International Journal of Economics and Financial Issues
Vol. 4, No. 3, 2014, pp.628-650
ISSN: 2146-4138
www.econjournals.com

Government Ownership and Firm Performance: The Case of Vietnam

Ngo My Tran
Faculty of Applied Economics, University of Antwerp, Belgium.
Email address: mytran.ngo@student.uantwerpen.be

Walter Nonneman
Faculty of Applied Economics, University of Antwerp, Belgium.
Email: walter.nonneman@uantwerpen.be

Ann Jorissen
Faculty of Applied Economics, University of Antwerp, Belgium.
Email: ann.jorissen@uantwerpen.be

ABSTRACT: This study extends some predictions from a game theoretical model which evaluates the net effect of government ownership on firm performance and empirically tests these predictions using a panel dataset of Vietnamese firms in the period 2004-2012. The empirical results estimated from static and dynamic models confirm our propositions of a negative effect of state ownership on firm profitability and labor productivity. Furthermore, this study documents a moderating role of firm size in the relationship between state shareholding and the performance of firms with higher state ownership in larger firms enhancing profitability and labor productivity.

Keywords: government ownership; firm performance; dynamic model and interaction effect
JEL Classifications: H11; P27

1. Introduction

There has been much debate on the effect of government ownership on firm performance. On the one hand, state ownership is argued to bring a 'helping hand' which assumes that the higher proportion of state ownership in a firm, the more capital subsidy is provided by the government. On the other hand, state ownership is supposed to bring a 'grabbing hand' which assumes that the government will extract more of firm's profit as a result of its ownership to the benefit of politicians and bureaucrats (Tian and Estrin, 2008).

Theoretically, Huang and Xiao (2012) argue for a net negative effect of government ownership and propose that less state ownership will result in an improvement in firm profitability and productivity. Shleifer and Vishny (1994) develop a game-theoretical model assuming state ownership bringing subsidies and bribes between the government and firms. They argue that firm performance may be damaged with heavy regulation by politicians, using the power of control to pursue political objectives.

Empirically, the evidence for this line of research is mixed. Some studies report a positive effect (Jiang *et al.*, 2008; Liao and Young, 2012; Xu and Wang, 1999) or an inverse U-shape effect of government ownership on firm performance (Sun *et al.*, 2002), while some studies present a negative effect (Chen *et al.*, 2005, Lin *et al.*, 2009, Qi *et al.*, 2000, Sun and Tong, 2003, Wei, 2007) or a U-shape of state ownership on firm performance (Gunasekarage *et al.*, 2007, Hess *et al.*, 2010, Ng *et al.*, 2009, Tian and Estrin, 2008, Wei and Varela, 2003; Wei *et al.*, 2005).

In the context of Vietnam, the country has installed a privatization program from 1992. One of methods of privatization comprises of transforming SOEs into joint-stocks companies and then selling parts of their shares to employees or private investors. Small or medium-sized SOEs, profitable or at least potentially profitable SOEs, but not "strategic enterprises" are the targets in the first stage of the Vietnamese privatization process and then the scope of privatization extends to all non-strategic small

and medium-sized SOEs[1] (Truong *et al.*, 2006). The Vietnamese government still holds a large fraction of ownership in formerly large state-owned economic enterprises/state corporation as well as firms in strategic sectors, namely mining, quarrying, electricity, oil and gas[2]. This practice raises for the question of the effect of state ownership on firm performance in the context of Vietnam.

This paper, inspired by Huang and Xiao's (2012) game theoretical model, extends their predictions. The game theoretical model of Huang and Xiao (2012) evaluates the net effect of government ownership on firm performance after considering the costs and benefits of government ownership for transition economies. We empirically test the propositions derived from the theoretical model by using panel dataset of the Vietnamese firms who have partial government ownership in the period of 2004-2012. We specifically examine whether the degree of government ownership matters for firm performance.

Hence, our study contributes to the existent literature in three ways. First, we expand the theoretical predictions of Huang and Xiao (2012) and provide empirical evidence for these propositions. Second, we shed more light on the effect of government ownership on firm performance in transition economies. Third, to our knowledge, this study is one of the first attempts to research the effect of state ownership on firm performance in the context of Vietnam. Hence, these findings are directly valuable to evaluate the effects of the privatization policies of the Vietnamese government.

The remainder of this study proceeds as follows. The next section will present the theoretical model and its propositions. Data and methodology of this study will be presented in the third section. Then, in the fourth section the empirical results are explained and discussed. Finally, some conclusions are formulated and possible paths for future research are indicated.

2. Theoretical Model and Hypothesis Development

The main reasoning in theoretical model of Huang and Xiao (2012) contrasts the 'helping hand' with the 'grabbing hand' of government ownership in the firms and its net effects on performance. Huang and Xiao set up a two-period Stackelberg game between the government and the firm.

In the first period, the government sets its optimal ownership in the firm maximizing the utility of the government, which is a weighted average with a relative weight of c, of two objectives, namely revenue and employment. The intervention cost of government is supposed to be $g(a)K$, where a is the state ownership in the firm; K is capital and $g(a)$, the capital subsidy rate, is an increasing function of state ownership, a. For purely private firms a=0, while for purely state-owned companies a=1. In case of mixed ownership, state ownership lies in the range of 0-1. The 'helping hand' implies that more government ownership brings, higher capital subsidy for the firm. On the other hand, there is the 'grabbing hand' that comes with government ownership. The firm's profit will be extracted by the government, proportional to its shareholding a on top of taxes on profit t. As the government cares for financial revenue R and employment L, the maximization problem of the government is:

$$\max_{a} U_g(R, L) = (t + a)[AK^{\alpha}L^{\beta} - wL - (r - g(a))K] + cL - g(a)K$$

with A denoting total factor productivity; w and r are the wage and the financial market rate; t represents the profit tax rate. For simplicity, they assume *that* $w=r=1$, $t=0$, $0<\alpha+\beta<1$, $c>0$ and that

[1] With Decision 91/TTg, dated 13-7-1994 of the Prime Minister on the decision on the pilot establishment of state corporation and the Decree 101/2009/ND-CP of the Government, dated 5-11-2009 on the pilot establishment, organization, operation and management of state economic groups, Vietnam has had 8 state economic groups and 96 state corporations which account for most of state ownership over the country and for 75% of nationally fixed assets. Some of the missions for these economics and corporations are the role in ensuring major balances of the national economy, applying high-technology; creating incentives for the development of the sector, other sectors and the whole economy and promoting links in the value-added chain, the development of other economic sectors.

[2] The decision 14/2011/TTg, dated 4-3-2011 of the Prime Minister on the issuance of criteria and classification SOEs presents the list of sectors which the government have to own 100% shareholding and the list of sectors which the government have to own larger than 50 percent after privatization such as rail/air/water transport, electricity/gas/oil, mining/quarrying, growing and processing rubber/coffee, manufacturing tobacco, paper and paper product…

the government shares the capital cost by exactly its fraction of ownership or $g(a)= ar$. With these normalizing assumptions, the government's maximization problem becomes:

$$\max_{a} U_g(R,L) = a[AK^{\alpha}L^{\beta} - L - (1-a)K] + cL - aK$$

In the second period, management maximizes utility assumed to be a weighted average of two objectives, namely profit and employment, given the ownership structure of the firm. Huang and Xiao argue that besides the profit objective, management of enterprises with state ownership also take into account the role of providing social welfare, maintaining employment to sustain social stability. Hence, the maximization problem of firm management is:

$$\max_{K,L} U_f(\pi,L) = (1-t-a)[AK^{\alpha}L^{\beta} - wL - (r-a)K] + b(a)L$$

Where the first part of the objective function is the net profit, π, and $b(a)$ is the weight on the employment objective of management. For simplicity, Huang and Xiao (2012) assume a specific functional form of $b(a)$ namely na with n being the employment preference multiplier and $n>0$. They argued that the more the state shareholding in the firm, the more management acts as politicians rather than as businessmen and thus put more weight on employment. Using the same normalizations as for the government objective function, the maximization problem of management reduces to:

$$\max_{K,L} U_f(\pi,L) = (1-a)[AK^{\alpha}L^{\beta} - L - (1-a)K] + naL$$

After solving this two-step optimization problem, they derive three theoretical propositions on the relationship between the labor productivity of the firms, as measured by sales per employee (P_1), profits per employee (P_2) and return on sales (ROS) and the extent of government ownership a[3]. More government ownership comes with lower performance as:

$$\frac{\partial P_1}{\partial a} = \frac{1}{\beta}\frac{-n}{(1-a)^2} < 0$$

$$\frac{\partial P_2}{\partial a} = \left(\frac{1-\alpha}{\beta}\right)\frac{-n}{(1-a)^2} < 0$$

$$\frac{\partial ROS}{\partial a} = \frac{-n\beta}{[(1-(n+1)a)]^2} < 0$$

Following the reasoning of Huang and Xiao (2012), we further develop the following theoretical predictions[4]. Besides, we also acquire the second derivatives of performance indicators with respect to state ownership to examine the possibility of non-linear effect of state ownership and firm performance.

Proposition 1: *The efficient use of labor of the firm, as measured by value added per employee, is negatively affected by government ownership.*

$$\frac{\partial VAEMP}{\partial a} = -\frac{\alpha}{\beta}\left[\frac{(n+1)(1+a)+2}{(1-a)^3}\right] < 0$$

$$\frac{\partial^2 VAEMP}{\partial a^2} = -\frac{2\alpha}{\beta}\left[\frac{(n+1)(1-a)+3}{(1-a)^4}\right] < 0$$

Proposition 2: *The efficient use of capital of the firm, as measured by turnaround indicator or sales over assets, is negatively affected by government ownership.*

$$\frac{\partial TURN}{\partial a} = -\frac{1}{\alpha} < 0$$

$$\frac{\partial^2 TURN}{\partial a^2} = 0$$

Proposition 3: *The profitability of the firm, as measured by return over assets, is negatively affected by government ownership.*

[3] Their fourth proposition states on the relationship between firm performance and employment. We do not delve into this relationship in our paper.

