological know-how and expertise compared to domestic firms, which leads them to be more efficient than domestic companies. (Djankov and Hoekman, 1998) In the literature on multinational enterprises (MNE), it is also a stylised fact that foreign firms pay on average higher wages than their domestic counterparts. The reasoning behind this is that they try to attract the best-educated and motivated workers by paying the highest wages. Therefore, we expect the coefficient of α_{for} to be larger than the coefficient of α_{privd} .

A priori, we anticipate an upward responsiveness of real firm-level wages to rents per worker. At the same time, important differences of the insider effect across different types of firms (i.e. differences in the absolute size of the coefficients γ , γ_{privd} and γ_{for}) are expected.

III. DATA AND SUMMARY STATISTICS

We use a panel of 1514 manufacturing firms from the 28 regions ('oblasti') in Bulgaria covering the period 1997-1998. To be included in the data set at least one of the following criteria has to be satisfied: number of employees greater than 100, total assets and sales exceed 8 and 16 million USD respectively. All the variables are taken from published annual company accounts which were made consistent across countries by "Bureau Van Dyck". The monetary variables are expressed in millions of leva. The data set is called the Amadeus data set.

⁷ As the average regional wage and the regional unemployment rate (correlation: -0.60) already filter out regional effects, they are not taken up together with the regional dummies.

This unique data set allows us to make at least two main contributions. First, scarce existing empirical work on transition economies in this field mostly had to rely on small samples of firms collected through surveys. In contrast, our sample contains virtually the entire population of medium and large firms in manufacturing. Comparing the employment and sales coverage of the data with the total employment and sales in manufacturing reported in the statistical yearbooks reveals that the data cover 82% of total sales and 66% of total employment in manufacturing⁸. In Appendix, table A1 presents a comparison between the sample and the population for all two-digit sectors. From table A1, it follows that the data are also quite representative at the 2-digit NACE sector level. Thus, our data set can be considered as fairly representative of the population of firms operating in the manufacturing sector. Furthermore, the data set is collected from company accounts at the three-digit level of sectoral disaggregation. To our knowledge, this kind of detailed firm-level data for a transition country has not been used before for this purpose.

A second strength of the data set is that it offers detailed information on the ownership structure of firms for two consecutive years. In particular, we know the fraction of shares held by the state and by private investors and can observe its evolution over time. Next to it, we are able to make a distinction between private domestic investors and foreign investors. Based on this detailed description of the shareholding structure and in line with the literature on the effect of ownership in transition countries, we also classify firms as being majority state-owned, majority private domestic-owned or majority foreign-owned. Earlier studies for Central and Eastern Europe in this field had to rely on ownership dummies to investigate the crucial question of how wage formation is related to form of ownership. (Grosfeld, Nivet, 1997, 1999; Luke, Schaffer, 1999) The use of fractions of shares also enables us to perform some additional robustness checks. Table 1 shows how ownership is distributed on average.

Table 1 Distribution of Ownership

	1997	1998
	Mean (St.Dev.)	Mean (St.Dev.)
% State ownership (STATE)	0.34 (0.38)	0.27 (0.35)
Fraction of STATE firms in total number of firms	0.70	0.66
% State of all state firms	0.49 (0.36)	0.40 (0.35)
% Private domestic ownership (PRIVD)	0.62 (0.39)	0.68 (0.37)
Fraction of PRIVD firms in total number of firms	0.79	0.83
% Private domestic of all private domestic firms	0.78 (0.26)	0.82 (0.23)
% Foreign ownership (FOR)	0.04 (0.17)	0.05 (0.19)
Fraction of FOR firms in total number of firms	0.06	0.08
% Foreign of all foreign firms	0.68 (0.23)	0.63 (0.29)
Number of majority state firms	332	269
Number of majority private domestic firms	897	1150
Number of majority foreign firms	63	83

Source: Amadeus Database

⁸ Sales coverage ratio = total sales of firms in Amadeus in 1998 divided by total national sales as reported by the National Statistical Offices. Idem for employment.

Note from table 1 that state ownership is relatively important but decreased very much in 1998 while the average fraction of shares in 1998 held by private domestic owners increased up to 68%. This ownership change is the result of a major privatisation program that finally took place. (EBRD, 2000) The fraction of shares held by foreign owners is only 4% on average, meaning that only a relative small fraction of firms do have some foreign participation. If we look at shareholding in foreign firms only, however, we can see that the low average share of foreign ownership hides the fact that foreign investors are concentrated in a few firms. For example, in 1998 119 firms had a foreign owner, the average share was 63% and 83 firms were holding more than 50% of the shares. Hence, foreign investors own most of the time a majority share. Concentration on shareholding in domestically private firms only reveals that private domestic investors hold on average 80% of the total shares in domestically private firms. Finally, we can observe that the fraction of private domestic and foreign firms in the total number of firms increases over time⁹. Recently, the flows of foreign direct investment started to increase rapidly. By 1998 there was almost a 10-fold increase in FDI compared to 1991. (EBRD, 2000) The rising number of firms in total reflects a better coverage in the latest year and indicates that our analysis draws upon an unbalanced panel.

The regional variables (at the NUTS3-regional level) are collected from the National Statistical Institute and the United Nations Development Program¹⁰.

Table 2 presents summary statistics for the variables used in the regression analysis.

Table 2 Summary statistics

Variables	1997			1998			1997-1998		
	Obs.	Mean	St. Dev.	Obs.	Mean	St. Dev.	Obs.	Mean	St. Dev.
Employment	1306	374.12	759.47	1381	348.03	693.74	2687	360.71	726.41
Average wage	1043	98.62	101.86	1109	112.22	76.55	2152	105.63	89.95
Alternative wage1	1514	97.71	16.71	1514	111.81	15.17	3028	104.76	17.44
Alternative wage2	1509	97.11	25.53	1509	110.33	32.87	3018	103.72	30.16
Regional unemployment rate	1514	15.42	5.64	1514	16.39	5.25	3028	15.91	5.47
Sales per employee	1045	652.04	1245.87	1111	1349.29	18863.37	2156	1011.34	13570.30
Profits per employee	1038	178.08	601.59	1106	303.45	3277.26	2144	242.75	2391.06
Value added per employee	1038	277.09	663.89	1108	415.98	3279.45	2146	348.80	2401.73

Source: Amadeus Database, NSI (1998, 1999), UNDP (1999)

All annual wages are expressed as real wages per worker, i.e. nominal wages deflated by a three-digit producer price index, normalised to 1 in 1995. This price index is obtained from the central statistical offices. Alternative wage 1 represents the running average regional wage per worker and alternative wage 2 the average two-digit sectoral wage per worker. Profits, value added and sales per worker are also expressed in real terms. Value added is calculated as sales minus material costs and profits as value added minus the wage bill. Average measures are constructed by dividing the variables by the

⁹ Note that the sum of the fractions of respectively state, private domestic and foreign firms in the total number of firms do not add up to 1 as each firm can have multiple owners.

¹⁰ We are grateful to Dr. A. Ivanov (National Coordinator, Human Development Team, Bulgaria) for providing useful data.

average number of employees in each firm for each year respectively. The average employment level is 361 and employment ranges from 6 to 16280 employees.

