
**ASSESSING EFFECTS OF PRIVATIZATION ON FIRM'S PERFORMANCE BY
PROPENSITY SCORE MATCHING METHOD:
THE CASE OF VIETNAM**

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Abstract

This study analyzes impacts of privatization on the business performance of state owned enterprises over the period 2002 – 2012. The estimation by propensity score matching and double difference shows that the privatization produces positive effects to profit, productivity and financial health while having no significant changes in term of employment. Besides, the analysis of privatization before and after 2007 reveals that in later period, privatized enterprises had relatively poorer performance than non privatized ones due to external impacts of the world financial crisis and unhealthy business environment. This finding confirms the necessity of design and implementation of policies that contribute to quality improvement of the business environment in order to facilitate the privatization and efficiency of Vietnamese enterprises.

Keywords: privatization, business performance, SOEs

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CONTENT

1. Introduction	2
2. The privatization of Vietnamese SOEs at a glance.....	2
3. Literature review.....	3
4. Methodology:.....	6
4.1 Empirical framework.....	6
4.2 Practical procedure.....	7
5. Data description and processing.....	9
6. Results and discussion	13
6.1 Results of probit estimation and balancing test	13
6.2 Effect of privatization on firm's performance in period 2002-2012.....	17
6.3 Comparison of privatization between two periods 2002-2006 & 2007 -2012	19
7. Summary and conclusion	21
References	23
Appendix	25

1. Introduction

Historically, the reformation of transitioning economy often associates with the privatization of state owned enterprises (SOEs) Bai et.al (2009). The mass privatization of SOEs is essential for more efficient resource allocation, a healthy and fair level playing fields for business of all sectors and a well-functioning market. However, the privatization could lead to conflicts among interest groups. When SOE's privileges are removed, soft budgets are eliminated and competition is introduced, some groups gain benefits but other might suffer losses. In reality, policy makers in transitioning countries have to face up with challenging issues not only in efficiently facilitating the process but also solving potential conflicts between economic domains.

Recently, the privatization of Vietnamese SOEs has gradually slowed down despite efforts of reformers. At the end of 2015, Vietnamese government officially admitted missing their priority target of equitizing 432 SOEs in the period 2010-2015. That event attracted considerable attention and arguments on the effectiveness of privatization. Does privatization really help Vietnamese SOEs improve their business performance? And if so why is it hard to privatize remaining SOEs? Is there any differences in the privatization before and after the global financial crisis?

This paper tries to shed more light on the policy issue by providing an empirical assessment on the economic impacts of privatization. We combine propensity score matching and double differences methods. Major findings are threefold: First, the study confirms that the privatization produces positive effects on firms' profit, labor productivity and financial health. Second, there are no significant improvement in terms of revenues and employment. Third, the impact is heterogeneous between two periods, before and after 2007 probably due to external impacts of the world financial crisis.

The rest of the paper is structured as follows: In part 2, we will present a background of privatization. After that, a literature review on the topic is in part 3. The methodology is explained in details in part 4. Then, descriptions and the use of dataset are provided in part 4. Part 6 discusses some main findings. Last but not least, part 7 summaries results and gives some policy recommendations.

2. The privatization of Vietnamese SOEs at a glance

It would be essential for us to understand the context of privatization of Vietnamese SOEs. The privatization of SOEs in Vietnam is widely known under the term "equitization". the socialist government did not want to use "privatization" because it seems contradict to the ideology of Marxism. However, there are no major differences in the essence of equitization and privatization. Therefore, in order to avoid confusion, if any, only the term "privatization" is used in this paper.

Since 1986, Vietnamese government has carried out substantial institutional reformation to accelerate the structural transformation toward market economy. One of the key pillars of

Vietnamese restructuring plan is the privatization of SOEs that play a dominant role in important industries and sectors. It is thus expected that the privatization of SOEs could significantly improve business performance and productivity of the whole economy.

According to Central Institute for Economic Management (CIEM) (2005) the privatization of Vietnamese SOEs aims at three main objectives: (i) Converting SOEs into multi-ownership companies for SOEs that is not necessarily fully owned by State; mobilising capital in the economy in order to enhance financial strength, renovate technology, and improve management methods of enterprises; (ii) ensuring a harmonious combination of various interests of the State, enterprises, investors, and employees; (ii) improving transparency and information disclosure requirements subject to market rules.

Basically, the privatization of Vietnamese SOEs has been conducted by transforming State companies into joint stock companies. In fact, a SOE could be privatized by three main methods: (1) keeping the amount of State owned capital in the enterprise unchanged and issuing additional shares to raise more capital, (2) selling part of the current amount of State owned capital in the enterprise, or combining a partial sale of the current amount of State owned capital in the enterprise with issuing more shares, (3) and selling the whole amount of State owned capital in the enterprise or combining a complete sale of the current amount of State owned capital in the enterprise with issuing more shares.

Regarding to procedure, the privatization is implemented by the following stages: (1) preparing an privatization plan including taking inventory, dealing with financial problems, redundant employees and valuation of the enterprise, (2) organising the sales of shares at direct auction sales held at the enterprise or selling shares through intermediary financial institutions and securities trading centers, and (3) finalising the transformation of the enterprises into joint stock companies. Notably, the sale or issuance of shares strictly follows criteria of State ownership depending on the scale, fields and industry of SOEs. For example, SOEs which do not belong to core industries²- could be sold mostly even entirely. On the other hand, for strategic SOEs, the government would sell only a minority shares to maintain controlling power. There are some capital thresholds of state ownership in privatized SOEs, such as 75%, more than 50%, less than 50% and 0%.

3. Literature review

The reformation of SOEs in transitioning economies has attracted considerable flow of literature. In this section we will discuss both studies on privatization in general and studies on the case of Vietnam in particular.

² See a detail list of strategic industries in Decision 14/2011/QĐ-TTg on “criteria for and classification of wholly state-owned enterprises and equitized enterprises of which over 50 per cent of shares are held by the State” and Decision 929/QĐ-TTg on the approval for Project “Reforming state owned enterprises with special focus on State Business Groups and General Corporations in the period 2011-2015” for the criteria, category to classify SOEs.

For the first branch of literature, there have been extensive studies on key features of the privatization process with a focus on China and other transitioning economies. Djankov and Murrell (2002), based on meta-analysis from previous studies on transition economies, concluded that privatization to outside owners brings better economic performance than privatization to insiders (current managers or workers). However, the research did not take China into account to test the robustness of its findings.