[4] The proofs of these propositions are presented in Appendix A

$$\frac{\partial ROTA}{\partial a} = -\left(\frac{1-\alpha}{\alpha}\right) - \frac{\beta}{\alpha}\left[\frac{(1-a^2)(n-1)+2a(1-a)}{(1-(n+1)a)^2}\right] < 0$$

$$\frac{\partial^2 ROTA}{\partial a^2} = -\frac{2\beta}{\alpha}\left[\frac{[(1-(n+1)a)^2] + (n+1)[(1-a^2)(n-1)+2a(1-a)]}{(1-(n+1)a)^3}\right] < 0$$

Proposition 4: *The profitability of the firm, as measured by return on equity, is negatively affected by government ownership*

$$\frac{\partial ROE}{\partial a} = -\left(\frac{1-\alpha}{\alpha}\right)\left(\frac{1-k}{(1-ka)^2}\right) - \frac{\beta}{\alpha}(1-a)\left[\frac{2na(1-k) + (1-a)(n+k-1)}{[(1-ka)(1-(n+1)a)]^2}\right] < 0$$

Where *k is* a constant and *0<k<1*

$$\frac{\partial^2 ROE}{\partial a^2} = -\left(\frac{1-\alpha}{\alpha}\right)\left[\frac{2k(1-k)}{(1-ka)^2}\right] - \frac{\beta(1-a)}{\alpha}\left[\frac{[(nk-1)^2 + n - (1-n^2k)k][(1-ka)(1-(n+1)a] + 2[(n+k+1) - 2(n+1)ka][2na(1-k) + (1-a)(n+k-1)]}{[(1-ka)(1-(n+1)a)]^2}\right] < 0$$

These propositions relating firm performance to the degree of government ownership are tested empirically in the next sections of this paper.

3. Data and Methodology

The primary data used in this study are the annual business surveys of the Vietnamese General Statistics Office for the period 2004-2012 which collect financial and other data on all business firms in Vietnam. For this analysis, we extract those firms having some degree state ownership (*0<a<1*) to construct a panel, excluding purely state-owned enterprises (*a=1*) and also purely private firms (*a*=0). The extracted firms consist of joint stock companies with state ownership being larger or smaller than 50 percent of the firm's shareholding and private limited companies with state ownership smaller than 50 percent. The unbalanced panel consists of 38,143 firm-year observations. For estimation purposes firms showing outliers were removed. Firms with values deviating more than three standard deviations from the mean were removed. Table 1 shows the variables constructed based on these data and their definitions.

We specify the econometric model in this study as follows. First, as a basic benchmark, we will estimate a pooled OLS model:

$$Perf_{it} = \beta X_{it} + u_{it}$$

Where $Perf_{it}$ are the performance indicators for firm *i* at time *t* (ROA, ROE, VAEMP and TURN). X_{it} is a vector of explanatory variables consisting of AGE, LNEMP, LNASSET, state ownership, control dummy for state control, industry dummies, region dummies and year dummies. β is a *k*x1 vector of parameters and u_{it} is the error term specific to firm *i* in period *t*.

Furthermore, we want to test the assumption of the theoretical model that the capital subsidy rate is an increasing or non-linear function of state ownership. There is evidence for such non-linear effects of state ownership on firm performance in the empirical literature (Gunasekarage*, et al.*, 2007, Hess*, et al.*, 2010, Ng*, et al.*, 2009, Sun*, et al.*, 2002, Wei and Varela, 2003, Wei*, et al.*, 2005, Yu, 2013). Also, the non linearity is supported by the theoretical model as the second derivatives of performance indicators with respect to the degree of state ownership are negative. In order to check for these non-linearities, we therefore include an interaction term between state ownership and the logarithm of assets and add a quadratic term of state ownership and its interaction with logarithm of assets as explanatory variables in the empirical specifications.

Second, a random effects panel model is estimated:

$$Perf_{it} = \beta X_{it} + \upsilon_i + \varepsilon_{it}$$

Where υ_i is the firm-specific random effect and ε_{it} is the error term.

Table 1. Variable description

Variable name	Definition
Performance indicators	
ROA	Return on total assets or pre-tax profit/total assets[5]
ROE	Return on equity or pre-tax profit/equity
TURN	Turnaround or sales/total assets
VAEMP	Value added per employee (million VND) (Value added is defined sales minus purchases of goods and services)
Characteristics	
AGE	Age of firms in the year 2012
LNEMP	Natural logarithm of the number of employees
LNASSET	Natural logarithm of total assets
SOLV	Solvency ratio or debt/total assets
State ownership	Percentage of government shareholdings in the firm
Control dummy	Joint stock companies with state holding being smaller than 50 percent of total shareholding but controlling the enterprises[6] are coded as 1, 0 otherwise.
Industry dummies	Fishing, agriculture, manufacturing, electricity/gas, construction, wholesale/retailer, hotel/restaurant, science/technology, transport, financial, mining/quarrying, real estate (= reference group)
Region dummies	Red river delta, Northern midlands and mountain areas, North Central coast and South Central coast, Central highlands, South East and Mekong river delta River (=reference group)
Year dummies	Eight year dummies from year 2004 (=reference group) to year 2012

Third, in order to account for the possibility of the dynamic characteristics of performance depending upon past dependence, a dynamic panel data model is estimated namely:

$$Perf_{it} = \gamma Perf_{i,t-1} + \beta X'_{it} + \alpha_i + \gamma_t + \varepsilon_{it}$$

Where $Perf_{i,t-1}$ are the lagged performance indicators, X'_{it} is a vector of time-invariant variables (industry, region, age) and time-varying variable (LNASSET, LNEMP, state ownership, quadratic term of state ownership, an interaction term between state ownership and logarithm of firm assets, control dummy and year dummies); α_i is the firm fixed effect; γ_t is the year fixed effect and ε_{it} is the error term. This model will be estimated by system generalized method of moments - system GMM (Roodman, 2009). Also, this estimation method could enable us to account for a potential endogeneity of state ownership (Ammann *et al.*, 2011). Using different specifications provide robustness checks for our results.

4. Data Analysis

4.1 Descriptive analysis

The key descriptive statistics for the data used in this study are displayed in Table 2 below. The mean return on total assets for the sample is 6 percent, while the return on equity on average is 14 percent. The average solvency rate is 58 percent. The average value for the turnover ratio is 1.68 which means that one unit of firm assets can generate an average of 1.68 unit of sales. The value added per employee is on average of 106.75 million VND[7]. The government ownership in the sample

[5] Due to the lack of data, we use pre-tax profits to calculate ROA. When we use profit from business as a proxy of EBIT to re-calculate ROA, we found a high correlation between two measures. Besides, when we regress ROA calculated by pre-tax profit on the proxy of ROA calculated by profit from business, the estimated coefficient nearly equals to unity.

[6] The government controls these firms by owning voting-preferred shares which has more voting rights than common shares. The number of votes of a voting preferred share is stipulated in company's charter.

[7] 1 million VND is approximately 47,4 US$ or 34 € (conversion rate spring 2014)

has an average percentage of 41 percent. The average value for firm age at the year 2012 is 14.56 years, while the youngest firm and the oldest firm have an age of 1 and 55, respectively.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
State ownership	19846	0.41	0.20	0.01	0.99
ROA	19691	0.06	0.09	-0.72	0.88
ROE	19538	0.14	0.18	-0.79	1.00
VAEMP	13831	106.75	188.16	0	1700
TURN	19677	1.68	2.05	0.00	20.19
AGE	21879	14.56	12.85	1	55
SOLV	19547	0.58	0.26	0.00	1.00
LNASSET	19833	10.75	1.63	5.57	15.95
LNEMP	19845	4.89	1.22	2.30	8.60

Table 3 summarizes the extent of state ownership as well as the percentage of joint stock companies in which the government has the control right although its ownership in these firms is less than 50 percent of total shareholding by year, region and industry for whole sample and sub-samples splitted by firm size in terms of total assets[8] (SMEs and large firms). The sample consists of 830 firms having state ownership in the year 2004. The average state shareholding in these firms in 2004 is 34 percent. The number of firms with state ownership increases over time and reaching 2,814 firms in the year 2008. However, this number of firms drops to 2,367 firms in 2012. Although, there is some variation in the number of firms with state ownership, the average shareholding of the government fluctuates in the range of 39-43 percent during the period 2005-2012. After a decade of implementing the privatization programs, the average state ownership in the Vietnamese firms is still relatively high over the research period.

Despite privatization, in 2006 the state still effectively controls cash flows in 21 percent of joint stock companies where state shareholding is less than 50 percent of total shareholding. By the year 2012, this percentage has decreased to 15 percent.

State shareholding is the highest in Northern midlands and mountain areas and North Central coast and South Central coast. State control over joint stock companies with less than 50% government shareholding is highest in these two regions. The government has the least ownership and the lowest control in South East and Red river delta region which are areas of the most expansive economic development in Vietnam.

Government ownership and control is the highest in the electricity/gas industry. Manufacturing, construction and hotel/restaurant have the lowest percentage of state ownership. The highest percentages of joint stock companies controlled by the government although it possesses less than 50 percent of total shares are in electricity/gas utilities and the agriculture sector; control is lowest in manufacturing and in the real estate business.

Looking at firm size, table 3 shows that the government has a dominant stake in large firms. Especially, the fraction of large firms where state ownership is present amounts approximately to 90 percent in the period 2010-2012. Average state ownerships in large firms is also higher in SMEs, except for the year 2011 and 2012. With respect to region and industry, large firms generally have more state ownership than SMEs. Regarding the control right of the government in joint stock companies where its ownership is less than 50 percent there appears not much difference in terms of firm size.

[8] According to Decree No. 90/2001/ND-CP of the Vietnamese government, firms with the registered capital of less than VND 10 billion (approximately €340,000) or the average number of annual employees of less than 300 are considered as small- and medium-enterprises (SMEs).