From table 2, it is clear that profits, value added as well as sales vary much more than wages. Restricting the data to the balanced panel indicates that over the sample period the producer price index increases by 24% and the average employment level decreases by 5%. Real wages per worker, real sales per worker and real value added per worker display an increase of 17%, 27% and 36% respectively whereas real profits per worker decreases by 7%.

The spread of the regional unemployment rate reveals considerable regional variation and disparities. A closer look at the regional data shows that the region Sofia (situated in the district Sofia-City) is characterised by the lowest average unemployment rate (8.4%) and the highest real wages. In contrast, the highest unemployment rate is to be found in the region Montana (situated in the North-West, district Montana). Real wages are the lowest in the region Kyusendil (situated in the South-West, Sofia district). The National Human Development Reports (UNDP, 1999, 2000) indicate that the income gap between the richer and the poorer regions is almost 50%. Moreover, there is strong evidence of a dramatically increasing income gap and hence rising disparities and inequality among and within regions. The uneven distribution of resources and access to policies may help explain these regional differences.

The classification of firms according to majority shareholding shows that the average employment level is the highest in majority foreign firms (652), followed by majority state firms (441) and the lowest in majority private domestic firms (331) (see lower part of table 3). Workers in majority foreign firms get the highest wages (mean wage of 153). Wages in majority state and majority private domestic companies are much lower (mean wage of 100 and 106 respectively). Privatisation is clearly associated with better firm performance. Majority private domestic firms outperform majority state firms. Furthermore, majority foreign firms outperform majority state firms as well as majority private domestic firms. Using the same data set, recent empirical research has found that privatisation has positive effects on firm performance and that foreign-owned firms do better than domestically private-owned firms. (Estrin et al., 2001) Strikingly, 18% of majority state companies (87 out of 476) are classified as loss-making firms, reporting non-positive profits per employee over the sample period.

Concentration on the evolution of the variables over time and restriction to the balanced panel reveals that, apart from the employment level and real profits per worker, majority state, majority private domestic and majority foreign companies behave in the same way. Two proxies for internal conditions, real sales and real value added per worker, show a considerable increase over the sample period. Real value added per worker, for example, increases by 32%, 21%, 32% and 16% in the total sample, in majority state firms, in majority private domestic enterprises and in majority foreign companies respectively. Real profits per worker decrease by 6%, 4% and 7% in the total sample, in

majority state companies and in majority private domestic firms while majority foreign companies record an increase in real profits per worker of 12%. Real wages per worker display a rise of 17% in the whole sample and in majority private domestic firms, an increase of 10% in majority state companies and a rise of 25% in majority foreign firms.

Table 3 Summary statistics by Ownership Category¹¹

Variables	Obs.	Total Sample Mean (St. Dev.)	Obs.	Maj. State Firms Mean (St. Dev.)	Obs.	Maj. Priv. Dom. Firms Mean (St. Dev.)	Obs.	Maj. Foreign Firms Mean (St. Dev.)
1997								
Employment	1163	400.4 (799.0)	303	528.6 (1398.4)	802	335.0 (390.4)	58	635.3 (553.3)
Average wage	933	101.7 (105.6)	265	98.2 (84.2)	620	100.3 (114.3)	48	137.9 (89.0)
Sales per employee	936	633.5 (1160.5)	265	498.5 (740.2)	623	651.1 (1295.2)	48	1150.8 (1066.1)
Profits per employee	931	167.3 (595.5)	265	111.5 (396.3)	618	179.1 (667.2)	48	323.8 (495.2)
Value added per employee	931	269.1 (663.3)	265	209.7 (446.5)	618	279.6 (742.0)	48	461.7 (545.8)
1998								
Employment	1371	346.8 (695.0)	236	328.5 (609.3)	1058	327.8 (708.5)	77	664.1 (685.7)
Average wage	1102	112.2 (76.7)	211	102.0 (78.0)	828	110.8 (71.5)	63	164.7 (112.2)
Sales per employee	1104	1351.1 (18922.8)	211	381.8 (428.1)	830	1578.1 (21809.9)	63	1606.3 (2338.0)
Profits per employee	1099	303.4 (3287.5)	211	98.5 (271.5)	827	337.2 (3741.0)	61	553.9 (2153.0)
Value added per employee	1101	415.9 (3289.7)	211	200.6 (304.1)	828	447.6 (3743.2)	62	725.8 (2145.3)
1997-1998								
Employment	2534	371.4 (744.8)	539	441.0 (1126.8)	1860	330.9 (592.5)	135	651.7 (630.1)
Average wage	2035	107.4 (91.2)	476	99.9 (81.5)	1448	106.3 (92.4)	111	153.1 (103.2)
Sales per employee	2040	1021.9 (13944.3)	476	446.8 (623.6)	1453	1180.7 (16507.8)	111	1409.3 (1902.1)
Profits per employee	2030	241.0 (2452.7)	476	105.7 (346.3)	1445	269.6 (2863.8)	109	452.6 (1641.7)
Value added per employee	2032	348.7 (2463.3)	476	205.6 (389.5)	1446	375.8 (2874.2)	110	610.5 (1649.7)

Source: Amadeus Database

IV. ESTIMATION METHOD AND RESULTS

1. Estimation Method

The estimation strategy consists of three parts. First, in line with existing empirical research, the *Pooled Ordinary Least Squares estimator* is used as a benchmark for cross-sectional time-series estimates. The standard linear model is given by:

$$\mathbf{y} = \mathbf{x}\beta + \epsilon \quad (1.8)$$

where \mathbf{y} is $NT \times 1$, \mathbf{x} is $NT \times K$ and ϵ is $NT \times 1$. As it is assumed that $\epsilon_{it} \sim IID(0, \sigma^2)$ for all i and t , the panel structure of the data is essentially ignored. Therefore, the pooled OLS results are mostly presented for illustrative purpose. To take somehow into account that individual firm data are not independent over time, the cluster(identification) option is applied. This option specifies that the

¹¹ In table 3, the sample is restricted to firms which are classified according to majority shareholding. In contrast, the sample in table 2 also contains firms which have multiple owners. Consequently, the number of observations in table 3 differs from the number in table 2.

observations are independent across clusters but not necessarily independent within clusters¹². In attempting to lessen or accommodate the influence of any outlying observations in the estimators, the robust regression approach is taken.

One correct way to deal with a model in which observations are not independent within clusters (here firms) is to estimate a random-effects model. Therefore, our principal results are obtained using the *Panel Data Estimation method*. A one-way error component panel data model is given by:

$$y_{it} = cte + \mathbf{x}_{it}\boldsymbol{\beta} + u_{it} \quad \text{with } u_{it} = v_i + \varepsilon_{it} \quad (1.9)$$

with $i = 1, \dots, N$ denoting the cross-section dimension and $t = 1, \dots, T$ denoting the time-series dimension. v_i is the unobservable unit-specific residual and ε_{it} is the ‘usual’ residual with usual properties (mean 0, uncorrelated with itself, uncorrelated with \mathbf{x} , uncorrelated with v and homoscedastic). The panel structure of the sample offers the opportunity to control for firm-specific heterogeneity, which may capture various unobservables, such as the quality of capital and labour.

