The Effect of Firm Ownership Structure on Performance: A case study of Eastern Europe and Central Asian Countries.

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Abstract

This paper uses World Bank Enterprise Survey 2009 and 2013 panel data for Central Asia and Eastern Europe to estimate the casual effects of firm ownership structure on firm performance measured by the growth rates of sales, labor productivity and employment. The study uses treatment effect models to compute the average treatment effects. Estimation results using propensity score matching show that on average private firms have sales and employment growth rates that are 6 percentage points higher compared to public firms. The effect is statistically significant at conventional significance levels. Labor productivity growth is similar across public and private firms. The key conditional independence assumption necessary for the validity of the matching models is found to be valid and the computed casual effects are consistent across the different treatment effect models.

1 Introduction

Firms have various ownership structures which can be categorized into two major groups; public and private. Private firms have a concentrated ownership structure. They are owned by one or few owners and the owners have strong control over management. Public firms have less concentrated ownership with many owners. They usually have corporate governance structure whereby ownership and management are separated. Separation of ownership and management in public firms limits owners' ability to influence management decisions resulting in different performance levels between public and private firms. Kapopoulos and Lazaretou (2007) found that concentrated ownership structure leads to higher profits. This performance difference is due to differences in ownership structure; private firms are closely managed by their owners while public firms are managed by managers who are agents for the owners.

Varian (1992, p441) claims that agency problem causes "principal-agent problem" whereby an inefficient outcome is attained due to the difference in benefits (utilities) of the principal (owner) and the agent (manager). Information asymmetries limit owners' ability to control public firms. This arises because managers are better informed about a firm's potential while owners are less informed. This gives managers the upper hand to direct firm resources in a way that maximizes their benefits (salaries, bonuses, etc.) instead of the owners' benefits (Asker, Farre-Mensa and Ljungqvist 2011).

Using 2009 and 2013 World Bank Enterprise Survey (WBES) panel data for Central Asia and Eastern Europe, the paper explores the casual effect of firm ownership structure on selected performance measures; growth rates of productivity, employment and sales. I will assess whether there is a performance difference between similar public firms and private firms and show that agency problems lead to lower performance by public firms. This study uses treatment effect models, propensity score matching, to estimate average treatment effect of being a public firm. Propensity score matching is used to control for possible endogeneity due to non-randomized assignment of firms to private and public. Estimation results show that on average private firms have 6 percentage points higher sales growth compared to similar public firms. The result is statistically significant at conventional significance levels. Similarly, private firms have, on average, 6 percentage points higher employment growth compared to similar public firms. The estimated result is also statistically significant at conventional significance levels. Labor productivity growth is found to be similar across public and private firms. The estimation results are consistent across other treatment effect models that make different assumptions on the treatment model.

The study is organized as follows. Section 2 explains the data followed by discussion of the methodology in section 3. Propensity score matching is used to get the causal effect of ownership structure on performance. The section explains the rationale for using matching methods to control for endogeneity issues that arise due to non-randomized assignment of treatment. Discussion of estimation results is presented in the following section. The section also discusses the validity of the key assumptions required for consistent estimation. The final section concludes the paper by providing policy recommendations.

2   Data

I used World Bank Enterprise Survey (WBES) panel data, for 2009 and 2013, covering ~1,800 firms across 21[1] countries in Eastern Europe and Central Asia. Some observations were

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[1] Mongolia, Albania, Montenegro, Bosnia and Herzegovina, Romania, Poland, Lithuania, Bulgaria, Kyrgyz republic, Moldova, Azerbaijan, Croatia, Armenia, Serbia, Latvia, Kazakhstan, Hungary, Slovakia, Czech Republic, Macedonia, and Estonia

excluded from the analysis because of perfect fitting of the probability (probit) model. These include firms in five countries (Albania, Kazakhstan, Serbia, Hungary and Slovakia) and firms in the real-estate industry. As a result, the whole sample contains 1,472 firms while the matched sample uses 1,143 firms. The dependent (treatment) variable is public, which is a binary variable with a value of 1 for public firms and 0 otherwise. A frim is public if its shares are traded publicly; otherwise it is private. The outcome variables are sales growth, labor productivity growth, and employment (permanent labor force) growth. Sales data was available in local currency of the respective countries and it was converted to sales in USD using official exchange rate data from the World Bank. Growth rates for the growth variables is estimated using the growth rate between 2009 and 2013. Treatment effects are estimated by comparing the potential outcome means of the outcome variables across matched public and private firms. Firms are matched based on size (measured by log of sales), industry and country.