Estrin et.al, (2009) filled that research gap by conducting a comparative study on the effects of privatization on efficiency, profitability, revenues, and other indicators of firms in East Europe and China. The study found that the effect of privatization is mostly positive in Central Europe. This impact became more prominent in later period of economic transformation. Especially, a switch to foreign owners control, would result in considerably improved performance. Similarly, the high concentration of private ownership³ has a stronger positive effect on performance than dispersed ownership. And contrary to the prediction of the theoretical framework, privatization did not lead to a reduction in employment. Estrin et. Al (2009) provides an excellent review on related literature on the case of East Europe and China; however, as a literature study in its nature, it does not help us to learn any empirical process to generalize outcomes for the case of Vietnamese SOEs.

To date, one of the most comprehensive/important studies on this line of research in China is Bai et al. (2009). Employing a fixed effect model and Heckman two-stage estimation, the study reveals that the privatization of China's state-owned enterprises resulted in a long-term sustainable positive profit gain. However, there is little impact on employment. In addition, firms whose state ownership is reduced to minority⁴ are more likely to have a better performance. However the research is not without weaknesses. The main indicator of business performance is sales per labor, which is problematic because it does not control for intermediate inputs. Another concern is a dataset is limited to manufacturing Chinese SOEs. Given the fact that SOEs cover all economic activities in Chinese economy, the representativeness is questionable.

One brilliant solution is offered by Todo, Inui & Yuan (2012) which utilized total factor productivity (TFP) as a main measurement for productivity. By a combination of propensity score matching and double difference method the authors confirmed previous findings on the positive impacts of privatization on productivity, size and smaller ratio of long-term debts to total assets. The author also found that privatized SOEs have larger probability of exporting. The study still has room for improvement because it did not distinguish different type of privatized SOEs.

Secondly, regarding to the second branch of research which focuses on the case of Vietnam, little has been done on the impact of privatization on firm's business performance.

³ High concentration of private ownership means few private shareholders hold a majority of company's shares. While dispersed ownership means shares are hold by many small shareholders.

⁴ Less than 50% state ownership

So far, one of the most prominent studies in the field is CIEM (2005), the study is based on a survey of 559 equitized enterprises in 23 provinces and cities. The study finds that privatization could generate positive effects on sales, value-added, number of workers, wages, total assets, export, and profit on sales ratios. Although the survey was well designed, this paper only provides descriptive statistics and has no any econometric techniques to back up the results. An empirical analysis is thus necessary to detect the causality.

Partly filling the gap of knowledge on the topic, Pham & Carlin (2008) analyzed a pooled time series data of 24 listed SOEs to test the effect of privatization on firm's financial status. The results suggested that after being privatized, firms generally exhibit reductions in profitability, improved liquidity, some degree of improvement in working capital management, an increase in financial leverage accompanied by a higher degree of solvency risk and greater calls on cash resources for the purpose of funding capital expenditure. Given a sample size is not sufficiently rich, it is difficult to form a comprehensive assessment and generalization for the whole privatization.

Besides, there are comprehensive studies on the reformation of Vietnamese SOEs with regard to legal aspects, economic efficiency as well as political-institutional factors, such as CIEM (2012), Bá (2013), Sjöholm (2006) & Minh (2013). While proving a range of useful insights, these studies did not focus on the impact of privatization. The evaluation of business performance of SOEs is quite limited on statistics without a sound econometric framework.

Standing on this fact, this paper fills the research gaps by providing empirical proofs for the economic effects of privatization on business performance of Vietnamese SOEs

4. Methodology:

4.1 Empirical framework

In order to evaluate the effect of privatization one can simply compare the mean of outcome indicators between privatized SOEs and non-privatized SOEs. However, this approach does not control for selection bias, since the privatization is not randomly assigned for SOEs. For example, large SOEs, SOEs operating in core industries or central SOEs, are probably more difficult to be privatized than SOEs in other categories. In the presence of nonrandom assignment, the untreated group (non-privatized SOEs) is unlikely to be an appropriate benchmark for comparison for the treated group (privatized) because of selection bias. In this context, the simple estimator based on the difference in means between treated and untreated groups is affected. Therefore, it is necessary to account and adjust for such differences to produce accurate estimates. One such method is propensity score matching, technique developed by Rosenbaum and Rubin (1983)

In the PSM estimation, we need to identify the average effect of treatment on the treated (ATT), i.e., the average effect of privatization on labor productivity, employment, financial conditions, profitability. ATT could be expressed by the following formula:

$$ATT = E(Y_1 - Y_0 | D = 1) = E(Y_1 | D = 1) - E(Y_0 | D = 1) \quad (1)$$

Where D is a dummy variable for privatization, D=1 means privatized SOEs (treated group), D=0 means non-privatized SOEs (untreated group). Y denotes outcomes (productivity, financial status, etc) which depend on D. Y_1 and Y_0 indicate outcomes with and without treatment, respectively

In words, ATT is the average difference between the outcome of privatized SOEs and their counter-factual outcome. Unfortunately, we can not observe the counterfactual outcome ($E(Y_0 | D = 1)$) because it is impossible to see at the same time the outcome of privatized SOEs and their outcomes if they had not been privatized. We can only observe the outcome of non-privatized control SOEs ($E(Y_0 | D = 0)$).

There are two important assumptions for the validity of ATT. First, Rosenbaum & Rubin (1983) proves that if the uptake of the program is based entirely on observed characteristics (X), the potential outcomes are independent of the treatment status:

$$(Y_1, Y_0) \perp\!\!\!\perp D | X \quad (2)$$

(2) is termed “unconfoundedness”, or “conditional independence”. If unconfoundedness is hold, the treatment assignment is as good as random after controlling for X. This property is crucial for correctly identifying the impact of the treatment, since it controls for differences between two groups. This allows us to use the untreated units (non privatized SOEs) as a counterfactual for the privatized SOEs.

The second necessary assumption is common support: $0 < P(D = 1 | X) < 1$. It means the proportion of treated and untreated SOEs must be greater than zero for every possible value of X.