Table 3. State ownership and the percentage of government control by year, region and industry

		Whole sample			SMEs			Large Firms	
	No of firms	State ownership (%)	Percentage of control	No of firms	State ownership (%)	Percentage of control	No of firms	State ownership (%)	Percentage of control
By year									
2004	830	0.34	-	266	0.32	-	564	0.34	-
2005	1603	0.40	-	441	0.37	-	1162	0.41	-
2006	2148	0.39	0.21	512	0.35	0.18	1636	0.41	0.22
2007	2615	0.39	0.15	550	0.34	0.15	2065	0.40	0.16
2008	2814	0.39	0.17	496	0.35	0.19	2318	0.40	0.16
2009	2206	0.41	0.15	452	0.38	0.17	1754	0.42	0.14
2010	2687	0.42	0.16	308	0.40	0.21	2379	0.42	0.16
2011	2576	0.43	0.15	227	0.43	0.17	2349	0.43	0.15
2012	2367	0.43	0.15	182	0.45	0.13	2185	0.43	0.15
By region									
Red river delta		0.40	0.17		0.34	0.17		0.41	0.17
Northern midlands and mountain areas		0.43	0.19		0.40	0.23		0.45	0.17
North Central coast and South Central coast		0.43	0.19		0.40	0.17		0.44	0.19
Central highlands		0.41	0.17		0.35	0.12		0.42	0.18
South East		0.39	0.13		0.34	0.15		0.39	0.13
Mekong river delta		0.42	0.16		0.40	0.14		0.42	0.16
By industry									
Fishing		0.44	0.16		0.41	0.17		0.48	0.17
Agriculture		0.49	0.25		0.43	0.22		0.53	0.28
Manufacturing		0.39	0.14		0.34	0.15		0.39	0.14
Electricity/Gas		0.58	0.25		0.58	0.33		0.57	0.23
Construction		0.39	0.17		0.34	0.19		0.39	0.17
Wholesale/Retailer		0.41	0.17		0.35	0.16		0.42	0.17
Hotel/Restaurant		0.39	0.17		0.33	0.21		0.42	0.15
Science/Technology		0.40	0.17		0.35	0.10		0.42	0.20
Transport		0.45	0.20		0.49	0.26		0.44	0.19
Financial		0.44	0.19		0.35	0.00		0.44	0.20
Mining/Quarrying		0.44	0.22		0.32	0.30		0.47	0.20
Real estate		0.40	0.14		0.35	0.18		0.41	0.13

Table 4 displays a correlation matrix for the explanatory variables used in the economic models. It appears that there is no substantial correlation among examined variables, except for a high correlation between LNASSET and LNEMP. In order to avoid co-linearity we will exclude LNEMP and opt for LNASSET as an indicator of size. Another argument to exclude LNEMP rather than LNASSET is that state owned firms often have excess labor problem (Shleifer and Vishny, 1994) so that total assets may reflect more truthfully the size of these firms.

Table 4. Correlation matrix

	L.ROA	SOLV	State ownership	Control dummy	AGE	LNASSET	LNEMP
L.ROA	-						
SOLV	-0.28*	-					
State ownership	-0.01	-0.04*	-				
Control dummy	-0.01	0.01	0.24*	-			
AGE	0.02	0.15*	-0.02*	0.00	-		
LNASSET	0.04*	0.28*	0.11*	-0.02*	0.15*	-	
LNEMP	0.11*	0.25*	0.07*	0.00	0.31*	0.61*	-

4.2 Empirical results

Table 5a below presents the regression results for the pooled effect models. Table 5b presents the estimates when we include the interaction between state ownership and logarithm of assets in these models. Table 5c displays the estimates of pooled models when we further include the quadratic term of state ownership as well as its interaction term with firm size (LNASSET) as explanatory variables.

The positive coefficients of state ownership in the simple pooled model (Table 5a) with respect to performance indicators do not allow us to confirm our propositions. Nevertheless, when we take into account the moderating role of firm size, the results in Table 5b support our hypotheses of negative effects of state ownership on firm profitability (ROA, ROE) and on the efficient use of labor (VAEMP). These results are consistent with the findings of Chen and Al-Najjar (2012), Lin, et al. (2009), Qi, et al. (2000), Sun and Tong (2003) and Wei (2007). The proposition of a negative association between state ownership and capital productivity is not supported by the empirical evidence. Besides, a significantly positive coefficient of the interaction term indicates a moderating role of firm size. This means higher state shareholdings in larger firms are beneficial on firm performance in terms of profitability (ROA, ROE) and labor productivity (VAEMP).

Table 5a. The estimates of pooled models

	ROA	ROE	VAEMP	TURN
State ownership	0.04***	0.07***	42.73**	1.03***
	(0.01)	(0.02)	(20.32)	(0.17)
Control	-0.00	-0.01**	-3.58	-0.11*
	(0.00)	(0.01)	(6.85)	(0.06)
AGE	0.00***	0.00***	-0.94***	0.01***
	(0.00)	(0.00)	(0.21)	(0.00)
SOLV	-0.11***	0.01	-81.44***	0.36***
	(0.01)	(0.01)	(11.54)	(0.10)
LNASSET	0.00**	0.01***	51.46***	-0.20***
	(0.00)	(0.00)	(1.87)	(0.02)
Constant	0.09***	-0.00	-393.57***	2.62***
	(0.01)	(0.03)	(29.59)	(0.25)
R^2	0.16	0.08	0.30	0.24
N	5,859	5,820	4,850	5,848

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

From the model of Huang and Xiao (2012), we theoretically show that in case of substantial state ownership (and thus higher subsidy), more weight will be imposed to employment by the government. In other words, the importance of employment increases. If employment pressure is low, firms can gain the benefit from the government subsidies in terms of profitability (ROA) and productivity (VAEMP). However, if employment pressure is large, the firm performance will suffer. We argue that larger firms with their stronger resources can withstand this employment pressure and still gain the benefits of government subsidies. For more detail of this proof, please see appendix B.

Figure 1 below graphically shows the differences in the negative effect of state ownership on firm performance with respect to different firm sizes. The representative medium-size firm in the graph has a firm size equal to the mean value of LNASSET and the representative large and small firms deviate two standard deviations from the mean of LNASSET. The estimates of pooled models

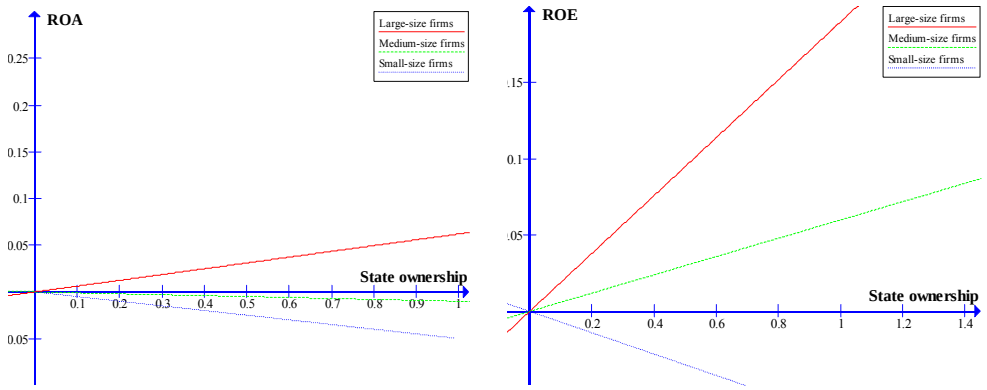
when a quadratic term of state ownership and an interaction term between the quadratic term of state ownership and firm size (LNASSET) are included are shown in Table 5c. The results indicate a complex non-linear effect of state ownership. In Figure 2, a graphical representation of firm performance's indicators with respect to state ownership, *ceteris paribus*, for large-, medium- and small-size firms, are presented. Figure 2 graphs show that the quadratic term effect of state ownership on firm performance is contingent upon firm size (in terms of LNASSET). The estimation results also show that for joint stocks companies with state ownership being less than 50% but government maintaining a control right profitability (ROE) is lower and use of capital (TURN) is less efficient[9].

Table 5b. The estimates of pooled models when adding interaction term between state ownership and firm size

	ROA	ROE	VAEMP	TURN
State ownership	-0.12*	-0.37***	-449.70***	1.20
	(0.07)	(0.14)	(152.25)	(1.26)
State*LNASSET	0.01**	0.04***	43.36***	-0.02
	(0.01)	(0.01)	(13.29)	(0.11)
Control	-0.00	-0.01**	-4.54	-0.11*
	(0.00)	(0.01)	(6.85)	(0.06)
AGE	0.00***	0.00***	-0.96***	0.01***
	(0.00)	(0.00)	(0.21)	(0.00)
SOLV	-0.11***	0.01	-81.02***	0.36***
	(0.01)	(0.01)	(11.53)	(0.10)
LNASSET	-0.00	0.00	39.37***	-0.20***
	(0.00)	(0.00)	(4.15)	(0.04)
			(11.52)	
Constant	0.14***	0.13***	-253.90***	2.57***
	(0.02)	(0.05)	(52.02)	(0.44)
R^2	0.16	0.08	0.30	0.24
N	5,859	5,820	4,850	5,848

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

Figure 1. Graph of firm performance indicators with respect to state ownership for large-, medium- and small-size firms (Pooled effects models when adding interaction term between state ownership and firm size)



[9] The results show the explanatory power of industry dummies, region dummies and year dummies .Due to the parsimonious purpose, we do not show the coefficients of these dummies. They are available on request

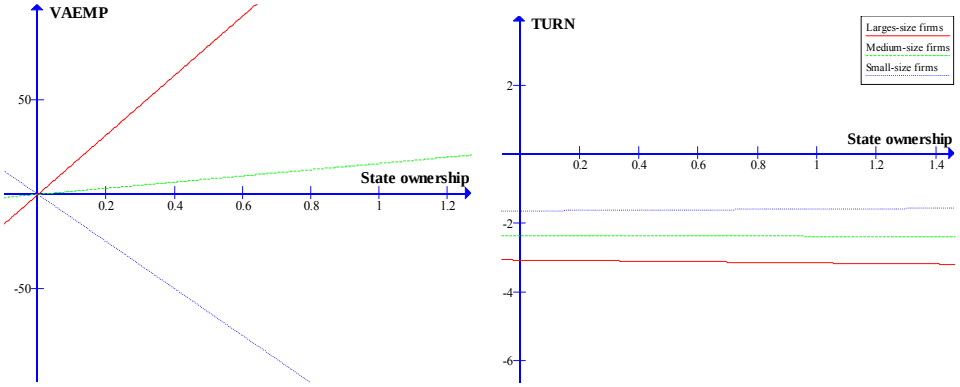


Table 5c. The estimates of pooled models with quadratic term of state ownership and the interaction term between quadratic term of state ownership and logarithm of assets