In the last part, we try to deal with two problems that have not been addressed so far. First, simultaneity may obscure the true relationship between wages and the variables reflecting internal conditions. Second, the level of employment entering both the definition of the wage and the measure of rents per worker raises the standard problem that measurement error may induce spurious correlation between these two key variables.

In general, there are two approaches to circumvent these problems: the recursive equation approach and the instrumental variable approach. The reasoning behind the former is that if shocks to internal factors were only passed on into higher wages after some time, the appropriate structure for estimation would be to regress wages on lagged values of the proxies for internal factors. According to this view, movements in previous internal conditions are treated as predetermined. The latter approach suggests finding good instrumental variables and applying the Two-Stage Least Squares procedure. To check the robustness of the results, this paper adopts the instrumental variable approach. Using the ordinary Two-Stage Least Squares method, however, brings us back to the problem we faced when employing pooled OLS, i.e. the panel structure of the data is completely ignored. In order to remove pay differentials between firms which are not related to firm performance but to the character of the firm, the *First-differences Instrumental Variable Method* suggested for dynamic fixed-effects models by Anderson and Hsiao (1982) is used. Under the assumption that endogeneity is constant across years, these results are expected to be in line with those obtained by the fixed-effects estimator.

¹² As cluster() implies robust, the Huber/White estimator of variance is used instead of traditional calculation. The cluster-option hence affects the estimated standard errors and variance-covariance matrix of the estimators but not the estimated

2. Estimation Results

In this section, our main findings are presented. In the specifications taking up regional dummies, the omitted regional intercept dummy variable is Sofia City. For reasons of brevity, the remaining regional intercept dummies are not reported. The pooled OLS as well as the panel estimates consist of two parts. In the first part, interaction-effects are ignored and the modified Right-To-Manage model augmented with the variables capturing the fraction of shares held by private domestic and foreign investors is estimated¹³. This part hence analyses to what extent the level of pay is related to ownership status. The pooled OLS estimates do not allow for clear-cut conclusions concerning the level of inside wages in private domestic-owned and foreign-owned companies. Once we control for unobserved fixed effects, however, we do find evidence that private firms pay higher wages than state firms. In accordance with the MNE-literature, we also find that foreign firms pay the highest wages. In the second part, we test whether the ownership structure of the firm is a potential determinant of insider power. In other words, we look not only at the direct effects of ownership changes but also at the interactions with firm performance. The benchmark ownership type is state-owned firms. The interactive coefficients on value added for private domestic and foreign firms are deviations from this benchmark. An explanation of the variables used in the regression analysis is given in Appendix.

Pooled Ordinary Least Squares. Table 4 reports the pooled OLS estimation results. Focusing on the question whether different ownership categories have a different impact on the insider power of employees, the estimates indicate that workers in state-owned firms seem to appropriate a large part of the rents (average point estimate of 0.230). On average, the employees' capacity to capture productivity gains is significantly lower in both private domestic and foreign firms. Since the value of the share of rents taken by insiders for private domestic and foreign firms is obtained from the sum of the benchmark (state) coefficient and the estimated coefficient, the coefficient on value added per worker appears to be close to zero (0.033) in foreign firms whereas the average point estimate is about 0.172 in private domestic firms, the latter resulting in an elasticity at the mean of 0.61.

As expected, foreign firms pay significantly higher wages than state-owned companies. The results for the wage level in private domestic firms, however, do not allow for clear-cut conclusions.

Finally, the estimates show that outside forces play an important role in the wage determination process. The coefficients of all the variables capturing external conditions have the expected sign and are -apart from the regional unemployment rate- highly significant. The cross-section elasticity of pay with respect to region-average wages and sector-average wages amounts to 0.16 and 0.48 respectively. In all specifications, the control variable for overall economic changes during the sample period has a statistically significant negative impact on real wages. This effect is the result of the economic and political crisis in which Bulgaria entered 1997. After a short and fragile burst of growth in 1994 and

coefficients.

¹³ These results are not reported but are available upon request.

1995, the Bulgarian economy relapsed into deep recession in late 1996 with figures showing a real growth rate of minus 11%, an annual inflation rate of 311% and currency depreciation hitting 3000%. The lack of a consistent economic policy and the imitation of market economy measures are blamed for the 1996-crisis. (OECD, 1998) In terms of economic performance as well as reform in general, 1997 was the year of the ‘second start’.

TABLE 4

Panel Data Estimation. The cross-section evidence shows strong effects from two potential sources of rents onto wages, i.e. (some form of) ownership and value added. It can however be objected that such evidence is unconvincing as the cross-section estimates are biased if omitted variables, of which the unobserved quality of workers is probably an important one, are correlated with ownership and value added. Since such unobserved fixed effects are likely to be positively correlated with private ownership, we are implicitly controlling for one of the potential sources of endogeneity of ownership by using the fixed-effects estimator. (Estrin et al., 2001) As mentioned above, we control for firm heterogeneity for each individual firm, even within the different ownership categories. Hence, our principal results are based on the panel data estimation method and are reported in table 5.

For a choice between the fixed-effects (within) estimator and the random-effects estimator, Hausman’s (1978) test to test $H_0 : E(v_i / x_{it}) = 0$ is performed. For all specifications, the Hausman test reveals that the subset of coefficients estimated by the fixed-effects estimator do differ statistically from the same coefficients estimated by the random-effects estimator. Under the assumption that our model is correctly specified, the observed differences must be due to the assumption of zero-correlation between v_i and x_{it} . Therefore, we should base our interpretation on the fixed-effects model. Only the results of the fixed-effects estimator are reported¹⁴.

With respect to rent sharing, we find again that employees in state-owned firms manage to cream off a significantly larger share of the rents compared to workers in private companies. Foreign-owned firms are in fact characterised by zero rent sharing. On average, the point estimate for state-owned firms is 0.052, which yields an elasticity of 0.11 at sample means. As the variable measuring the ratio of value added to employment in state-owned companies has a mean value of 205.65 and a maximum value of 4910.18, the state value-added series on the microeconomic level is much more volatile than that of a typical economic variable. As a result, an elasticity of 0.11 has very important consequences. The standard deviation of value added per employee in state firms equals 389.48 and the range amounts to 5731.34. This large range is probably due to outlying observations. There is no generally accepted way to parameterise the size of rent sharing in labour markets, but it is possible to calculate a version of Lester’s (1952) ‘range’ of wages. Given the large variance of average value added, we assume that the

¹⁴ A critique to the use of within-group estimation is that the assumption of non-zero correlation between the time-invariant fixed effect and the exogenous variables does not allow for doing out-of sample inference. (Baltagi, 1995) Since we rely on a large representative sample of manufacturing firms, however, we argue that this critique does not apply to our results.

width of the distribution can be thought of as two standard deviations. Under this assumption, the regression estimates allow a tentative calculation of the spread of pay induced, other factors held constant, solely by the dispersion of value added across firms. The ‘range’ of wages due to rent sharing in state-owned firms is then approximately 42 percent of the mean wage¹⁵. In contrast, the bargaining power of employees in foreign firms seems too weak to let them push up wages in response to productivity gains. The average point estimate for foreign companies is 0.004, which results in a very small elasticity between wages and rents (0.02). Although not always significant, private domestic firms also seem to be characterised by less rent sharing.