If these two above assumptions are satisfied, Rosenbaum and Rubin (1983) shows that potential outcomes are also independent of treatment conditional on the probability that the firm is privatized, or the propensity score $P(X)$. ATT in equation (1) becomes:

$$ATT = E[Y_1 | D = 1, P(X)] - E[Y_0 | D = 0, P(X)]$$

$E[Y_1 | D = 1, P(X)]$ is estimated by the average of actual outcomes of privatized SOEs. Each privatized SOE is matched with a non privatized SOE that has a similar propensity score in case of nearest neighbor matching or the weighted average of remaining SOEs using their propensity scores in case of radius, kernel matching⁵, etc. Then, the second term, the expected outcome of privatized SOEs if they had not been privatized, can be estimated by the average outcome of the matched remaining SOEs.

Given the availability and wide scope of the data, we can employ a difference-in-differences (DID) combining with PSM to estimate ATT as proposed by Heckman et al. (1997, 1998). In particular, we examine the treatment effect on the change of outcomes. DID-PSM estimation can eliminate time-invariant effects on the outcome variables. With a panel data over two time periods $t=\{1,2\}$, the DD estimator for the mean difference in outcomes Y_i^t across treated SOE ($i=1$) and non treated SOE ($i=0$) in the common support is given by:

$$ATT_{PSM}^{DD} = \frac{1}{N_1} [\sum (Y_1^{t2} - Y_1^{t1}) - \sum w(1,0)(Y_0^{t2} - Y_0^{t1})].$$

N_1 denotes for number of privatized SOEs. Y_1^{t2}, Y_1^{t1} are the outcomes for a privatized SOEs in two time period $t=2$ & $t=1$. Y_0^{t2}, Y_0^{t1} are the outcomes for a non privatized SOEs in two time period. $W(1,0)$ is the weight used to aggregate outcomes for the matched non privatized SOEs. Various weighting schemes are used to calculate the weighted outcomes of the matched comparators⁶.

4.2 Practical procedure

In order to examine the effects of privatization, the first step is defining the treatment group and control group. In this paper, treatment group is defined as fully state owned enterprises (100% SOEs) in year $n-1$ whose shares of state capital was reduced to below 50% in the next year (year n). Control group is 100% SOEs in both years

In the data set classification of these two groups is based on the change of their legal forms. There are 14 legal forms of enterprises, in which legal forms from 1 to 4 are 100% SOEs, legal form 5 is SOEs in which the State owns more than 50% shares, form 6 is collectives and 7 to 14 are private, FDI firms and enterprises in which the State holds less than 50% shares. So if a firm changes their legal form from (1-4) in year $n-1$ to (7-14) in year n , it is in treatment group. Given privatization is hard to reverse, we assume that if a SOE privatized more than 50% in year n it will

⁵ See World bank (2010) for detailed formula of different matching algorithms.

⁶ See World bank (2010) for explanations on the use of weights in matching.

remain as a non-state enterprise in the following years. For control group, we include SOEs that have legal forms (1-4) in both year n-1 and year n.

In the next step, we have to construct the propensity score by selecting a model and using appropriate characterizing variables. The probit model is chosen with privatization dummy (value 1 implies for treatment status and 0 for non treatment status) being the dependent variable. The covariates (or observed characteristics) denoted by X are supposed to affect both of probability of participation in the privatization and the outcome (business performance) while they are not directly affected by the treatment.

Following Todo, Inui & Yuan (2012), we introduce seven groups of covariates to represent enterprise' characteristics: productivity, financial status, size, experience, industry, year and region. The main reason for choosing these covariates is they can affect to the chance of privatization. For example: SOEs with high productivity, healthy financial status are more attractive to outside investors so it could be more easily privatized. In contrast, SOEs with huge amount of employees, and have strategic businesses that State wants to control, might have less chance of privatization.

First, we employ labor productivity as the ratio of added value per labor as a measurement for productivity. Labor productivity enters the model in logarithmic form. In Bai et.al (2009), labor productivity is calculated by revenue per labor but that measurement does not take into account intermediate inputs. A company specialized in reselling activities, such as a retailer could rank very high by this measure (Gal, 2013).

Therefore, in order to measure labor productivity more accurately, we chose added value per labor following Tran Toan Thang (2011) because value added itself is the difference between output (revenues) and intermediate inputs. The added value is adjusted to real level by GDP deflator. For financial status, we use liquidity ratio measured by current assets divided by current liability. For firm size, we use the log of average employment in a year as the indicator. Firm experience is represented by total business years since establishing year. To deal with missing data on establishing years, we exploit advantage of panel data by finding missing information in firm's record in other years. If a firm has more than 1 year of establishment, we use an establishing year that has more records.

And lastly, dummies for twenty main industries in VSIC2007,⁷ dummies for years and dummy for six main economic regions are constructed (see appendix 4). We also use the square term of the log of labor productivity, the log of employment, and the age to control for possible non-linear relations.

Based on the propensity score estimated from the probit model, we employ three alternative matching methods to create the matched control observations: nearest neighbor matching using

⁷ VSIC2007: Vietnam Standard Industry Classification 2007. Before 2007, Vietnamese firms were classified by VSIC1993. Classification by VSIC1993 are recoded in order to ensure the consistency with the VSIC2007.

one nearest neighbor, radius and kernel matching. The use of three methods above is necessary to check the robustness of results because each of method has their own advantages and disadvantages. According to Heinrich, Maffioli & Vanquez (2010), the nearest neighbors matching is excellent in term of bias reduction because it uses the most similar control observation to match. But it is not as efficient as radius and kernel method which make use of a lot of information, therefore, reduce variances.

In the nearest neighbor matching, a SOE from the control group is chosen as a match for a treated SOE in terms of the closest propensity score. In the case of radius matching, it uses as many comparison cases as are available within the caliper (score distance) that is set at 0.05. In the case of kernel matching, each treated observation is matched with the weighted average of all control observations in the common support region. We use the default Epanechnikov kernel function and default value of bandwidth 0.06 in STATA as required for kernel matching. The study uses a program developed by Leuven and Sianesi (2003), **psmatch2** in Stata to implement PSM.

After the matching, it is important to check the quality of matching by conducting a balancing test. We do that by using **pstest** – a command in **psmatch2** package to compare the mean of each covariate between the treatment and the control group after matching. **Pstest** is handy because it provides the information about t statistic, the percentage of bias reduction as well as the visual graph. If our matching is well done, the t statistic should be insignificant, the bias reduction should be sufficiently high and the lines of density of propensity score after matching of two groups should be similar (Heinrich, et.al (2010)). If the matching is not good because of irrelevant variables, we can just eliminate them from the set of covariates and redo the process until it passes the balancing tests.