	ROA	ROE	VAEMP	TURN
State ownership	0.73***	0.37	488.91	-1.20
	(0.26)	(0.53)	(575.40)	(4.92)
State squared	-1.49***	-1.22	-1,722.63*	4.55
	(0.46)	(0.93)	(1,024.42)	(8.66)
State*LNASSET	-0.04*	0.01	-35.14	0.25
	(0.02)	(0.05)	(50.60)	(0.44)
State squared*LNASSET	0.10**	0.04	144.36	-0.49
	(0.04)	(0.08)	(90.51)	(0.77)
Control	-0.00	-0.01	-3.95	-0.10*
	(0.00)	(0.01)	(6.90)	(0.06)
AGE	0.00***	0.00***	-0.96***	0.00***
	(0.00)	(0.00)	(0.21)	(0.00)
SOLV	-0.12***	0.01	-81.02***	0.36***
	(0.01)	(0.01)	(11.56)	(0.10)
LNASSET	0.00	0.01	47.85***	-0.22***
	(0.00)	(0.01)	(6.63)	(0.06)
Constant	0.04	0.03	-355.10***	2.81***
	(0.04)	(0.07)	(78.77)	(0.68)
R^2	0.17	0.08	0.30	0.24
N	5,859	5,820	4,850	5,848

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

The estimates of the random effects model are displayed in Table 6a and results including the interaction term between state ownership and firm size are in Table 6b. The evidence in Table 6b confirms the finding of negative relationship between state ownership and firm profitability of the pooled models. Figure 3 shows the different effects of state ownership on firm performance contingent on firm size. When we include the squared term of state ownership and its interaction with firm size (Table 6c and Figure 4), the evidence is similar in nature as was found from the benchmark pooled models.

Figure 2. Graph of firm performance indictors with respect to state ownership for large-, medium- and small-size firms (Pooled effects models with quadratic term of state ownership and its interaction with logarithm of assets)

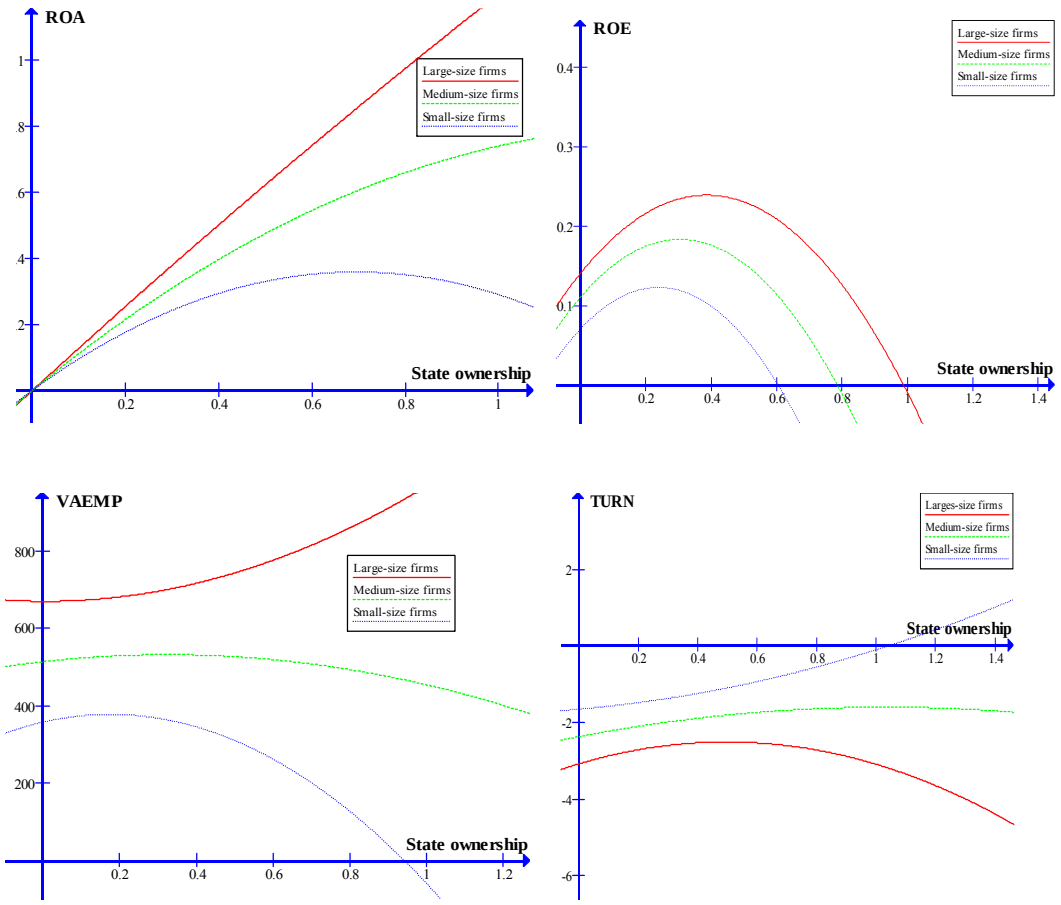


Table 6a. The estimates of random effect models

	ROA	ROE	VAEMP	TURN
State ownership	0.01	0.05**	28.03	0.19
	(0.01)	(0.02)	(24.30)	(0.17)
Control	-0.00	-0.01	5.45	0.01
	(0.00)	(0.01)	(6.20)	(0.04)
AGE	0.00***	0.00***	-0.89**	0.01**
	(0.00)	(0.00)	(0.35)	(0.00)
SOLV	-0.08***	0.05***	-78.10***	-0.07
	(0.01)	(0.01)	(13.27)	(0.09)
LNASSET	-0.00	0.01***	50.87***	-0.40***
	(0.00)	(0.00)	(2.68)	(0.02)
Constant	0.11***	-0.04	-227.37***	6.30***
	(0.02)	(0.04)	(39.35)	(0.33)
N	5,859	5,820	4,850	5,848

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

Table 6b. The estimates of random effect models when adding interaction term between state ownership and firm size

	ROA	ROE	VAEMP	TURN
State ownership	-0.13*	-0.47***	-119.72	-1.05
	(0.07)	(0.15)	(162.94)	(1.09)
State*LNASSET	0.01*	0.05***	13.09	0.11
	(0.01)	(0.01)	(14.27)	(0.10)
Control	-0.00	-0.01	5.28	0.01
	(0.00)	(0.01)	(6.20)	(0.04)
AGE	0.00***	0.00***	-0.89**	0.01**
	(0.00)	(0.00)	(0.35)	(0.00)
SOLV	-0.08***	0.05***	-77.84***	-0.07
	(0.01)	(0.01)	(13.27)	(0.09)
LNASSET	-0.00**	-0.00	47.18***	-0.44***
	(0.00)	(0.00)	(4.83)	(0.03)
Constant	0.15***	0.11*	-185.77***	6.65***
	(0.03)	(0.06)	(60.35)	(0.45)
N	5,859	5,820	4,850	5,848

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

Figure 3. Graph of firm performance indicators with respect to state ownership for large-, medium- and small-size firms (Random effects models when adding interaction term between state ownership and firm size)

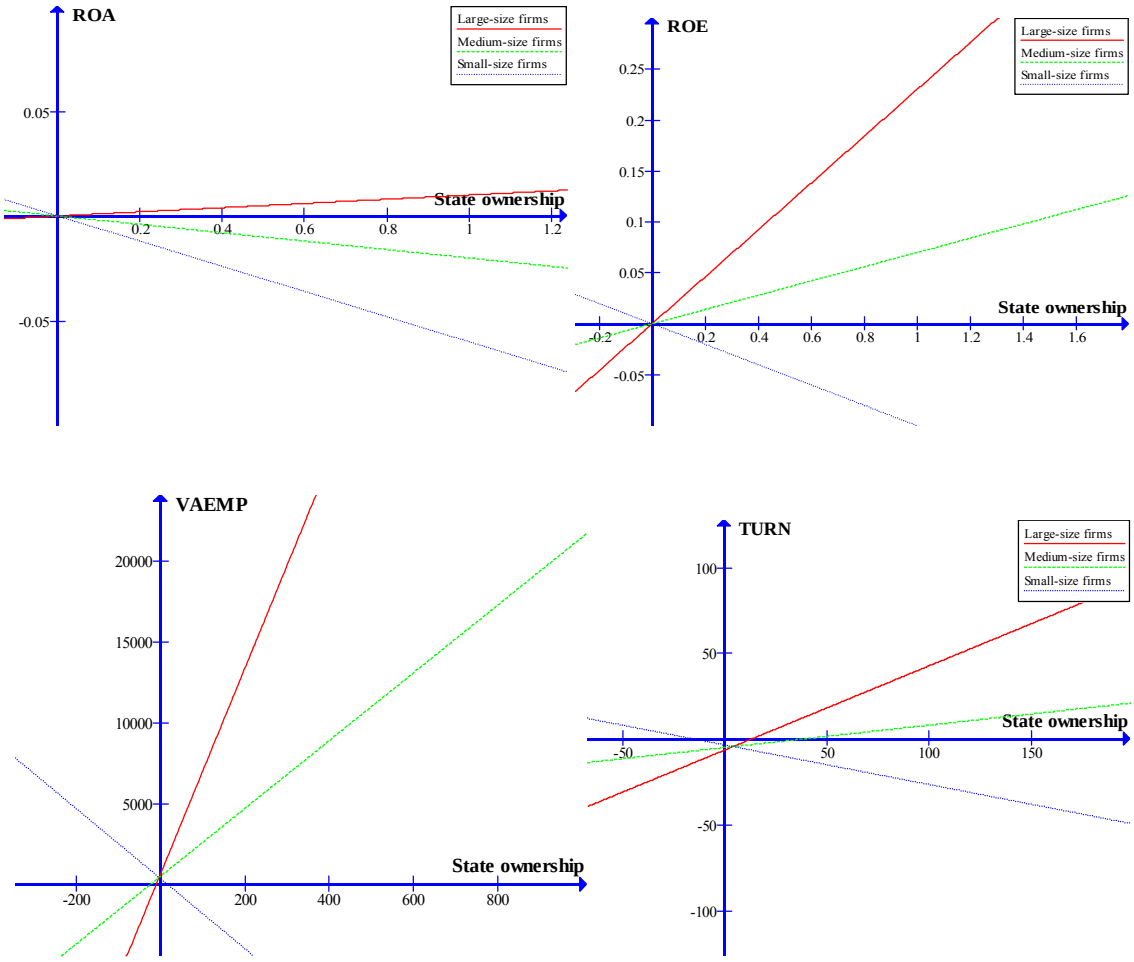


Table 6c. The estimates of random effect models with quadratic term of state ownership and the interaction term between quadratic term of state ownership and logarithm of assets