Compared to the benchmark case, employees in both private domestic and foreign firms are paid significantly higher wages with wages being the highest in foreign companies.

In general, labour market conditions appear to be important for wage bargaining. A doubling of the region-average wage rate would push up real wages by 64 percent and a doubling of the sector-average wage rate would increase real wages by 82 percent. Again, regional unemployment exerts a downward pressure on wages but this effect is not accurately estimated.

TABLE 5

V. ROBUSTNESS CHECKS

To investigate whether our estimation results are robust to the use of different variables and estimation techniques, two robustness checks are carried out. The first one is related to the measurement of internal conditions and ownership status. Following the empirical literature, we estimate all specifications using accounting profits per worker or sales per worker instead of value added per worker. Next to it, we use a slightly different sample to investigate whether majority shareholding has an effect on our earlier results. The second check refers to the estimation method: the robustness of the fixed-effects estimator is checked by applying the first-differences instrumental variable approach.

1. Measurement Check

Internal Conditions. When value added per worker is substituted by profits per worker, the pooled OLS estimates are well in line with the earlier results, i.e. rent sharing in private firms is considerably lower than in state firms (see upper part of table 6). Strikingly, the degree of rent sharing is significantly lower in all ownership categories compared to the estimates using value added per worker. This finding is highly pronounced for private domestic companies: the average point estimate drops from 0.172 (table 4) to 0.004 (table 6), resulting in an average elasticity of nearly zero. As a

¹⁵ This number emerges from $0.11 * 2 * \frac{sd(SOEva_L)}{mean(SOEva_L)} = 0.11 * 2 * \frac{389.48}{205.65}$, with SOEva_L real average value added in state-

owned companies. Note that this calculation is a modified version of Lester’s range of feasible wages. He assumed that - under a normal distribution- the width of a distribution is equal to four standard deviations.

consequence, the bargaining power of insiders in domestically private-owned enterprises is too small to let them raise wages in response to increases in profitability. The average point estimate for foreign firms (0.009), which is slightly higher than the one for private domestic firms, also gives rise to a very small elasticity between wages and profits (0.03). As mentioned above, the profit per worker variable being negatively related to wages by construction may result in an underestimation of the rent-sharing effect.

Whereas we initially could not reach a clear conclusion concerning the wage level in domestically private-owned companies, the results using average profits indicate that employees in both private domestic and foreign firms are paid significantly higher wages than those in state-owned firms.

Outside pressure plays an even more important role in the bargaining process. A doubling of the local unemployment rate would according to the calculations depress real wages by about 10 percent. Doubling region-specific or sector-specific wages would raise real wages by approximately 50 and 75 percent respectively. These elasticities are considerably higher than in our earlier results.

From the bottom part of table 6, it follows that the pooled OLS results with sales per worker measuring the firm's ability-to-pay also accord very well with those using value added per worker, be it that the degree of rent sharing is again clearly lower. On average, the estimated coefficient capturing rent sharing amounts to 0.10, 0.06 and 0.03 in state, private domestic and foreign companies respectively.

Again, we find the empirical regularity that the level of foreign wages is significantly higher than the level of pay in state-owned firms.

The variables capturing outside forces are also in the current setting highly significant: regional unemployment affects wages negatively while both regional and sectoral wages exert an upward pressure on the level of pay. The respective elasticities are -0.04, 0.28 and 0.37.

TABLE 6

Before interpreting the panel estimates, it should be mentioned that for all variants of the earlier specifications, Hausman's test always rejects the random-effects model.

The panel results with profits per worker as internal variable are presented in the upper part of table 7. As before, rent sharing appears to be most prevalent in state firms. The responsiveness of real wages with respect to profits per worker is clearly lower than their responsiveness with respect to value added per worker: the average point estimate of 0.036 yields a profits-wages elasticity of 0.04 (compared to 0.11 using value added). Again, we can point to the direct endogeneity bias as a possible explanation for the lower estimated rent-sharing effect. Remarkably, the coefficient on both private domestic and foreign rents is found to be significantly negative and highest in absolute value for foreign firms. This finding leads to the strong conclusion that an increase in profitability in private

companies results in lower wages. The conclusions concerning the level of inside wages and labour market conditions equal those of the first panel estimates.

TABLE 7

The lower part of table 7 reports the panel estimates when sales per worker is substituted for value added per worker. As before, wages in state-owned companies appear to be quite responsive to changes in sales (average point estimate of 0.047). Surprisingly, the slope coefficients related to both ownership categories appear to be insignificant, implying that we are unable to detect significant differences with respect to rent sharing in state, private domestic or foreign firms.

In line with the first panel results, private companies pay significantly higher wages compared to the benchmark case. The highest level of pay is still to be found in foreign firms. The estimates regarding outside forces confirm the previous results.

Ownership Variable. As an additional measurement control, we check whether the results are invariant to the choice of the sample. When substituting ownership dummies for the fraction of shares held by the various ownership categories, we can firmly conclude that our main results remain robust to restraining the analysis to majority ownership groups only¹⁶. For the pooled OLS results, the only difference is that rent sharing appears to be even lower in foreign firms. The coefficient on value added in foreign firms drops by 73%, i.e. from 0.033 to 0.009. The panel results are nearly unchanged.

2. Methodological Check

To correct for possible simultaneity between the internal variable and the wage and to allow for firm-specific effects, the results of the first-differences instrumental variable procedure are reported in table 8¹⁷. The various specifications take up the first differences of all variables, including the ownership intercept and slope coefficients. As suggested by Arellano (1989), the instruments are taken in levels. (Baltagi, 1995) More specifically, the 2-period and the 3-period lagged value of value added combined with the 2-period and the 3-period lagged value of real average wages at the firm level are used as instruments to solve for the least squares of the sample's first moment conditions. The choice of the lagged value of real average wages as additional instrument can be motivated by efficiency-wage considerations. According to this channel, higher wages stimulate work effort and hence productivity. From table 8, it follows that the findings of the fixed-effects model appear to be quite robust. In line with the panel estimates, the results confirm the existence of crucial differences in insider effect across different types of firms. Interestingly, the conclusion to be drawn from comparing the fixed-effects estimates with the first-differences TSLS estimates is that the extent of rent sharing in state-owned

¹⁶ Instead of using continuous shareholding variables ranging between zero and one, we now replace them with dummies for majority ownership. These results, which are very well in line with the earlier findings, are available upon request.

¹⁷ In addition to wiping out fixed-effects, differencing makes the variables stationary. In our setting, however, this is not likely to be an important issue as the cross-section dimension greatly exceeds the time-series dimension.

companies is underestimated using an OLS technique. The first-differences TSLS approach points to an average estimate of 0.080 for state firms, resulting in an elasticity at sample means of 0.17. According to the panel results, the corresponding average point estimate is 0.052 and the corresponding elasticity amounts to 0.11. Consistent with the panel estimates, in foreign firms the bargaining strength of insiders seems to be too weak to let them push up wages in response to firm performance. Even stronger, the coefficient on foreign rents is found to be significantly negative. In the first-differences TSLS estimates, we find the same result for private domestic firms. In accordance with the panel estimates, inside wages in private firms are higher than those in state firms.