After propensity scores have been estimated and a matching algorithm has been chosen, we compute the DID-PSM to estimate the impact of the privatization on business outcomes. Following, Todo, Inui & Yuan (2012), we consider the change of outcomes from year n-1 to year n, from year n-1 to year n+1 and from year n-1 to year n+2 to investigate the short and medium term relationship of privatization and business performance.

5. Data description and processing

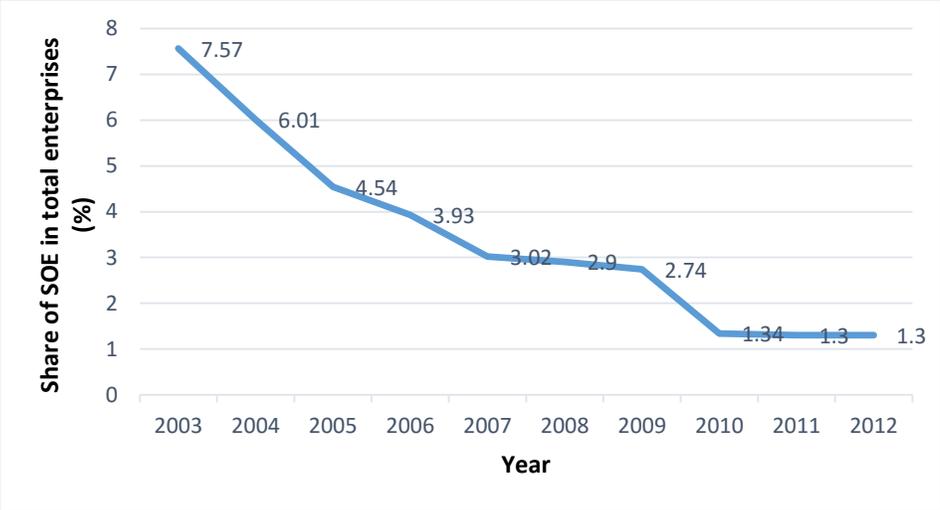
Our data is extracted from Vietnam Enterprise Survey conducted by the General Statistics Office of Vietnam in the period 2002-2012. The survey provides rich information including firm's identification, their operation and performance information extracted from balance sheets and income statements. The dataset covers enterprises in all industries and regions.

It is essential to construct a firm-level panel data set from the original data set. First of all, we use a set of consistent firm identifications such as tax code and identification code to construct an unbalanced panel. We drop firms without tax codes. If firms have duplicate tax codes, only one firm is kept. And because we wish to examine the effect of privatization process, we only keep firms that appeared at least three consecutive years during the sample period. Figure 1 shows us

that in 2002, SOEs accounted for 9.38% of total enterprises but it rapidly fell down to 1.3% in 2012. It suggests that our data sample covers a period of massive privatization which is good for research objective.

Figure 1: share of SOE sector in total number of enterprises in period 2002 2012

Source: Author’s calculation



Secondly, we drop observations which do not belong to either treatment or control group as defined in 4.2. In addition, we drop all firms whose legal form is collectives like Pham The Anh & Nguyen Duc Hung (2014). Although collectives do some small business and are owned by the state, they do not operate like a firm according to Law on Collectives, 2003.

We exclude firm-year observations with unreasonable value of key variables. This includes firms with negative added value, non-positive revenue and employment, negative fixed asset, negative or unreasonable firm age (higher than 100), firms with ROA & ROE higher than 100% or lower than -100% and some outliers of labor productivity, liquidity ratio. To eliminate outliers, we use scatter graph to look at the distribution and remove only one or few radical ones. Outliers can also be valid observations, so it might do more harm than good if we try to remove outliers without any sound economic rationale.

The final data sample consists of 38531 firm-year observations. Treatment group has 1532 firms that make up 8215 firm-year observations. The control group has 4662 firms that make up 30316 firm-year observations.

Table 2 presents summary statistic of the sample. According to table 2, an average firm in the sample has: logarithm of labor productivity (added value per labour) is 4.27, 17.75 years old, 455 employees, average sale is 340703 VND millions, liability ratio is 0.61, liquidity ratio is 2.17, ROA is 3.5% and ROE is 8.7%.

Table 2: Summary statistic of key variables*Source: Author's calculation*

Variable	Obs	Mean	Std. Dev.	Min	Max
Logarithm of labor productivity	38,531	4.27	1.05	-2.07	11.21
Age	38,531	17.75	12.96	1	99
Employment	38,531	454.67	1700.11	1	88173
Revenue (VND million)	38,531	340703.40	3017455	1	194000000
Liability ratio	38,508	0.61	0.37	-0.88	9.69
Liquidity ratio	38,268	2.17	99.28	-7069.64	12937
ROA (%)	38,531	3.50	7.09	-95.43	87.58
ROE (%)	38,531	8.71	16.30	-99.77	99.98

Is there any difference between privatized and non privatized firms? Table 3 provides general statistics of two groups before matching. Generally, non privatized SOEs tend to be older, more productive, twice larger in terms of employment, earn higher revenue, have lower liability ratio, higher liquidity ratio and involve in more business fields. However, the profitability (ROA, ROE) of privatized SOEs is better than non privatized SOEs. Noting that this is only a rough comparison, in the next part we will test the significance of these differences by DID-PSM method to produce more solid results.

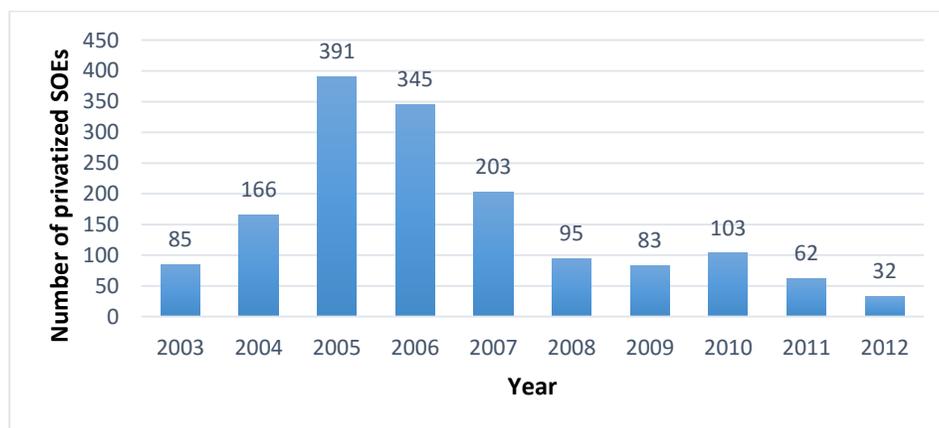
Table 3: Summary statistic of key variables of treatment and control groups*Source: Author's calculation from the data sample*