	ROA	ROE	VAEMP	TURN
State ownership	0.14	-0.31	353.38	2.92
	(0.28)	(0.58)	(609.49)	(4.14)
State squared	-0.49	-0.26	-881.95	-7.43
	(0.50)	(1.02)	(1,094.76)	(7.38)
State*LNASSET	-0.00	0.06	-28.81	-0.28
	(0.02)	(0.05)	(54.03)	(0.37)
State squared*LNASSET	0.03	-0.02	78.02	0.74
	(0.04)	(0.09)	(97.06)	(0.66)
Control	-0.00	-0.01	5.39	0.00
	(0.00)	(0.01)	(6.24)	(0.04)
AGE	0.00***	0.00***	-0.89**	0.01**
	(0.00)	(0.00)	(0.35)	(0.00)
SOLV	-0.08***	0.04***	-77.72***	-0.06
	(0.01)	(0.01)	(13.29)	(0.09)
LNASSET	-0.00	-0.00	51.43***	-0.40***
	(0.00)	(0.01)	(7.16)	(0.05)
Constant	0.12***	0.09	-233.78***	6.26***
	(0.04)	(0.08)	(84.86)	(0.61)
N	5,859	5,820	4,850	5,848

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

Figure 4. Graph of firm performance indicators with respect to state ownership for large-, medium- and small-size firms (Random effects models with quadratic term of state ownership and its interaction with logarithm of assets)

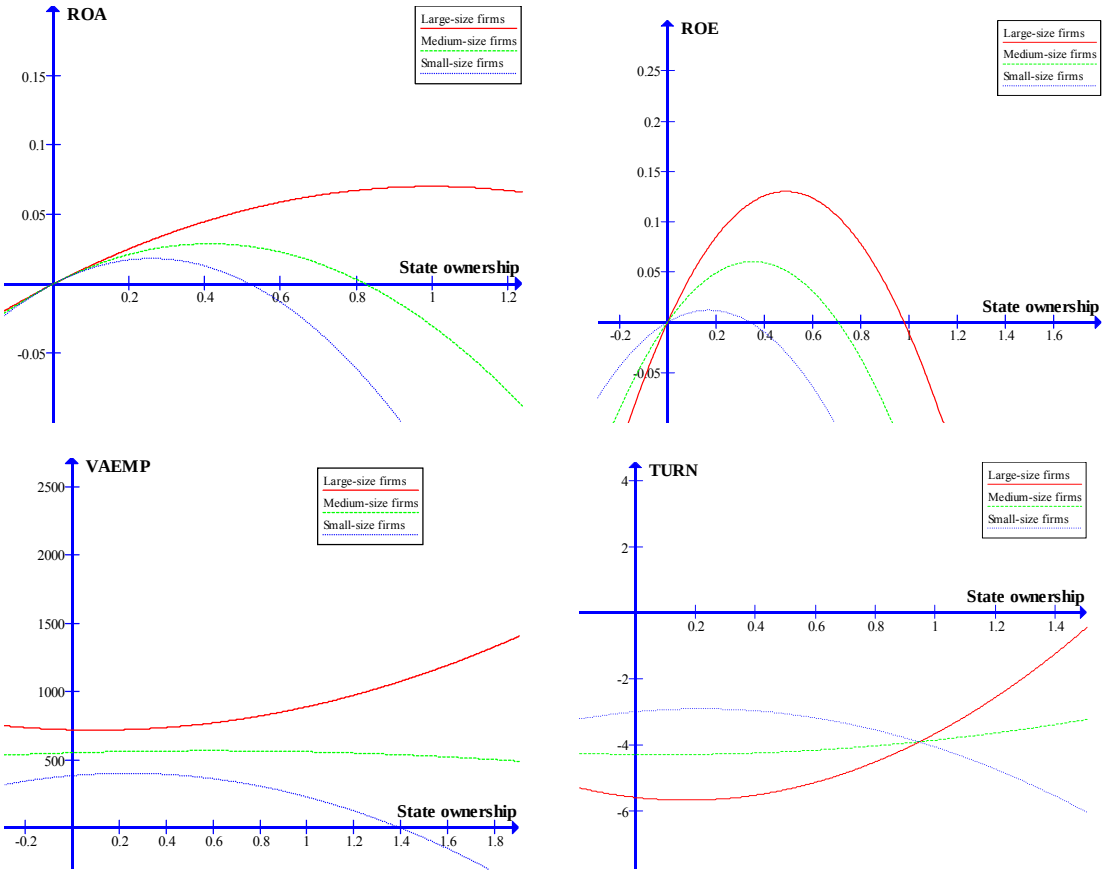


Table 7a, 7b and 7c below show the estimates of the dynamic panel data models when past performance is taken into account. These models are estimated by system GMM. The Sargan/Hansen tests points to joint validity of instruments used in these models. Besides, the tests for autocorrelation (*abar* test) indicate that there is no autocorrelation in the disturbances.

Similar to earlier specifications, the results in Table 7a – lacking interaction terms - do not confirm our theoretically derived propositions. However, the results in Table 7b – including interaction effects - support our propositions on the negative effect of state ownership on firm profitability (ROA and ROE) and the efficient use of labor (VAEMP). The moderating role of firm size on the relationship of state ownership and firm performance is also confirmed in this model. Figure 5 below shows that state ownership has a different effect on firm performance with respect to large-, medium- and small-size firms. These results confirm the findings derived from the pooled effects models and random effects models. Including the quadratic term of state ownership and its interaction with logarithm of assets (Table 7c and Figure 6) does not yield a clear picture on these relationships, similar to the outcomes of the pooled effects model and random effects models.

The estimates from Table 7a, 7b and 7c point to path dependence of performance. All estimates of lagged variables are statistically significant and important. Hence, the estimates of earlier models could be biased if we do not take into account these dynamic characteristics of performance.

Table 7a. The estimates of dynamic panel data models

	ROA	ROE	VAEMP	TURN
State ownership	0.03***	0.06***	21.94	0.95***
	(0.01)	(0.02)	(17.76)	(0.25)
Control	-0.00	-0.01	1.83	-0.10*
	(0.00)	(0.01)	(7.14)	(0.06)
AGE	0.00**	0.00***	-0.51**	0.00
	(0.00)	(0.00)	(0.20)	(0.00)
SOLV	-0.10***	0.01	-53.55***	0.21
	(0.01)	(0.01)	(14.07)	(0.15)
LNASSET	0.00	0.00**	26.79***	-0.16***
	(0.00)	(0.00)	(4.43)	(0.02)
L.ROA	0.21***			
	(0.04)			
L.ROE		0.38***		
		(0.04)		
L.VAEMP			0.61***	
			(0.10)	
L.TURN				0.18***
				(0.05)
Constant	0.09***	0.03	-243.64***	2.16***
	(0.02)	(0.03)	(52.41)	(0.32)
N	4,766	4,727	3,492	4,767

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

Table 7b. The estimates of dynamic panel data models when adding interaction term between state ownership and firm size

	ROA	ROE	VAEMP	TURN
State ownership	-0.17***	-0.28**	-381.74**	0.14
	(0.06)	(0.14)	(151.45)	(0.72)
State*LNASSET	0.02***	0.03**	35.88***	0.06
	(0.01)	(0.01)	(13.12)	(0.06)
Control	-0.00	-0.01	5.30	-0.03
	(0.00)	(0.01)	(6.79)	(0.03)
AGE	0.00***	0.00***	-0.54***	0.01***
	(0.00)	(0.00)	(0.17)	(0.00)
SOLV	-0.09***	0.02**	-58.27***	0.23***
	(0.01)	(0.01)	(11.45)	(0.05)
LNASSET	-0.01***	-0.00	18.84***	-0.24***

	(0.00)	(0.00)	(4.12)	(0.02)
	(0.00)	(0.01)	(8.84)	(0.04)
L.ROA	0.19***			
	(0.02)			
L.ROE		0.37***		
		(0.02)		
L.VAEMP			0.55***	
			(0.03)	
L.TURN				0.09***
				(0.01)
Constant	0.16***	0.13***	-95.97*	3.25***
	(0.02)	(0.05)	(50.05)	(0.24)
N	4,766	4,727	3,492	4,767

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

Figure 5. Graph of firm performance indicators with respect to state ownership for large-, medium- and small-size firms (Dynamic models when adding interaction term between state ownership and firm size)