Table 1 compares the average sales, and average growth rates of sales, productivity and employment across the matched and whole sample. Average growth rates for sales, labor productivity and employment are below zero. For the whole sample, on average sales growth declined by 4.4%, productivity declined by 1.8% and employment growth declined by 3.6% between 2009 and 2013. Correa, et al (2010) in a World Bank Enterprise note series stated that the negative growth rates in the region was due to the global financial crisis. Performance data from the WBES shows that firms in the region are showing negative growth rates (World Bank 2017). Average growth rates for sales and labor productivity are higher in the matched sample compared to the whole sample. This is due to the lower growth rates in the 5 countries dropped from the study. For the matched sample sales and labor productivity growth rate is higher for private firms compared to public firms. Average labor productivity growth is slightly higher among public firms than private firms.

Table 1: Descriptive statistics

Firms	Sample used in matching				Full sample			
	Sales ($M)	Sales growth (%)	Labor productivity (%)	Employment growth (%)	Sales ($M)	Sales growth (%)	Labor productivity (%)	Employment growth (%)
Private								
mean	5.18	-1.9	-0.2	-2.8	9.18	-3.3	-1.9	-2.5
Sd.	24.40	27.4	24.6	19.6	98.40	26.6	24.2	18.7
N	996	826	825	1,089	1,301	1,093	1,088	1,450
Public								
mean	9.86	-11.9	1.1	-14.0	11.20	-12.7	-1.0	-12.8
Sd.	23.70	27.2	25.6	20.1	26.30	26.2	25.2	20.1
N	147	116	116	150	171	137	137	176
Total								
mean	5.78	-3.1	-0.1	-4.1	9.41	-4.4	-1.8	-3.6
Sd.	24.40	27.6	24.7	20.0	92.90	26.7	24.3	19.1
N	1,143	942	941	1,239	1,472	1,230	1,225	1,626

3 Methodology

I used propensity score matching to estimate the casual effect of firm ownership structure on firm performance. Propensity score matching is among the set of treatment effect estimators used to measure treatment effect when randomization is not applied during treatment assignment (Khandker, Koolwal and Samad 2010). If observations are assigned to treatment and control groups without randomization there is high likelihood that outcome variables and the treatment assignment are correlated. This results in endogeneity (self–selection) making OLS estimation inconsistent. Treatment effect models ensure consistent estimation with non-randomized treatment by making outcome variables and treatment independent after conditioning on certain variables. Estimation of casual effect by treatment models relies on getting a proper counterfactual. A counterfactual is a program participant's outcome in the absence of the program. Matching methods form a counterfactual by estimating the probability of getting treatment conditional on variables assumed to affect participation. Average treatment effects (casual effect of treatment) are estimated by comparing the difference in the average values of the outcome variables between treated and non-treated firms with similar probability of getting treatment.

Panel structure of the data was used to match firms based on their 2009 covariates; firm size (measured by log of sales), industry and country. The outcome variables (sales growth, employment growth, and labor productivity growth) were measured using their levels in 2013.

Firms are tracked for two years, 2009 and 2013, and observed if there was a difference between public and private firms, only firms which maintained their ownership structure during the two periods are included in the estimation. Average treatment effect (ATE) on sales growth, labor productivity growth, and employment growth was estimated by measuring the average difference in potential outcome means between similar public and private firms. To check for robustness, the ATE was estimated using other treatment effect methods to see the sensitivity of the results to the different assumptions made by the different methods[2]. In addition, ATE was estimated adding firm age as an additional matching variable.

4   Results

Consistent estimation of matching methods requires three key assumptions. These are overlap (probability of being public firm is different from zero for any firm), conditional independence[3] and independently and identically distributed sample (i.i.d) (Stata Corp LP 2015). Since the data is randomly collected the data generating process ensures i.i.d, but this assumes that firms that are removed from the panel because of lack of data or other reasons for both years of the panel are absent at random. Overlap property is essential to successfully predict propensity scores from the probit model and estimate the ATE. Estimation of the probability model, probit, shows the overlap property is valid. This implies that there is no perfect predictor of probability of being public. Table 2 in the appendix shows probit estimation results using robust standard errors.