Variable	Non privatized SOEs			Privatized SOEs		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Logarithm of labor productivity	30,316	4.32	1.09	8215	4.11	0.86
age	30,316	18.37	12.90	8215	15.43	12.92
employment	30,316	511.11	1893.42	8215	246.39	521.37
Revenue (VND million)	30,316	397200.9	3390846	8215	132209.20	468925.10
Liability ratio	30,299	0.60	0.38	8209	0.68	0.32
Liquidity ratio	30,111	3.17	86.54	8157	-1.54	136.31
roa_percent	30,316	3.36	6.95	8215	4.03	7.53
roe_percent	30,316	8.03	15.66	8215	11.21	18.28
Number of business fields	30,316	1.60	0.97	8215	1.55	0.95

Figure 2 illustrates that there were about 1565⁸ privatized SOEs, accounted for 27.73% of total SOEs in the data sample in the period 2002 to 2012. Before Vietnam joined WTO in 2007, the privatization quickly speeded up from 85 SOEs in 2003 to 391 SOEs in 2006, which were a pretty high number. However, after joining WTO and being seriously hit by global financial crisis in 2007, 2008, the number of privatized SOEs sharply decreased. Clearly, the bad international and domestic economic prospect hinders the privatization process greatly by reducing the demand and interest in privatized SOEs. But one more reason that could explain for the decreasing trend is Vietnam used a “cherry picking” strategy in the privatization of SOEs. Most of potential and non strategy SOEs were “sold out” quickly at the first half period. The remaining SOEs were almost not attractive enough or political important so it was difficult to privatize them.

Figure 2: Privatized SOEs in period 2003 -2012

Source: Author’s calculation



We examine impacts of privatization on business performance using the set of indicators for firm performance include: size of operation (logarithm of employment), labor productivity (added value per labor), revenue, liability to asset ratio, and profitability (ROA, ROE). All nominal number are expressed in million of VND (Vietnamese currency). For added value, it is adjusted to real level by divide for GDP deflator index in each year. Then, in order to use double different estimation, we need to calculate the change of each indicator between year n-1 (before privatized) and n, n-1 and n+1, n-1 & n+2.

⁸ There are 1532 privatized left after cleaning process. 33 firms are deleted in the cleaning process.

6. Results and discussion

6.1 Results of probit estimation and balancing test

As stated above, we run a probit model to estimate how SOEs are chosen for privatization. Table 2 reports the result of the probit regression. Six features stand out from the table.

Firstly, according to the results shown in Table 2, almost of key variables are significant at 1% level except liquidity ratio. It means almost covariates are good predictors for the chance of privatization.

Secondly, the positive coefficient of logarithm of labor productivity implies that labor productivity has a positive effect on the probability of privatization. In another words, a more productive SOEs tends to have higher chance of privatization. However, the negative coefficient of the square term, \ln_avp2 suggests that super productive SOEs are harder to be privatized.

This inverted U-shape effect explains the fact that the government often chooses productive SOEs to privatize first because this helps attract investors, and thus, brings benefits. But the government's unwillingness to privatize a key SOE with excellent performance, may be due to her substantial contribution to tax revenues, or her political importance. An example is State business groups or State general corporations⁹.

Dependent variable: <i>privatization dummy</i>	(1) Before matching
Independent variables:	
Logarithm of labor productivity	0.165*** (0.0428)
Square of logarithm of labor productivity	-0.0372*** (0.00478)
age	-0.0299*** (0.00216)
age2	0.000371*** (4.09e-05)
Logarithm of employment	-0.168*** (0.0394)
Squared of logarithm of employment	-0.00849** (0.00385)
Liquidity ratio	-0.000317 (0.000206)
Constant	-2.321*** (0.691)
Observations	38,268
Industry dummy	YES
Region dummy	YES
Year dummy	YES
Log pseudelikelihood	-14363.227
Pseudo R2	0.2756

Table 4: Probit estimation before matching

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

⁹ In state sector, State Business Groups (SBGs) and General Corporations (GCs) hold majority share of state equity and assets. According to CIEM (2012) in 2010, SBGs and GCs hold about 59% of total state equity. They also accounted for 70% in total before tax profit of 100% SOEs. In some industries, SBGs & GCs are dominant producers: 99% of fertilizer production, 97% of coal mining, 94% in electricity, gas production; 91% in telecommunication, 88% in insurance and so on. In 2010, Top ten enterprises who paid the most income tax, were all SBGs & GCs.

Thirdly, the firm age has a U-shape effect which means a young SOE has lower propensity to privatize than a more established one.

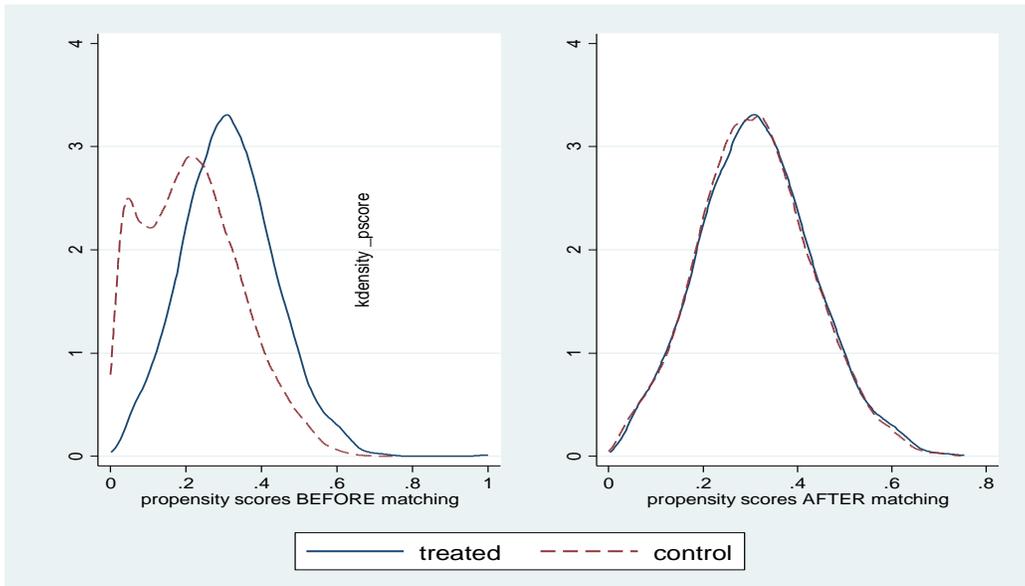
Fourth, smaller firms in terms of employment are also more likely to be privatized. It could be explained by the fact that employment in SOEs often worried about their jobs if their company is privatized and therefore, become reluctant to support for the privatization. Moreover, every SOE has to prepare a detail plan for redundant employees after privatization, so it often takes longer time and more efforts for a large SOE with abundant labor force to set up a retired plan or social security policies for their thousands labors. According to CIEM, (2012) redundant employees of post-privatization is one of the most difficult problem that significantly hinder the privatization of SOEs.