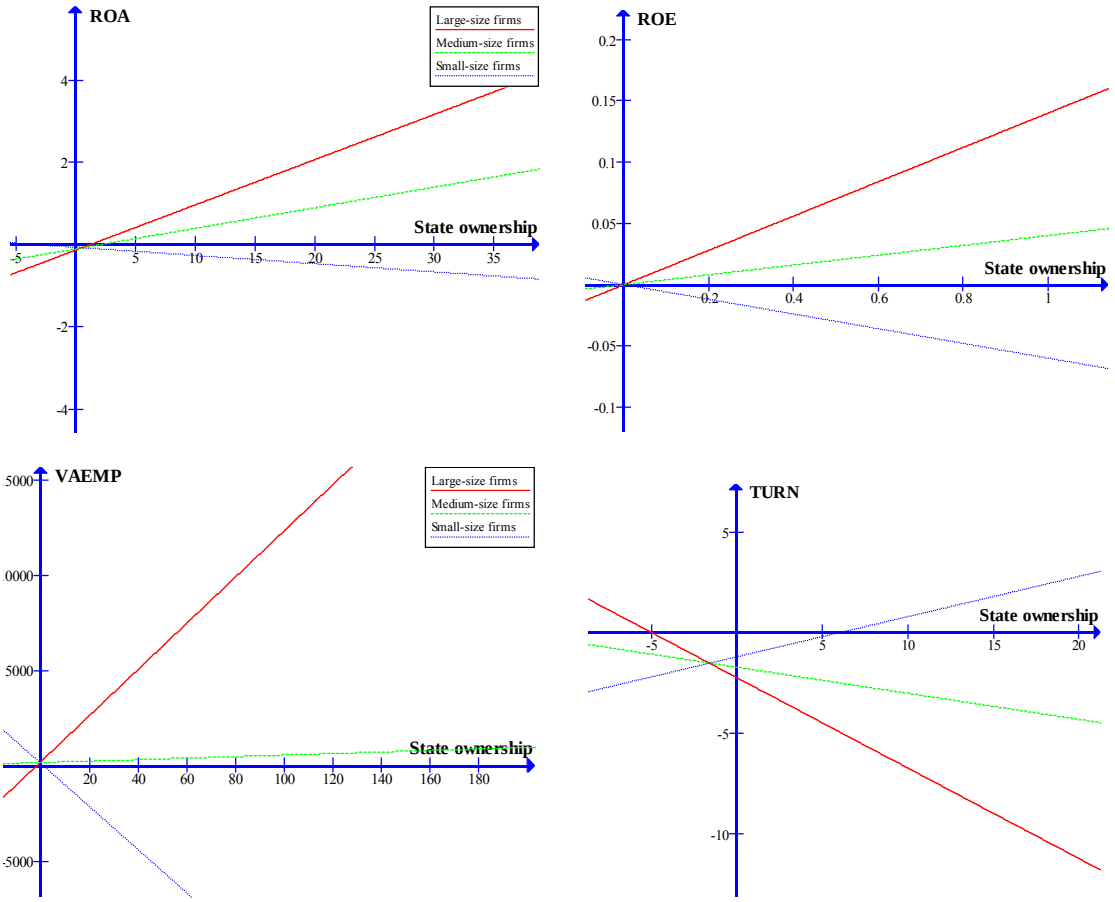
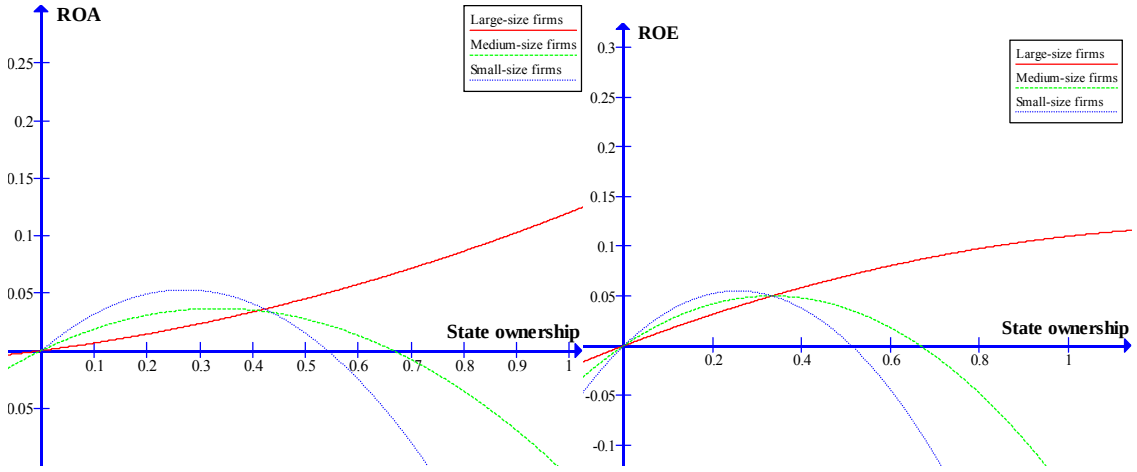


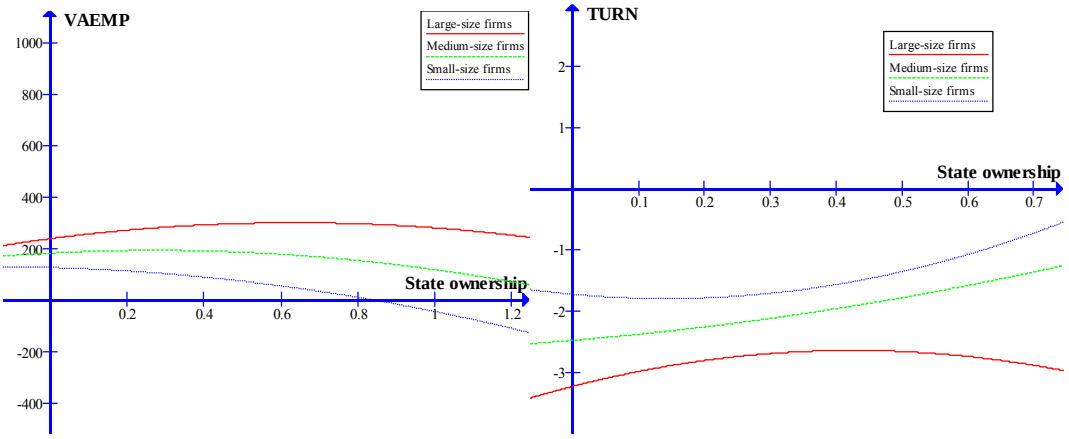
Table 7c. The estimates of dynamic panel data models with quadratic term of state ownership and the interaction term between quadratic term of state ownership and logarithm of assets

	ROA	ROE	VAEMP	TURN
State ownership	0.54**	0.51	-356.21	-4.77*
	(0.25)	(0.54)	(568.14)	(2.84)
State squared	-1.27***	-1.41	-37.51	9.05*
	(0.44)	(0.94)	(1,006.17)	(4.95)
State*LNASSET	-0.04	-0.02	42.41	0.51**
	(0.02)	(0.05)	(49.74)	(0.25)
State squared*LNASSET	0.09**	0.08	-12.79	-0.82*
	(0.04)	(0.08)	(88.56)	(0.44)
Control	0.00	-0.00	6.37	-0.03
	(0.00)	(0.01)	(6.84)	(0.03)
AGE	0.00***	0.00***	-0.54***	0.01***
	(0.00)	(0.00)	(0.17)	(0.00)
SOLV	-0.09***	0.02**	-59.25***	0.23***
	(0.01)	(0.01)	(11.48)	(0.05)
LNASSET	0.00	0.00	18.34***	-0.28***
	(0.00)	(0.01)	(6.62)	(0.03)
L.ROA	0.19***			
	(0.02)			
L.ROE		0.37***		
		(0.02)		
L.VAEMP			0.55***	
			(0.03)	
L.TURN				0.09***
				(0.01)
Constant	0.08**	0.03	-100.50	3.78***
	(0.03)	(0.07)	(77.97)	(0.39)
N	4,766	4,727	3,492	4,767

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

Figure 6. Graph of firm performance indicators with respect to state ownership for large-, medium- and small-size firms (Dynamic models with quadratic term of state ownership and its interaction with logarithm of assets)





5. Discussion and Conclusion

This paper expands the theoretical predictions on the effect of state ownership on firm performance from the Huang & Xiao's (2012) theoretical model. More specifically, we theoretically propose that there is a negative association between state ownership and firm profitability (measured by ROA and ROE), the efficient use of labor (measured by VAEMP) and the efficient use of capital (measured by TURN). These predictions are empirically tested using an unbalanced panel dataset of 38,143 Vietnamese firms in which the government has some stake for the period of 2004-2012.

The descriptive analysis of this new and original subsample of firms shows that government ownership in privatized Vietnamese firms is still relatively substantial during the research period, fluctuating in a range of 34 to 43 percent. State shareholding is highest in Northern midlands and mountain areas and North and South Central coast. The government has the least ownership in South East and Red river delta region. Utilities - electricity/gas - has the highest state ownership while the lowest percentage of state ownership is in manufacturing, construction and hotel/restaurant business.

Even in joint stock companies where the state has a less than 50 percent stake in shareholdings, the government has retained cash flow rights on equity ownership in 15 to 21 percent of the number of companies. Specifically, the government kept control in 25 percent of joint stock companies operating in electricity/gas and agriculture despite its minority stake. The lowest proportion of control (14 percent) is in the manufacturing and real estate business. Particularly, control in minority joint stock companies is retained more in firms in the Northern midlands and mountain areas and the North and South Central Coast than those in the South East region.

Three different econometric estimation methods are used: a pooled model as a benchmark case, a static random effects model and a dynamic panel data model using system GMM. For each of these estimation models, various specifications are used. Especially, the interaction effect between the size of firms and the effects of government participation on performance are introduced.

The empirical result from the pooled models – taking size interaction into account - support the theoretical propositions that – on average - state ownership has a negative effect on firm profitability (ROA, ROE) and labor productivity (VAEMP). The results imply that the "grabbing hand" of government outweighs the "helping hand" and that this behavior by the state depresses firm performance. This result is consistent with evidence found in previous studies in different emerging or transition economies. The results also show that it is control that matters, rather than shareholding as such. In firms where the government has a minority shareholding stake but retains control over cash flows – on average - firm profitability (ROE) and the efficient use of capital (TURN) suffers.