TABLE 8

VI. INTERPRETATION

Before interpreting the results, we should bear in mind that the pooled OLS estimation method on the one hand and the panel and first-differences procedures on the other hand can basically not be compared. The use of the three different estimation procedures, however, leads to one striking result that emerges from nearly all specifications: rent sharing is highly pronounced in state-owned firms whereas both private domestic and foreign companies are characterised by considerably less rent sharing. The results regarding state-owned and domestically private-owned firms are in line with those of scarce existing empirical research for Poland (period 1992-1994) and Russia (1996-1997) in this field. Both studies use ownership dummies to discriminate between state, privatised and commercialised enterprises and find that the share of rents taken by workers in privatised companies is significantly less than the share taken by state-owned employees. When focusing on the preferred estimation method, which takes account of firm-specific effects, and when correcting for endogeneity, we find in addition that the level of inside wages is on average higher in private firms compared to state firms and that foreign enterprises pay the highest wages.

Within the bargaining framework, the findings for foreign-owned companies can be explained in two ways. First, foreign firms appear to be characterised by a relatively high level of inside wages, which prevents insiders from translating productivity gains into wage increases. Moreover, if one thinks about a two-stage game in which the location decision of foreign firms occurs after firms and insiders bargain over wages, the ‘threat of relocation’ possibility of foreign firms vis-à-vis the insiders increases the bargaining position of foreign firms. If bargaining breaks down, the conflict payoff (or outside option for the firm) is positive as foreign firms can relocate activity to other countries. Hence, firm mobility curbs insider power. This leads to a low -in our case sometimes a reverse-responsiveness of real wages to productivity gains, generating in turn lower wages in equilibrium. (Zhao, 1995) A second possible explanation is that foreign firms are typified by ‘low’-wage

considerations, meaning that they resist letting wages increase in response to productivity improvements.

Next to it, it can be said that wage determination in foreign firms is driven more by profitability considerations than wage formation in state-owned firms. Given the economic and financial crisis in 1996, it is very reasonable to assume that during the considered timespan firms in Bulgarian regions financed most of their investment from retained earnings. The statistically significant negative coefficient on the interaction term related to foreign ownership in the first-differences TSLS estimates may reflect that investment effort strongly dominates other objectives in foreign companies. Higher investment spending in foreign firms could then be explained by more efficient corporate governance and a probably different time horizon underlying economic decisions. Empirical research has already found evidence of investment behaviour being related to form of ownership. (Grosfeld, Nivet, 1997) Finally, the rejection of rent sharing in a non-standard competitive framework may be the result of a clustering of foreign firms in sectors operating in a perfectly competitive market. To gain a first insight into that issue, we divided the sample into 6 subsamples according to the 2-digit NACE industry classification¹⁸. The underlying idea was to examine in which subsectors rent sharing is not an issue and then to check the homogeneity/heterogeneity of firms according to ownership type within these subsectors. The presence of predominantly foreign-owned firms in subsectors with perfectly competitive elements would then explain our findings. A closer look at the data of the subsamples leads to the following conclusions. First, the different ownership categories are evenly distributed across subsectors. Within each subsector, on average 20-30% of the firms are majority state-owned, 65-80% are majority private domestic-owned and 3-10% are majority foreign-owned. Second, the shareholding structure is quite similar within each subsector. The average fraction of shares held by state owners is 32%, private domestic investors retain on average 64% of the shares and foreign investors hold on average 4% of the shares. Third, within each subsector foreign investors are concentrated in a few firms and hence own most of the time a majority stake. Based on this information, we do not expect to see crucial differences in labour market performance across subsectors. To test this hypothesis, we performed the regressions for each subsector separately. As anticipated, the pooled OLS and the panel results do not point to significant differences in labour market performance across subsectors.

The result that the strongest positive relationship between firm's ability-to-pay and wages is found in state-owned firms can partly be explained by the fact that insiders in these companies still play an important role. This is however not a sufficient explanation as increased product market competition

¹⁸ Sectors with a small number of observations were dropped. To be specific, subsample 1 comprises firms from industry 15, subsample 2 from industry 17 and 18, subsample 3 from industry 24 and 26, subsample 4 from industry 27 and 28, subsample 5 from industry 29 and 31 and subsample 6 from industry 36 respectively. Subsample 1 and 2 cover both 25% of the sample, subsample 3 and 4 both 12% and subsample 5 and 6 cover 19% and 7% respectively. In the aggregate, the 6 subsamples cover about 80% of the original sample. In line with the original sample, 21% of the firms are majority state-owned, 74% majority domestically private-owned and 5% majority foreign-owned.

(resulting for example from higher FDI) may prevent insiders from exploiting their power on the bargaining table. In this context, further research aims at analysing the impact of competitive pressure on labour market performance by introducing explicitly measures of market concentration and import penetration into the analysis. The motivation is that competitive pressure may result in disciplining firm behaviour and that the effect may depend on the ownership type of the firm. Empirical research has already found evidence of the existence of complementarities between competitive pressure and ownership changes in the Bulgarian product market. (Estrin et al., 2001)

The economic chaos following the 1996-crisis and the coefficient of the regional unemployment rate showing the expected sign but being insignificant (in contrast to the other variables capturing outside forces) brings us to another, rather tentative, explanation. More specifically, a second interpretation rests on the wage-unemployment ratchet effect, introduced by Lindbeck and Snower (1987). The underlying idea is that after an adverse shock to which firms reacted by reducing employment, the probability for each employee of being laid off decreases and the incumbent workforce with important bargaining power responds by pushing for higher wages. Based on our evidence, it seems that in the aftermath of the 1996-crisis, this effect was really pronounced in state-owned firms.

From a policy point of view, the results tentatively suggest that FDI should be promoted. This policy implication is based on the high inside wages and the high investment efforts, stimulating job creation, in foreign firms.

Finally, a caveat to our results is the possibility of residual selection bias. It could be that some categories of owners were able to obtain shares in better firms, in ways which are unobservable to the researcher but possibly observable to the buyers. This problem arises in all studies of privatisation and firm performance. In our analysis, we argue that the fixed-effects estimator controls for ownership endogeneity. This is valid if the unobservable quality is fixed for each firm. The effect may be dynamic, however, if for example the unobservable quality relates to potential for restructuring and improvements in productivity rather than being intertemporally fixed. We control implicitly for this dynamic effect by using the first-differences TSLS method. Nevertheless, the possibility of selection bias should be borne in mind in interpreting our findings.