Last but not least, the liquidity ratio has a negative effect, implying that firms with larger net current asset are less likely to be privatized. It suits well with the fact that SOEs with large current assets like land, factories or other fixed assets, often face difficulty in the process of revaluating their assets. According CIEM (2012), the revaluation of SOE's asset is an obstruction to privatization because SOEs were not allowed to reevaluate their current assets as lower value than book value of these assets. However, value of asset changes overtime and in fact, the market value of asset could be lower than their booked value at the time of privatization. Thus, this legal constraint badly influence to SOEs with large current assets. However, the coefficient is not significant at 5% level, which implies that this relationship is not significant.

After obtaining propensity score from the probit estimation, we match privatized SOEs with non-exporting SOEs by STATA (psmatch2) and check whether the pre-privatization conditions are similar between the two groups. The results of balancing test could be seen by figure 3, 4 and table 5.

Figure 3: Density of propensity score before and after kernel matching

Source: Author's graph conducted by STATA

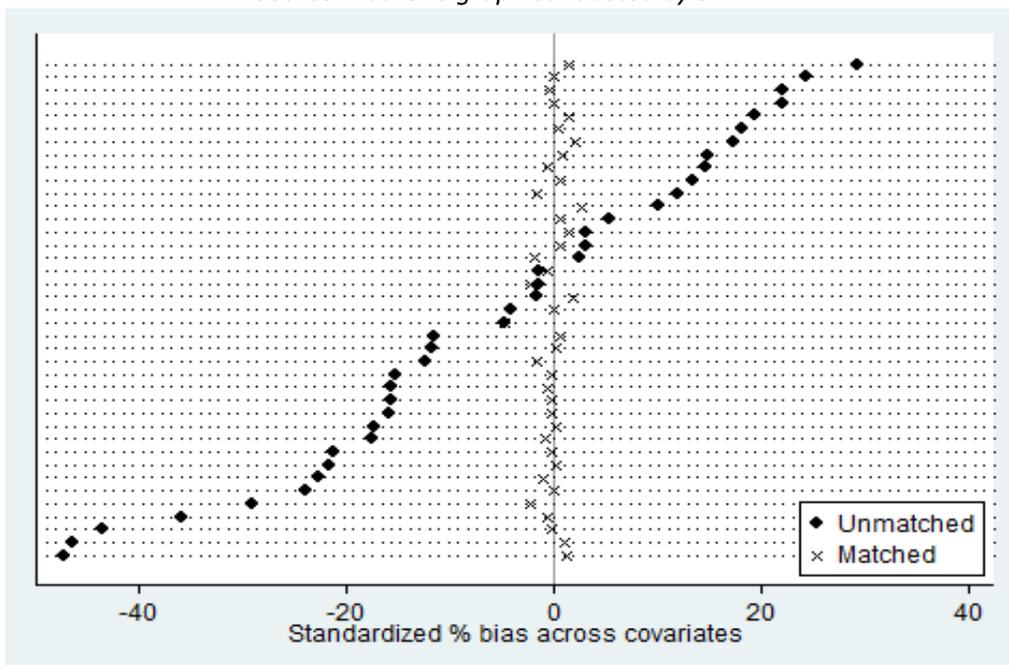


In figure 3, we can see that after kernel matching, the distribution of propensity score between two groups is almost similar, which means the match was able to find a good comparison between each observation of treatment and control group.

Figure 4 illustrates that, after matching, matched firms have the same distributions of all covariates with small bias compared to unmatched firms. It suggests a successful balance matching.

Figure 4: Reduction of bias across covariates of matched and unmatched observations

Source: Author's graph conducted by STATA



Although graphs show interesting features of matching, it is necessary to see the test result to make sure a balancing test is satisfied. Table 5 shows us the balancing test results. Although privatized SOEs and remaining SOEs are systematically different in their mean of covariates before matching, the two groups later share similar mean of characteristics after kernel matching. In addition, for every characteristic after matching, the percentage of bias reduction is almost 100%, p value is larger than 0.05. Thus we cannot reject the null hypothesis that mean of two groups are similar. The results from these balancing tests indicate that the matching is successfully done.

Table 5: Results of balancing tests

Source: Author's calculation

Variable	Unmatched	Mean		%bias	%reduction of bias	t-test	
	Matched	Treated	Control			t	p>t
Logarithm of labor productivity	U	4.1076	4.32	-21.6		-16.34	0.000
	M	4.1661	4.1646	0.2	99.3	0.09	0.926
Square of logarithm of labor productivity	U	17.614	19.85	-24		-17.48	0.000
	M	18.041	18.049	-0.1	99.7	-0.05	0.960
age	U	15.43	18.375	-22.8		-18.34	0.000
	M	15.219	15.353	-1	95.5	-0.52	0.601
Age ²	U	405.05	504.08	-15.2		-11.95	0.000
	M	401.97	403.4	-0.2	98.6	-0.11	0.909
Logarithm of employment	U	4.6286	5.2476	-47.4		-37.64	0.000
	M	4.7625	4.747	1.2	97.5	0.65	0.516
Square of logarithm of employment	U	23.051	29.318	-46.4		-35.69	0.000
	M	24.151	24.014	1	97.8	0.57	0.566
Liquidity ratio	U	-1.5365	3.1702	-4.1		-3.80	0.000
	M	1.6074	1.6052	0	100	0.01	0.992

Following the successful balancing test, we now can investigate the effect of privatization on the outcome of interest. The following table presents effects of privatization in 2002-2012 period by kernel matching method. Besides, the robustness of findings is also checked by radius and nearest neighbor matching method. In three cases, results are found to have similar trends. For short, only the results of kernel matching are presented. Detailed estimation of radius and nearest neighbor matching could be found in the appendix.