However, we also find a moderating role of firm size on the relationship between state ownership and firm performance. More specifically, we find that increased state ownership in larger firms seems to enhance the performance of such large firms in terms of profitability and efficient use of labor. Hence, the larger the firm the higher the likelihood that the "helping hand" dominates the "grabbing hand". Thus, focusing on the "average firm" and overlooking the moderating role of firm size could confound this non-linear effect, depending upon size, of government shareholding on performance. From specifications with more complex interaction terms, it follows that the non-linear effects of state ownership on firm performance are diverse and complex. What causes these complex

patterns is not yet fully understood and suggests an area for further research. The results from the pooled model specifications are confirmed by the outcomes of the random effects model and dynamic models. Finally, using a dynamic panel data specification, the estimation results show that there is path dependence of firm performance. Earlier firm performance strongly affects current performance.

Generally, our results indicate that "on average" – and more specifically for smaller and medium size firms - less state ownership and abstention of state control is conducive to better performance of firms in terms of profitability and productivity as the grabbing hand of government tends to outweigh the helping hand. However, in larger firms, the opposite seems to hold. Larger government shareholding seems to contribute to firm performance and the helping hand seems to dominate the grabbing hand. The underlying mechanisms are not yet entirely clear and should be subject of further research.

References

Ammann, M., Oesch, D., Schimid, M.M. (2011). "Corporate Governance and Firm Value: International Evidence." *Journal of Empirical Finance*, 18, 36-55.

Chen, C.H., Al-Najjar, B. (2012). "The Determinants of Board Size and Independence: Evidence from China." *International Business Review*, 21, 831-46.

Chen, S.K., Chen, X., Lin, B., Zhong, R. (2005). "The Impact of Government Regulation and Ownership on the Performance of Securities Companies: Evidences from China." *Global Finance Journal*, 16, 113-124.

Gunasekarage, A., Hess, K., Hu, A.J. (2007). "The Influence of the Degree of State Ownership and the Ownership Concentration on the Performance of Listed Chinese Companies." *Research in International Business and Finance*, 21(3), 379-95.

Hess, K., Gunasekarage, A., Hovey, M. (2010). "State-Dominant and Non-State-Dominant Ownership Ownership Concentration and Firm Performance: Evidence from China." *International Journal of Managerial Finance*, 6(4), 264-89.

Huang, L., Xiao, S. (2012). "How Does Government Ownership Affect Firm Performance? A Simple Model of Privatization in Transition Economies." *Economics Letters*, 116, 480-82.

Jiang, B.B., Laurenceson, J., Tang, K.K. (2008). "Share Reform and the Performance of China's Listed Companies." *China Economic Review*, 19(3), 489-501.

Liao, J., Young, M. (2012). "The Impact of Residual Governmetn Ownership in Privatized Firms: New Evidence from China." *Emerging Markets Review*, 13, 338-51.

Lin, C., Ma, Y., Su, D. (2009). "Corporate Governance and Firm Efficiency: Evidence from China's Publicly Listed Firms." *Managerial and Decision Economics*, 30(3), 193-209.

Ng, A., Yuce, A., Chen, E. (2009). "Determinants of State Equity Ownership, and Its Effect on Value/Performance: China's Privatized Firms." *Pacific-Basin Finance Journal*, 17(4), 413-43.

Qi, D., Wu, W., Zhang, H. (20009. "Shareholding Structure and Corporate Performance of Partially Privatized Firms: Evidence from Listed Chinese Companies." *Pacific-Basin Finance Journal*, 8(5), 587-610.

Roodman, D. (2009). "How to Use Xtabond2: An Introduction to Difference and System Gmm in Stata." *The Stata Journal*, 9(1), 86-136.

Shleifer, A., Vishny, R. (1994). "Politicans and Firms." *Quarterly Journal of Economics*, 109, 995-1025.

Sun, Q., Tong, W.H.S. 2003. "China Share Issue Privatisation: The Extent of Its Success." *Journal of Financial Economics*, 70(2), 1-27.

Sun, Q., Tong, W.H.S., Tong, J. (2002). "How Does Government Ownership Affect Firm Performance? Evidence from China's Privatization Experience." *Journal of Business Finance & Accounting*, 29(1-2), 1-27.

Tian, L., Estrin, S. (20089. "Retained State Shareholding in Chinese Plcs: Does Government Ownership Always Reduce Corporate Value?" *Journal of Comparative Economics*, 36, 74-89.

Truong, D.L., Lanjouw, G., Lensink, R. (2006). "The Impact of Privatization on Firm Performance in a Transition Economy: The Case of Vietnam." *Economics of Transition*, 14(2), 349-89.

Wei, G. (2007). "Ownership Structure, Coporate Governance and Company Performance in China." *Asia Pacific Business Review*, 13(4), 519-45.

Wei, Z.B., Varela, O. (2003). "State Equity Ownership and Firm Market Performance: Evidence Form China's Newly Privatized Firms." *Global Finance Journal*, 14(1), 65-82.
Wei, Z.B., Xie, F.X., Zhang, S.R. (2005). "Ownership Structure and Firm Value in China's Privatized Firms: 1991-2001." *Journal of Financial and Quantitative Analysis*, 40(1), 87-108.
Xu, X., Wang, Y. (1999). "Ownership Structure and Corporate Governance in Chinese Stock Companies." *China Economic Review*, 10(1), 75-98.
Yu, M. (2013). "State Ownership and Firm Performance: Empirical Evidence from Chinese Listed Companies." *China Journal of Accounting Research*, 6, 75-97.

Appendix A
Proofs of propositions

The summary of the assumption and the results of Huang and Xiao (2012) which are used in this study to develop our propositions.

Assumptions:

- The wage (w) and the financial market interest rate (r) are equal to 1 ($w=r=1$)
- The government's ownership in the firm (a) lies between 0 and 1 ($0<a<1$).
- The employment preference multiplier (n) is positive ($n>0$)
- $0< \alpha+\beta<1$, $\alpha>0$, $\beta>0$, $1>\frac{1}{n+1}>a>0$

Results:

Return = $AK^{\alpha}L^{\beta} - L - (1-a)K$

Sales = $AK^{\alpha}L^{\beta}$

The first order conditions of the second-period firm manager's maximization problem with respect to K and L gives:

$$AK^{\alpha-1}L^{\beta} = \frac{1-\alpha}{\alpha} \quad (1)$$

$$\frac{K}{L} = \frac{\alpha[1-(n+1)\alpha]}{\beta(1-\alpha)^2} \quad (2)$$

Proof of proposition 1: *The efficient use of labor of the firm, as measured by value added per employee, is negatively affected by government ownership*

$$\frac{\partial VAEMP}{\partial a} = -\frac{\alpha}{\beta}\left[\frac{(n+1)(1+a)+2}{(1-a)^3}\right] < 0$$

Value added *(VADD)* = wages + profits= $wL + rK$

With the assumption of unity of w and r, we have $VADD = L + K$

Hence, value added per employee *(VAEMP)* = $1 + \frac{K}{L}$

By (2), we have $VAEMP = 1 + \frac{K}{L} = 1 + \frac{\alpha[1-(n+1)\alpha]}{\beta(1-\alpha)^2}$

$$\rightarrow \frac{\partial VAEMP}{\partial \alpha} = \frac{\alpha}{\beta}\frac{[-(n+1)(1-\alpha)^2 + 2(1-\alpha)(1-(n+1)\alpha)]}{(1-\alpha)^4} = -\frac{\alpha}{\beta}\left[\frac{(n+1)(1+\alpha)+2}{(1-\alpha)^3}\right] < 0$$

$$\rightarrow \frac{\partial^2 VAEMP}{\partial \alpha^2} = -\frac{\alpha}{\beta}\frac{[(n+1)(1-\alpha)^3 + 3(1-\alpha)^2[(n+1)(1+\alpha)+2]]}{(1-\alpha)^6}$$

Or $$\frac{\partial^2 VAEMP}{\partial \alpha^2} = -\frac{2\alpha}{\beta}\left[\frac{(n+1)(1-\alpha)+3}{(1-\alpha)^4}\right] < 0$$

Proof of proposition 2: *The efficient use of capital of the firm, as measured by turnaround indicator or sales over assets, is negatively affected by government ownership*

$$\frac{\partial TURN}{\partial a} = -\frac{1}{\alpha} < 0$$

TURN = $\frac{Sales}{Asset} = \frac{AK^{\alpha}L^{\beta}}{K} = AK^{\alpha-1}L^{\beta}$

By (1), we have TURN= $\frac{1-\alpha}{\alpha}$

➔ $\frac{\partial TURN}{\partial \alpha} = -\frac{1}{\alpha} < 0$

➔ $\frac{\partial^2 TURN}{\partial \alpha^2} = 0$

Proof of proposition 3: *The profitability of the firm, as measured by return over assets, is negatively affected by government ownership*

$$\frac{\partial ROTA}{\partial \alpha} = -\left(\frac{1-\alpha}{\alpha}\right) - \frac{\beta}{\alpha}\left[\frac{(1-\alpha^2)(n-1)+2\alpha(1-\alpha)}{(1-(n+1)\alpha)^2}\right] < 0$$

ROTA=$\frac{Return}{Assets} = \frac{AK^{\alpha}L^{\beta}-L-(1-\alpha)K}{K} = AK^{\alpha-1}L^{\beta} - \frac{1}{\frac{K}{L}} - (1-\alpha)$

By (1) and (2), we have:

$$ROTA = \left(\frac{1}{\alpha}-1\right)(1-\alpha) - \frac{\alpha}{\beta}\frac{(1-\alpha)^2}{[1-(n+1)\alpha]}$$

➔ $\frac{\partial ROTA}{\partial \alpha} == -\left(\frac{1-\alpha}{\alpha}\right) - \frac{\beta}{\alpha}\left[\frac{(1-\alpha^2)(n-1)+2\alpha(1-\alpha)}{(1-(n+1)\alpha)^2}\right] < 0$ (Assume n>1)