ATE estimates for sales growth rate show that, on average, public firms' sales growth is 6 percentage points less compared to similar private firms. The effect is significant at 1%. Other treatment effect models which make different assumptions on the treatment model also give similar and significant results as shown[4] in Table 2. There is no significant difference between public and private firms on labor productivity. Propensity score matching (PSM) results show that on average

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[2] Stata treatment effects manual provides brief description on the different assumptions by the different treatment effect models (Stata Corp LP 2015 p210-214).

[3] Conditional independence is discussed in the end of the section after results discussion since CI can be tested only after estimation. Note that all standard errors shown in the tables are robust standard errors.

[4] Online appendix for the study can be found https://goo.gl/NBDeHK , it contains additional charts and tables

public firms are 2 percentage points more productive than similar private firms, but the effect is not significant. Similar to sales growth, public firms are found to have significant (1%) and slower growth in employment. Baseline estimates show that private firms' employment growth rate is on average 6 percentage points higher than similar public firms. The estimate is statistically significant and consistent across other treatment effect models. Figure 2 in the online appendix shows scatter plots of the predicted potential outcome effects (POE).

The statistically significant results of higher sales and employment growth rates of private firms compared to similar public firms is consistent with the theoretical predictions[5] based on principal-agent problem. Having concentrated ownership helps private firms to have more efficient management that focuses on ensuring higher performance while agency problem in public firms results in sub-optimal performance. The similar labor productivity growth rates among public and private firms is not consistent with my initial expectations and requires further studies to explore the reason behind the same levels of productivity growth rates between public and private firms.

Table 2: Average Treatment Effects of performance variables

| Treatment - public firm, matching - firm size (log of sales), industry and country			
Treatment effect model	Sales growth	Labor productivity growth	Employment Growth
Propensity score matching	-5.89***	2.11	-6.27***
	(1.742)	(3.166)	(3.399)
Nearest neighborhood matching	-10.47***	-1.36	-8.68***
	(3.754)	(3.715)	(3.049)
Regression Adjustment	-4.22	3.36	-6.82***
	(2.669)	(2.713)	(2.513)
Inverse probability weights (IPW)	-6.02***	2.03	-8.37***
	(2.089)	(1.970)	(1.815)
Regression Adjustment with IPW	-5.04*	2.10	-8.15***
	(2.704)	(1.970)	(1.842)
Observations	942	941	1070
Public firms	116	116	132
Private firms	826	825	938

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

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[5] Empirical results also support the claim that principal agent problem leads to low performance by public firms compared to private firms. The studies use different performance measures such as investment, profits (Curtiss, Raginger and Medonos, 2012; Kapopoulus and Lazaretou, 2007; Asker, Farre-Mensa and Ljungqvist 2011).

Conditional independence is a key assumption required for consistency of the results. It implies that conditioning on the matching variable (firm size, firm age) firm ownership structure is independent of the outcome variables (sales, labor productivity and employment growth) which ensures selection on observables. Post estimation test is conducted to check for conditional independence (CI). The CI test result in the online appendix in Table 1 show that the conditional independence assumption is valid. The validity of the CI assumption can be seen from the balance plot in Figure 1.