6.2 Effect of privatization on firm's performance in period 2002-2012

Table 6. Effects of privatization in 2002 -2012 period

Source: Author's calculation

Outcome variables	Time difference	Mean for treatment group	Mean for control group	Difference	t statistics
Labor productivity	$Y_t - Y(t-1)$	-1.327	-42.883	41.556	3.45***
	$Y(t+1) - Y(t-1)$	1.557	-30.075	31.632	1.99**
	$Y(t+2) - Y(t-1)$	5.233	-12.203	17.436	1
Employment	$Y_t - Y(t-1)$	-16.811	-25.287	8.476	0.73
	$Y(t+1) - Y(t-1)$	-22.881	-22.158	-0.724	-0.05
	$Y(t+2) - Y(t-1)$	-31.428	-25.778	-5.650	-0.31
Revenue	$Y_t - Y(t-1)$	13787.209	6436.225	7350.984	0.32
	$Y(t+1) - Y(t-1)$	36558.571	49617.194	-13058.623	-0.41
	$Y(t+2) - Y(t-1)$	54053.067	71956.718	-17903.650	-0.48
ROA	$Y_t - Y(t-1)$	0.295	-0.286	0.581	5.78***
	$Y(t+1) - Y(t-1)$	0.652	0.042	0.610	4.8***
	$Y(t+2) - Y(t-1)$	0.983	0.323	0.661	4.31***
ROE	$Y_t - Y(t-1)$	0.771	-0.551	1.322	4.51***
	$Y(t+1) - Y(t-1)$	1.338	0.065	1.273	3.62***
	$Y(t+2) - Y(t-1)$	1.828	0.796	1.032	2.47**
Liability	$Y_t - Y(t-1)$	-0.011	0.006	-0.017	-4.14***
	$Y(t+1) - Y(t-1)$	-0.021	0.003	-0.024	-4.76***
	$Y(t+2) - Y(t-1)$	-0.028	0.001	-0.029	-4.85***

Table 6 reports four main findings of the relationship between privatization and firm performance. *Firstly*, according to the estimation of PSM, after privatization the labor productivity growth is positive and statistically significant. This finding is consistent with Bai et.al, (2009) and Todo, Inui and Yuan, 2012. For the case of Vietnam, after one year of privatization, the added value per labor increased about 20.3 VND million¹⁰ to 41.55 VND million. However the differences of labor productivity did not accelerate overtime. It possibly because of the negative impact of global financial crisis as well as unhealthy business environment which harmfully affected more to non state owned enterprises.

One more feature about productivity after privatization is that it reduced in the first year after privatization and increase significantly in the next two year. It implies that privatized firms need time to make adjustment to achieve efficiency.

¹⁰ Estimated by nearest neighbor matching

Secondly, what kind of adjustment that privatized SOEs had to decide to achieve greater efficiency? One of key factor is employment. According to our results, there is no significant evidence to prove that privatization leads to reduction of firm's employment. Once again, it is similar to what Bai et al, 2009 found in Chinese case. In Vietnam situation, despite the fact that the sign of coefficient shows a decreasing trend of employment in every year, but the reduction applied for both of two groups. So what could be the reasons for decreasing trend of labor in SOEs? One possible explanation is the movement of labor from state sector to non state sectors which had a rapid growth in the period. As we can see in the figure 1, the number of SOEs sharply fell down which means the private and FDI firms have skyrocketed. If this is the case, it is good news for economy because the movement of labors from non efficient sector to more efficient sector will boost up productivity and economic growth for the economy. However, another possibility is workers in the whole economy just lost their jobs because of negative impacts of external factors, such as global financial crisis. If this possibility were the main cause, it does not only hinder economic growth but also poses a challenging issues for Vietnamese economy that is high unemployment.

In order to solve that puzzle, in the next part, we will test separately two sample data before 2007 and after 2007 with the same methodology and procedures. The year 2007 is chosen because there were two remarkable event in this year: Vietnam joined WTO, and the start of global financial crisis. The participation of Vietnam in WTO facilitated her international, regional trade but it also made the small economy becoming more vulnerable to global economic crisis.

Thirdly, despite having no significant effect in revenue, the profitability of privatized SOEs were significantly improved than non privatized SOEs. For ROE ratio, a privatized SOEs tend to have about 1.03% to 2.89%¹¹ higher than a matched non-privated SOEs. And for ROA ratio, the treatment group has a mean about 0.58 % to 0.82%¹² higher than control group. This is a big improvement given the mean of ROA ratio is only 3.5% for the whole sample. All results are significant at 1% level.

Fourthly, the results also profoundly indicate that privatization resulted in lower liability ratio for privatized SOEs. According to Table 8, in the year of privatization, the liability ratio of privatized SOEs were reduced by 1.7% higher than control SOEs. In the next two years, the reduction were even further, to 2.4% in next year and 2.9% in two year after privatization. Both of radius and nearest neighbor matching have same findings.

One possible way to interpret the improve in profitability and financial soundness of privatized SOEs is because after privatization, the company was no longer enjoy soft budget from government as well as easy access to capital. Therefore, company had to use resources more efficiently. Besides, shareholders, investors can impose more pressures on the Board to improve returns and reduce debts.