VII. CONCLUSION

This paper focuses on wage determination in Bulgaria. Wage equations derived from a slightly modified Right-To-Manage model are estimated using a unique firm level data set covering all medium and large sized manufacturing firms from the 28 regions of Bulgaria during the period 1997-1998. Starting from the simplest method to analyse cross-section time-series data, we apply alternative panel procedures, exploiting the rich panel structure of the data as well as controlling for the

endogeneity bias. The central question investigated is whether and how wage determination is related to ownership status. The broad conclusion to be drawn from this paper is that the wage formation process is clearly related to form of ownership: there are statistically significant differences in the share of surplus taken by employees in state, private domestic and foreign companies. When taking account of firm heterogeneity, it is found that rent sharing is nearly non-existent in foreign-owned firms while the level of pay is higher compared to the benchmark, state-owned firms. Rent sharing appears to be highly pronounced in state-owned firms and rent sharing is on average considerably lower in domestically private-owned firms. Private domestic firms also pay higher wages than state firms but the highest level of inside wages is to be found in foreign firms. From a policy point of view, the results might be interpreted as promoting FDI in terms of wage discipline and job creation.

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TABLES

Table 4 Wage equation 1997-1998, dependent variable $wage_{it}$ - Pooled OLS

	Pooled OLS ^o , cluster(id) Robust Regression		Pooled OLS, cluster(id) Robust Regression			
Constant	59.762 *** (3.354)	11.936 ** (4.565)	42.042 *** (6.687)	61.442 *** (3.631)	9.013 ** (3.961)	11.642 ** (4.897)
Va_L	0.243 *** (0.005)	0.225 *** (0.005)	0.230 *** (0.006)	0.232 *** (0.006)	0.225 *** (0.006)	0.224 *** (0.006)
PRIVD	3.640 (2.806)	3.227 (2.787)	-4.684 * (2.704)	-4.742 * (2.714)	2.844 (2.784)	2.942 (2.783)
FOR	63.168 *** (5.805)	60.798 *** (5.763)	46.996 *** (5.769)	48.395 *** (5.777)	46.946 *** (5.917)	46.791 *** (5.916)
PRIVDva_L	-0.060 *** (0.005)	-0.057 *** (0.005)	-0.002 (0.006)	-0.001 (0.006)	-0.056 *** (0.006)	-0.056 *** (0.006)
FORva_L	-0.234 *** (0.006)	-0.216 *** (0.006)	-0.188 *** (0.008)	-0.190 *** (0.008)	-0.176 *** (0.008)	-0.176 *** (0.008)
Avg_wage			0.164 *** (0.057)			
Reg_u				-0.094 (0.166)		-0.154 (0.170)
Sector_wage		0.477 *** (0.030)			0.495 *** (0.030)	0.494 *** (0.030)
Year 1997	-8.050 *** (1.870)	-3.514 * (1.888)	-5.512 *** (1.962)	-7.854 *** (1.815)	-3.061 * (1.883)	-3.218 * (1.890)
N	2039	2039	2036	2036	2036	2036

^o Regional dummies included but not reported. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.
White-standard errors in parentheses.

Table 5 Wage equation 1997-1998, dependent variable $wage_{it}$ - PANEL

	Fixed Effects ^o		Fixed Effects		
Constant	86.020 *** (6.775)	-1.707 (11.006)	14.101 (18.220)	91.077 *** (11.614)	0.054 (14.422)
Va_L	0.050 *** (0.010)	0.055 *** (0.010)	0.049 *** (0.010)	0.050 *** (0.010)	0.055 *** (0.010)
PRIVD	21.190 ** (9.387)	18.461 ** (8.927)	20.474 ** (9.301)	21.159 ** (9.391)	18.453 ** (8.931)
FOR	68.007 *** (15.103)	47.567 *** (14.505)	67.318 *** (14.963)	67.988 *** (15.110)	47.576 *** (14.513)
PRIVDva_L	-0.017 (0.013)	-0.036 *** (0.016)	-0.017 (0.013)	-0.017 (0.013)	-0.036 *** (0.012)
FORva_L	-0.044 ** (0.017)	-0.054 *** (0.016)	-0.044 ** (0.017)	-0.044 ** (0.017)	-0.054 *** (0.016)
Avg_wage			0.650 *** (0.153)		
Reg_u				-0.307 (0.573)	-0.103 (0.545)
Sector_wage		0.836 *** (0.085)			0.835 *** (0.085)
Year 1997	-15.422 *** (1.691)	-4.394 ** (1.960)	-6.374 ** (2.711)	-15.746 *** (1.796)	-4.511 ** (2.056)
Hausman test	$\chi^2(6) = 67.5$	$\chi^2(7) = 76.0$	$\chi^2(7) = 47.8$	$\chi^2(7) = 193.8$	$\chi^2(8) = 84.6$
N	2040	2040	2040	2040	2040
R^2	0.167	0.248	0.183	0.167	0.248

^o Regional dummies included but not reported. *** Significant at 1%; ** Significant at 5%; * Significant at 10%. Hausman test checks for orthogonality of individual effects and other regressors. Standard errors in parentheses. $R^2 = R$ -sq within.

Table 6 Wage equation 1997-1998, dependent variable $wage_{it}$ - Pooled OLS

	Pooled OLS ^o , cluster(id) Robust Regression		Pooled OLS, cluster(id) Robust Regression			
Constant	98.998 *** (4.055)	18.449 *** (5.559)	33.154 *** (8.768)	93.461 *** (4.556)	3.323 (4.850)	13.842 ** (5.946)
Prof_L	0.077 *** (0.007)	0.073 *** (0.007)	0.079 *** (0.010)	0.185 *** (0.010)	0.166 *** (0.009)	0.166 *** (0.008)
PRIVD	5.526 * (3.387)	4.243 (3.272)	7.186 ** (3.357)	13.117 *** (3.345)	11.112 *** (3.230)	11.339 *** (3.209)
FOR	53.816 *** (7.163)	52.484 *** (6.921)	55.351 *** (7.091)	61.352 *** (7.046)	59.960 *** (6.808)	58.947 *** (6.791)
PRIVDprof_L	-0.066 *** (0.007)	-0.058 *** (0.007)	-0.080 *** (0.010)	-0.185 *** (0.010)	-0.166 *** (0.010)	-0.166 *** (0.008)
FORprof_L	-0.068 *** (0.008)	-0.064 *** (0.007)	-0.070 *** (0.010)	-0.176 *** (0.010)	-0.157 *** (0.010)	-0.157 *** (0.009)
Avg_wage			0.504 *** (0.075)			
Reg_u				-0.641 *** (0.217)		-0.624 *** (0.208)
Sector_wage		0.761 *** (0.037)			0.760 *** (0.037)	0.755 *** (0.037)
Year 1997	-9.618 *** (2.368)	-1.475 (2.328)	-2.759 (2.577)	-10.480 *** (2.366)	-1.604 (2.318)	-2.313 (2.321)
N	2039	2039	2036	2036	2036	2037

^o Regional dummies included but not reported. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.
White-standard errors in parentheses.