Figure 1: Treatment effects balance plot based on propensity score matching results
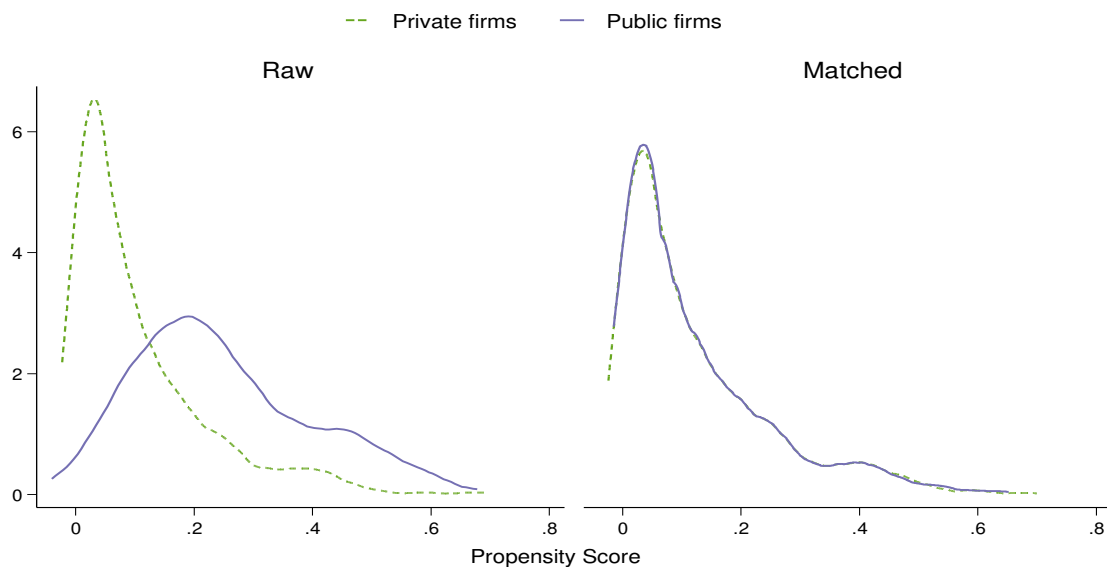
5 Conclusion

The study used WBES panel data for 2009 and 2013 for Eastern Europe and Central Asian countries to estimate the casual effect of firm ownership on performance. Propensity score matching was used to estimate the average treatment effects for sales growth, labor productivity growth, employment growth and capacity utilization. Estimation results show that public firms on average have lower sales and employment growth rates compared to similar private firms, while there was no significance difference between public and private firms on labor productivity growth. The estimation results using propensity score matching were consistent across the results computed using other treatment effect models. The propensity score matching estimates were re-

estimated to see whether adding firm-age will change the results we get using only firm size, industry and country. Controlling for age it is useful to see if the results seen in the base outcome are a result of private firms being young in most soviet era countries. As Table 1 in the appendix shows the initial estimates do not change significantly after matching on firm size, industry, country and age.

Countries should focus on improving the corporate governance of public firms to improve their performance. Corporate governance reduces agency problems by designing incentives for management to take actions that benefit the owners while punishing them when they fail to serve those interests. (DeMarzo and Berk 2017) Corporate governance not only ensures that management is serving the interests of the owners but also other stakeholders that have interest in the firm mainly financers. By ensuring transparency, accountability and proper incentives firm owners can reduce agency problems and improve the value of a firm.

6 Appendix

Table 1: Average Treatment Effects including firm age as a matching variable

ATE estimates matching based on firm size, age, industry and country

	Sales growth	Labor productivity growth	Employment growth
ATE (Average	-5.76***	5.04	-9.67**
treatment effect)	(1.484)	(4.697)	(4.254)
Observations (total)	928	927	1054
Public firms	112	112	128
Private firms	816	815	926

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Table 2: Probit regression results for estimation of propensity scores

Dependent variable: public		
Matching variables (firm size - log(sales), Industry, Country		
Log (Annual sales in USD)	0.159***	(0.0296)
Industry		
Manufacturing	0.484**	(0.206)
Construction	0.495**	(0.227)
Wholesale-retail	-0.171	(0.213)
Hotels	0.259	(0.292)
Transport and communication	0.693***	(0.263)
Country		
Azerbaijan	0.524**	(0.253)
Bosnia and Herzegovina	0.565**	(0.227)
Bulgaria	-1.075**	(0.450)
Croatia	-0.106	(0.322)
Czech	-0.220	(0.495)
Estonia	0.449*	(0.240)
Kyrgyzstan	1.081***	(0.293)
Latvia	-1.253***	(0.466)
Lithuania	-0.892*	(0.488)
Macedonia	-0.222	(0.222)
Moldova	0.537***	(0.202)
Mongolia	-0.133	(0.233)
Montenegro	-0.626	(0.531)
Poland	0.0523	(0.490)
Romania	-0.266	(0.271)
Constant	-3.684***	(0.472)
N	1143	
Pseudo R-squared	0.174	

Standard errors in parentheses
* p<0.1 ** p,0.05 *** p<0.01

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