➔

$$\frac{\partial^2 ROTA}{\partial \alpha^2} = -\frac{\beta}{\alpha}\left[\frac{[(-2\alpha)(n-1)+2(1-2\alpha)][(1-(n+1)\alpha)^2]+2[(n+1)(1-(n+1)\alpha)][(1-\alpha^2)(n-1)+2\alpha(1-\alpha)]}{(1-(n+1)\alpha)^4}\right]$$

Or $\frac{\partial^2 ROTA}{\partial \alpha^2} = -\frac{2\beta}{\alpha}\left[\frac{[(1-(n+1)\alpha)^2]+(n+1)[(1-\alpha^2)(n-1)+2\alpha(1-\alpha)]}{(1-(n+1)\alpha)^3}\right] < 0$

Proof of proposition 4: *The profitability of the firm, as measured by return on equity, is negatively affected by government ownership*

$$\frac{\partial ROE}{\partial \alpha} = -\left(\frac{1-\alpha}{\alpha}\right)\left(\frac{1-k}{(1-k\alpha)^2}\right) - \frac{\beta}{\alpha}(1-\alpha)\left[\frac{2n\alpha(1-k)+(1-\alpha)(n+k-1)}{[(1-k\alpha)(1-(n+1)\alpha)]^2}\right] < 0$$

From the assumption of Huang & Xiao (2012), the capital subsidy rate *g(a)* is an increasing function of government ownership (*a*). In other words, it means that the higher the proportion of government ownership in the firm, the more priority for firm to access a loan. Hence, we propose that debt is proportional to the government shareholding.

Therefore, the total value of debt is equal to *ka*K (K is the total assets) and *k* is assumed to be larger than 0 and smaller than 1 (0<*k*<1).

Asset = Debt + Equity

Hence Equity = Asset – Debt = (1-*ka*)K

$$ROE = \frac{Return}{Equity} = \frac{AK^{\alpha}L^{\beta}-L-(1-\alpha)K}{(1-k\alpha)K} = \frac{1}{(1-k\alpha)}\left[AK^{\alpha-1}L^{\beta} - \frac{1}{\frac{K}{L}} - (1-\alpha)\right]$$

By (1) and (2), we have:

$$ROE = \left(\frac{1-\alpha}{\alpha}\right)\left(\frac{1-\alpha}{1-k\alpha}\right) - \frac{\beta}{\alpha}\frac{(1-\alpha)^2}{(1-k\alpha)(1-(n+1)\alpha)}$$

➔ $\frac{\partial ROE}{\partial \alpha} = -\left(\frac{1-\alpha}{\alpha}\right)\left(\frac{1-k}{(1-k\alpha)^2}\right) - \frac{\beta}{\alpha}(1-\alpha)\left[\frac{2n\alpha(1-k)+(1-\alpha)(n+k-1)}{[(1-k\alpha)(1-(n+1)\alpha)]^2}\right] < 0$

Since, *n*>1 hence *n*+*k*>1 or *n*+*k*-1>0

$$\frac{\partial^2 ROE}{\partial a^2} = -\left(\frac{1-\alpha}{\alpha}\right)\left[\frac{2k(1-k)}{(1-k\alpha)^2}\right] - \frac{\beta(1-\alpha)}{\alpha}\left[\frac{[(2n(1-k)-(n+k-1)][(1-k\alpha)(1-(n+1)\alpha)]+2[(n+k+1)-2(n+1)k\alpha][2n\alpha(1-k)+(1-\alpha)(n+k-1)]}{[(1-k\alpha)(1-(n+1)\alpha)]^2}\right]$$

Or

$$\frac{\partial^2 ROE}{\partial a^2} = -\left(\frac{1-\alpha}{\alpha}\right)\left[\frac{2k(1-k)}{(1-k\alpha)^2}\right] - \frac{\beta(1-\alpha)}{\alpha}\left[\frac{[(nk-1)^2+n-(1-n^2k)k][(1-k\alpha)(1-(n+1)\alpha]+2[(n+k+1)-2(n+1)k\alpha][2n\alpha(1-k)+(1-\alpha)(n+k-1)]}{[(1-k\alpha)(1-(n+1)\alpha)]^2}\right] < 0$$

Since $0<k<1$

$1-ka>1-a>0;$

$n+k-1>0;$

$(1-n^2k)k< (1-k)k<nk<n;$

$n+k+1>2;$

$1>\frac{1}{n+1} > a$,*hence* $ka(n+1) < k$ *or* $2ka(n+1) < 2k < 2$

Appendix B

Argument for interaction effect

From Huang and Xiao (2012), we have the government's maximization problem as follows:

$$\max_{a} U_g(R,L) = a[AK^{\alpha}L^{\beta} - L - (1-a)K] + cL - aK$$

where c is the relative weight of two objectives, revenue and employment.

If the government imposes the weight of γ on revenue R, the weight on labor becomes $(1-\gamma)$. As a result, the relative weight of c will get the value:

$$c = \frac{1-\gamma}{\gamma} \quad (*)$$

We assume that this weight is proportional to the subsidy of the government. Thus, we specify:

$$c=h.a \quad (**)$$

where h is constant ($h>0$) and is regarded as the size of "employment pressure".

Then, from (*) and (**) we can rewrite the function of γ as follows

$$\gamma = \frac{1}{ha+1} \quad (***)$$

Notes that: $0<a<1$

When a moves toward 0, γ will get value of 1 which implies that the government only cares about the revenue contribution. In contrast, when a moves toward to 1, the value of γ will get decreasing and thus the value of $(1-\gamma)$ will increase, which implies that the government cares more about the importance of employment objective. As a result, the importance of employment objective increases with an increase of state ownership.

Concerning the size of employment pressure (h), when h moves toward 0, the value of γ is 1 (and hence employment weight is 0). When h moves toward infinity, ∞, the value of γ is 0 (and hence employment weight is 1). These values imply that the employment pressure is proportional to the government's employment weight.

- ***Solution of the first order condition to the government's maximization problem:***

(1) The first order condition (FOC) with respect to K:

$$\frac{\partial U}{\partial K} = \alpha A a K^{\alpha-1} L^{\beta} - a(1-a) - a = 0$$

$$\alpha A a K^{\alpha-1} L^{\beta} = 2a - a^2$$

$$AK^{\alpha-1} L^{\beta} = \frac{2-a}{\alpha} \quad (2)$$

(3) The first order condition (FOC) with respect to L:

$$\frac{\partial U}{\partial L} = \beta A a K^{\alpha} L^{\beta-1} - a + ha = 0$$

$$AK^{x} L^{\beta-1} = \frac{1-h}{\beta}$$

$$\frac{(1)}{(3)} => \frac{K}{L} = \frac{\alpha}{\beta}\left(\frac{1-h}{2-a}\right) \quad (4)$$

Notes:

Other assumptions from the model of Huang & Xiao (2012):
- The government's ownership in the firm (*a*) lies between 0 and 1 (0<*a*<1).
- 0< α+β<1, α>0, β>0

$$\frac{\partial VAEMP}{\partial a} = ?$$

Value added *(VADD)* = wages + profits= *wL* + *rK*
With the assumption of unity of *w* and *r,* we have *VADD = L + K*
Hence, value added per employee *(VAEMP) = 1 +* $\frac{K}{L}$

By (4), we have: *VAEMP = 1 +* $\frac{K}{L} = 1 + \frac{\alpha}{\beta}\left(\frac{1-h}{2-a}\right)$

➔ $\frac{\partial VAEMP}{\partial a} = \frac{\alpha}{\beta}(1-h)\frac{1}{(2-a)^2}$

With $0 < h \leq 1$, $\frac{\partial VAEMP}{\partial a} > 0$

With $h > 1$ $\frac{\partial VAEMP}{\partial a} < 0$

Hence, with this proof, we show that the efficient use of labor is positive or negative (with an increase of state ownership) depending on the size of employment pressure imposed by the government. If the employment pressure is low, labor productivity increases with the increase of government ownership. However, if the employment pressure is high, labor productivity of firm will decrease. We argue that larger firms with stronger resources will have more advantage to withstand this employment pressure and thus still gain the benefits from the government subsidies after fulfilling the requirement of employment.

$$\frac{\partial ROA}{\partial a} = ?$$

$$ROA = \frac{Return}{Assets} = \frac{AK^{\alpha}L^{\beta} - L - (1-\alpha)K}{K} = AK^{\alpha-1}L^{\beta} - \frac{1}{\frac{K}{L}} - (1-\alpha)$$

By (2) and (4), we have:

$$ROA = \frac{2-\alpha}{\alpha} - \frac{1}{\frac{\alpha}{\beta}\left(\frac{1-h}{2-2}\right)} - (1-\alpha)$$

$$ROA = (2-\alpha)\left[\frac{1}{\alpha} - \frac{\beta}{\alpha(1-h)}\right] - (1-\alpha), \text{ assume } h \neq 1$$

$$\rightarrow \quad \frac{\partial ROA}{\partial a} = \frac{\beta}{\alpha(1-h)} + \frac{\alpha-1}{\alpha}$$

With $0<h<1$,

Re-write $\frac{\partial ROA}{\partial a} = \frac{\beta+(\alpha-1)(1-h)}{\alpha(1-h)}$

Since $0< \alpha+\beta<1$

$\alpha-1 <-\beta$

$1-h>0$, hence $(\alpha-1)(1-h) < -\beta(1-h)$

but $0<\beta(1-h)<\beta$ or $-\beta <-\beta(1-h)<0$

Thus,

$$\frac{\partial ROA}{\partial a} = \frac{\beta + (\alpha-1)(1-h)}{\alpha(1-h)} > 0$$

With $h>1$

$$\frac{\partial ROA}{\partial a} = \frac{\beta}{\alpha(1-h)} + \frac{\alpha-1}{\alpha} < 0$$

Hence, this proof also shows that the effect of government ownership on firm profitability is positive or negative according to the size of the employment pressure. We argue that larger firms are more beneficial to tackle with this employment pressure and thus still benefit with government subsidies in terms of profitability.