	Pooled OLS ^o , cluster(id) Robust Regression		Pooled OLS, cluster(id) Robust Regression			
Constant	54.736 *** (5.183)	23.563 *** (6.145)	32.169 *** (7.205)	67.888 *** (3.894)	8.056 ** (4.086)	32.735 *** (5.201)
Sales_L	0.093 *** (0.003)	0.099 *** (0.003)	0.093 *** (0.003)	0.095 *** (0.003)	0.094 *** (0.003)	0.102 *** (0.003)
PRIVD	1.232 (3.059)	3.801 (3.032)	1.708 (3.189)	1.535 (3.141)	4.689 (3.025)	4.344 * (2.963)
FOR	51.889 *** (6.702)	56.088 *** (6.641)	21.940 *** (7.418)	25.753 *** (7.412)	22.966 *** (7.166)	28.766 *** (7.314)
PRIVDsales_L	-0.023 *** (0.003)	-0.033 *** (0.003)	-0.024 *** (0.004)	-0.026 *** (0.004)	-0.038 *** (0.004)	-0.036 *** (0.003)
FORsales_L	-0.080 *** (0.004)	-0.087 *** (0.004)	-0.043 *** (0.005)	-0.046 *** (0.005)	-0.043 *** (0.005)	-0.053 *** (0.005)
Avg_wage			0.279 *** (0.061)			
Reg_u				-0.304 * (0.177)		-0.263 * (0.174)
Sector_wage		0.295 *** (0.032)			0.522 *** (0.031)	0.307 *** (0.031)
Year 1997	-11.304 *** (1.920)	-9.303 *** (1.944)	-6.568 *** (2.130)	-11.631 *** (1.925)	-6.151 *** (1.888)	-9.465 *** (1.942)
N	2043	2042	1972	2040	2040	2040

^o Regional dummies included but not reported. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.
White-standard errors in parentheses.

Table 7 Wage equation 1997-1998, dependent variable $wage_{it}$ - PANEL

	Fixed Effects ^o		Fixed Effects		
Constant	97.779 *** (6.562)	4.844 (10.931)	19.424 (18.403)	105.797 *** (11.583)	8.211 (14.422)
Prof_L	0.033 *** (0.011)	0.040 *** (0.010)	0.033 *** (0.011)	0.033 *** (0.011)	0.040 *** (0.010)
PRIVD	21.522 ** (9.098)	16.235 * (8.619)	20.629 ** (9.001)	21.487 ** (9.100)	16.226 * (8.623)
FOR	69.738 *** (14.137)	43.727 *** (13.604)	68.902 *** (13.985)	69.650 *** (14.141)	43.723 *** (13.611)
PRIVDprof_L	-0.034 ** (0.014)	-0.053 *** (0.013)	-0.035 ** (0.014)	-0.034 ** (0.014)	-0.053 *** (0.013)
FORprof_L	-0.075 *** (0.018)	-0.077 *** (0.017)	-0.075 *** (0.017)	-0.075 *** (0.018)	-0.077 *** (0.017)
Avg_wage			0.706 *** (0.155)		
Reg_u				-0.428 (0.582)	-0.197 (0.551)
Sector_wage		0.885 *** (0.086)			0.884 *** (0.086)
Year 1997	-15.677 *** (1.718)	-3.885 ** (1.986)	-5.832 ** (2.751)	-16.125 *** (1.824)	-4.109 ** (2.082)
Hausman test	$\chi^2(6) = 135.7$	$\chi^2(7) = 55.9$	$\chi^2(7) = 119.8$	$\chi^2(7) = 329.1$	$\chi^2(8) = 77.6$
N	2040	2040	2040	2040	2040
R^2	0.140	0.232	0.160	0.141	0.232

^o Regional dummies included but not reported. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.

Hausman test checks for orthogonality of individual effects and other regressors. Standard errors in parentheses. $R^2 = R$ - sq within.

	Fixed Effects ^o		Fixed Effects		
Constant	67.169 *** (7.310)	35.803 *** (8.248)	40.574 *** (11.190)	71.011 *** (11.556)	39.429 *** (12.014)
Sales_L	0.044 *** (0.006)	0.052 *** (0.006)	0.044 *** (0.006)	0.044 *** (0.006)	0.052 *** (0.006)
PRIVD	18.015 * (9.724)	21.130 ** (9.448)	20.256 ** (10.071)	17.985 * (9.729)	21.100 ** (9.452)
FOR	62.896 *** (16.472)	59.931 *** (15.992)	61.214 *** (16.754)	62.892 *** (16.479)	59.928 *** (15.999)
PRIVDsales_L	0.003 (0.007)	-0.006 (0.007)	0.001 (0.007)	0.003 (0.007)	-0.006 (0.007)
FORsales_L	-0.001 (0.010)	-0.009 (0.009)	-0.003 (0.010)	-0.001 (0.010)	-0.009 (0.009)
Avg_wage			0.246 *** (0.071)		
Reg_u				-0.233 (0.542)	-0.219 (0.527)
Sector_wage		0.259 *** (0.035)			0.259 *** (0.035)
Year 1997	-16.031 *** (1.599)	-12.749 *** (1.616)	-13.711 *** (1.958)	-16.275 *** (1.698)	-12.981 *** (1.711)
Hausman test	$\chi^2(6) = 160.4$	$\chi^2(7) = 227.8$	$\chi^2(7) = 157.2$	$\chi^2(7) = 166.5$	$\chi^2(8) = 225.9$
N	2044	2043	1976	2044	2043
R^2	0.259	0.303	0.277	0.260	0.304

^o Regional dummies included but not reported. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.

Hausman test checks for orthogonality of individual effects and other regressors. Standard errors in parentheses. $R^2 = R$ - sq within.

Table 8 Wage Equation 1997-1998, dependent variable wage_{it} - Endogeneity and Fixed-Effects Check

	First-differences TSLS						Panel - Fixed Effects					
	(1) °	(2)	(3)	(4) °°	(5) °	(6) ° °°	(1) °	(2)	(3)	(4) °°	(5) °	(6) ° °°
Constant	31.207 *** (5.905)	7.833 ** (3.583)	3.147 (2.713)	14.465 ** (5.310)	13.956 ** (5.736)	27.657 *** (7.902)	86.020 *** (6.775)	14.101 (18.220)	0.054 (14.422)	91.409 (11.651)	-1.707 (11.006)	86.272 *** (6.794)
Va_L	0.080 *** (0.017)	0.069 *** (0.016)	0.075 *** (0.015)	0.078 *** (0.016)	0.082 *** (0.016)	0.087 *** (0.016)	0.050 *** (0.010)	0.049 *** (0.010)	0.055 *** (0.010)	0.051 *** (0.010)	0.055 *** (0.010)	0.052 *** (0.010)
PRIVD	46.321 *** (14.854)	33.908 ** (14.472)	28.773 ** (13.619)	39.359 ** (14.323)	37.033 ** (13.779)	46.956 *** (14.410)	21.190 ** (9.387)	20.474 ** (9.301)	18.453 ** (8.931)	20.769 ** (9.421)	18.461 ** (8.927)	20.799 ** (9.417)
FOR	138.452 *** (29.396)	121.021 *** (28.550)	86.670 *** (27.088)	107.343 *** (27.725)	98.454 *** (27.632)	117.845 *** (227.725)	68.007 *** (15.103)	67.318 *** (14.963)	47.576 *** (14.513)	70.297 *** (15.509)	47.567 *** (14.505)	70.322 *** (15.503)
PRIVDva_L	-0.100 *** (0.033)	-0.088 ** (0.033)	-0.103 *** (0.031)	-0.136 *** (0.033)	-0.108 *** (0.031)	-0.135 *** (0.031)	-0.017 (0.013)	-0.017 (0.013)	-0.036 *** (0.012)	-0.018 (0.013)	-0.036 *** (0.012)	-0.018 (0.013)
FORva_L	-0.178 *** (0.050)	-0.156 *** (0.050)	-0.164 *** (0.047)	-0.206 *** (0.047)	-0.172 *** (0.047)	-0.207 *** (0.045)	-0.044 ** (0.017)	-0.044 ** (0.017)	-0.054 *** (0.016)	-0.047 ** (0.017)	-0.054 *** (0.016)	-0.047 ** (0.017)
Avg_wage		0.712 *** (0.191)						0.650 *** (0.153)				
Reg_u			-0.185 (0.711)	-0.004 (0.755)					-0.103 (0.545)	-0.312 (0.575)		
Sector_wage			1.144 *** (0.111)		1.095 *** (0.111)				0.835 *** (0.085)		0.836 *** (0.085)	
Year 1997							-15.422 *** (1.691)	-6.374 ** (2.711)	-4.511 ** (2.056)	-15.786 *** (1.803)		-15.457 *** (1.698)
Hausman test							$\chi^2(6)=67.5$	$\chi^2(7)=47.8$	$\chi^2(7)=84.6$	$\chi^2(8)=215.8$	$\chi^2(7)=60.3$	$\chi^2(6)=128.7$
N	613	613	613	607	613	607	2040	2040	2040	2030	2040	2030
R²	0.093	0.053	0.163	0.123	0.220	0.210	0.167	0.183	0.248	0.166	0.248	0.166

° Regional dummies included but not reported. °° Sectoral dummies included but not reported. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.

TSLS differenced equations: Standard errors in parentheses - All variables are in first differences, the instruments are in levels.

Instruments (1) : (Va_L PRIVDva_L FORva_L)_{t-2, t-3} (Wage_L PRIVDwage_L FORwage_L)_{t-2, t-3}

Instruments (2) : (Va_L PRIVDva_L FORva_L)_{t-2, t-3} (Wage_L PRIVDwage_L FORwage_L)_{t-2, t-3}

Instruments (3) : (Va_L PRIVDva_L FORva_L)_{t-2, t-3} (Wage_L PRIVDwage_L FORwage_L)_{t-2, t-3}

Instruments (4) : (Va_L PRIVDva_L FORva_L)_{t-2, t-3} (Wage_L PRIVDwage_L FORwage_L)_{t-2, t-3}

Instruments (5) : (Va_L PRIVDva_L FORva_L)_{t-2, t-3} (Wage_L PRIVDwage_L FORwage_L)_{t-2, t-3}

Instruments (6) : (Va_L PRIVDva_L FORva_L)_{t-2, t-3} (Wage_L PRIVDwage_L FORwage_L)_{t-2, t-3}

FE estimator: Standard errors in parentheses - Hausman test checks for orthogonality of individual effects and other regressors. $R^2 = R$ -sq within.

APPENDIX

Table A1 Sales industry coverage using Amadeus data set, 1998

Code	Name	Coverage
15	Food and Beverages	51%
16	Tobacco	80%
17	Textiles	100%
18	Wearing Apparel, Fur	44%
19	Leather, Luggage and Footwear	57%
20	Wood, Straw and Plaiting Materials	51%
21	Pulp, Paper and Paper Products	76%
22	Publishing, Printing and Media	55%
23	Coke, Refined Petroleum Products and Nuclear Fuel	-
24	Chemicals and Chemical Products	98%
25	Rubber and Plastic Products	55%
26	Other Non-Metallic Mineral Products	74%
27	Basic Metals	100%
28	Fabricated Metal Products	56%
29	Machinery and Equipment n.e.c.	64%
30	Office Machinery and Computers	23%
31	Electrical Machinery and Apparatus n.e.c.	100%
32	Radio, TV and Communication Equipment	100%
33	Medical, Precision and Optical Instruments	50%
34	Motor Vehicles, Trailers and Semi-trailers	67%
35	Other Transport Equipment	87%
36	Furniture, Manufacturing n.e.c.	43%
37	Recycling	-

Note: Sales coverage ratio = total industry sales in Amadeus / total national industry sales according to the 2-digit NACE industry classification. Data on national industry sales are not available in sectors 23 and 37.

List of Variables

Avg_wage	Running Average Regional Real Wage
FOR	Ownership Intercept Variable : Fraction of Shares held by Foreign Owners
FORprof_L	Real Profits per Employee interacted with the Foreign Ownership Variable
FORsales_L	Real Sales per Employee interacted with the Foreign Ownership Variable
FORva_L	Real Value Added per Employee interacted with the Foreign Ownership Variable
FORva_L _{t-2}	2-Period Lagged Value of FORva_L
FORva_L _{t-3}	3-Period Lagged Value of FORva_L
FORwage_L	Real Wage per Employee interacted with the Foreign Ownership Variable
FORwage_L _{t-2}	2-Period Lagged Value of FORwage_L
FORwage_L _{t-3}	3-Period Lagged Value of FORwage_L
majFOR	Ownership Intercept Dummy Variable : value = 1 if Fraction of Shares held by Foreign Owners > 50%
majFORva_L	Real Value Added per Employee interacted with the Foreign Ownership Dummy Variable
majPRIVD	Ownership Intercept Dummy Variable : value = 1 if Fraction of Shares held by Private Domestic Owners > 50%
majPRIVDva_L	Real Value Added per Employee interacted with the Private Domestic Ownership Dummy Variable
PRIVD	Ownership Intercept Variable : Fraction of Shares held by Private Domestic Owners

PRIVDprof_L	Real Profits per Employee interacted with the Private Domestic Ownership Variable
PRIVDsales_L	Real Sales per Employee interacted with the Private Domestic Ownership Variable
PRIVDva_L	Real Value Added per Employee interacted with the Private Domestic Ownership Variable
PRIVDva_L _{t-2}	2-Period Lagged Value of PRIVDva_L
PRIVDva_L _{t-3}	3-Period Lagged Value of PRIVDva_L
PRIVDwage_L	Real Wage per Employee interacted with the Private Domestic Ownership Variable
PRIVDwage_L _{t-2}	2-Period Lagged Value of PRIVDwage_L
PRIVDwage_L _{t-3}	3-Period Lagged Value of PRIVDwage_L
Prof_L	Real Accounting Profits per Employee
Reg_u	Regional Unemployment Rate
Regional Dummies	27 Dummy Variables corresponding to the 27 Regions - Omitted Region = Sofia City
Sales_L	Real sales per Employee
Sector_wage	Average Two-digit Sectoral Real Wage
Sectoral Dummies	22 Dummy Variables corresponding to the 22 Manufacturing Sectors
Va_L	Real Value Added per Employee
Va_L _{t-2}	2-Period Lagged Value of Va_L
Va_L _{t-3}	3-Period Lagged Value of Va_L
Wage_L	Real Wage per Employee
Wage_L _{t-2}	2-Period Lagged Value of Wage_L
Wage_L _{t-3}	3-Period Lagged Value of Wage_L
Year 1997	Time Dummy : value = 1 if Year = 1997