¹¹ Result in nearest neighbor matching

¹² Result in nearest neighbor matching

6.3 Comparison of privatization between two periods 2002-2006 & 2007 -2012

Table 7: Different impacts of privatization before and after 2007

Source: Author's calculation

Outcome variables	Time difference	2002-2006			2007 2012		
		Mean for treatment group	Mean for matched control group	Difference	Mean for treatment group	Mean for matched control group	Difference
Labor productivity	Yt - Y(t-1)	13.211	2.546	10.665	-4.501	-51.006	46.504***
	Y(t+1) - Y(t-1)	15.240	19.136	-3.896	-3.295	-47.033	43.738*
	Y(t+2) - Y(t-1)	6.172	33.030	-26.857	-1.573	-22.851	21.278
Employment	Yt - Y(t-1)	-43.125	-24.307	-18.818	-6.146	-21.896	15.75
	Y(t+1) - Y(t-1)	-42.038	-18.839	-23.199	-14.509	-6.826	-7.682
	Y(t+2) - Y(t-1)	0.143	-57.628	57.77*	-23.492	-14.251	-9.240
Revenue	Yt - Y(t-1)	3646.137	2530.682	1115.455	16444.810	7287.837	9156.97
	Y(t+1) - Y(t-1)	13285.727	13894.522	-608.795	42581.582	102525.997	-59944.415
	Y(t+2) - Y(t-1)	20518.075	31936.816	-11418.741	64622.464	85547.019	-20924.554
ROE	Yt - Y(t-1)	3.203	-0.628	3.831***	-0.728	-0.827	0.099
	Y(t+1) - Y(t-1)	4.616	0.345	4.271***	-2.553	-2.139	-0.415
	Y(t+2) - Y(t-1)	3.619	0.485	3.134**	-4.199	-2.479	-1.72***
ROA	Yt - Y(t-1)	1.008	-0.040	1.048***	0.148	-0.393	0.245*
	Y(t+1) - Y(t-1)	1.419	0.074	1.346***	-0.566	-0.644	0.078
	Y(t+2) - Y(t-1)	1.092	0.342	0.750	-0.942	-0.805	-0.138
Liability	Yt - Y(t-1)	-0.038	-0.003	(-0.035)***	0.006	0.007	(-0.012)***
	Y(t+1) - Y(t-1)	-0.038	-0.021	-0.017	-0.014	0.006	(-0.0199)***
	Y(t+2) - Y(t-1)	-0.046	-0.025	-0.021	-0.020	0.005	(-0.0251)***

Table 7 generates four key distinct characteristics that we need to take into considerations. *Firstly*, as regard as productivity, there is a substantial difference between two periods. Before 2007, privatization did not statistically improve the labor productivity but after 2007, privatization increased labor productivity a lot. By looking in table 7 statistic and the economic background, it is suggested that the difference of labor productivity were driven by the change of employment.

Before 2007, both privatized SOEs and non privatized SOEs experienced a substantial growth of labor productivity. However, in that period, the average employment of non privatized SOEs decreased more than privatized SOEs. Given labor productivity is measured by added value per labor, so the sharp decrease of labor in non privatized SOEs lead to the increase of labor productivity. For example, there is a statistically significant evidence at 10% level that in period 2002-2006, after 2 years of privatization, a privatized SOE has more than 57 labors compared to matched non privatized SOEs.

Actually, in privatized SOEs, the average labor also sharply decreased in year n and $n+1$ after privatization. But in the year $n+2$, it turned out to bounce back. It's possibly because of the impressive business performance that privatized SOEs achieved after 2 years of privatization. Their ROE increased greatly by 3.1 % to 4.27 % higher than a matched non privatized SOEs, ROA also increased about 1% higher than control SOEs. At the same time, the financial health of privatized SOEs was also better. The estimation shows that, they could reduced their liability ratio by 3,5 % more than a matched non privatized SOE. As the result of better economic prospect, privatized SOEs seem to hire more labors to meet the human demand. Why do privatized SOEs have such of progress? It is because after privatization, a firm would be more profit oriented or more risk taking than SOEs to be profitable. For non privatized SOEs, their poor business performance and the attractiveness of private market were supposed to explain for the drain of labor.

Secondly, In period 2007- 2012, when the global financial crisis and recession stroke, Vietnamese enterprises suffered negatives impacts, such as the decrease of capital flow, foreign investment, shrinking down demand of main trade partners, macroeconomic instability, high inflation, etc. In that context, it is no surprise that business performance of enterprise was not as good as the previous period (2002-2006). For productivity, both of treated and matched control SOEs experienced a decrease but the decrease of productivity in privatized SOEs were slightly while non-privatized SOE's productivity decreased sharply.

Thirdly, regarding to the employment, there was no significant relationship. But the negative difference in mean of change indicates that privatized SOEs tend to reduce more labors in time of crisis. It possibly was the case because privatized SOEs have more rooms to freely adjust their employees since they often have more short term labor contracts. And in turn, the ability to adjust employment helped privatized SOEs to remain productive.

Fourthly, In the period 2007-2012, there was a significant evidence that a 2 years privatized SOE had lower ROE ratio by 1.72% than a comparable non privatized SOE. It could be interpreted that in difficult time, privatized SOEs were more exposed to risks and endured more losses than a fully SOE. There were also a highly significant reduction in liability ratio of privatized SOEs compared with non privatized SOEs. It could reflect the difficulties in accessing capital for privatized SOEs as well as other private firms.

To summary, before 2007, the privatization produced a significantly positive effects on profitability, firm size (employment), financial health and insignificant effect on productivity, revenue. After 2007, privatization helped privatized firms to have higher productivity but suffered more losses and lower liability ratio.

7. Summary and conclusion

This paper applies Propensity Score matching and Double differences method to examine the impact of privatization on business performance of Vietnamese state owned enterprises in the period 2002 to 2012. According to the PSM-DID estimation, we find that privatized SOEs tend to have higher profitability, higher labor productivity and lower debt/asset ratio. That results are generated after successful matching, balancing test and robustness checks. So far, these all findings above are consistent with theoretical framework and previous studies in foreign countries. Our results also offers one explain about the cause of improvement in productivity, profit and financial status that come from the flexibility of labor adjustment after privatization. This could help reduce redundant and inefficient labors, creating more incentives and pressure for company's employees to improve company performance. The probit regression also shows that SOEs with more employees get less chance of privatization.

By studying 2 periods: before 2007 and after 2007, some interesting features of privatization are revealed. Before 2007, privatized SOEs have higher profit, more labors and less liability ratio but their labor productivity were not significantly higher than non privatized SOEs. After 2007, in the context of global financial crisis and recession, privatized SOEs were more vulnerable than non privatized SOEs, resulted in their lower profit ratio. However, even in the difficult time, privatized SOEs were still more productive.

These above findings lead us to suggest some policy implications. Firstly, the privatization of SOEs is proven as to improve significantly productivity, profits and even creating more jobs. But it is not "a cure for all diseases". Privatized or equitized SOEs are more exposed to external risks. Therefore, the government should try to maintain a stable macroeconomic, a healthy and fair business environment, a functioning market which are crucial for the development of enterprises. This is not a new implication since considerable number of studies and research in the past also pointed out the negative affect of business environments to the development and competitiveness of Vietnamese enterprises. But here in my study, it provides one more significant proof that business environment greatly affects to the outcome of privatization

process. If the government does not want to fail again in achieving privatization's objectives, they need to do more to improve business environment in Vietnam.

Secondly, the government can foster the privatization process and boost up profit for privatized SOEs by reforming regulations in labor market that would help SOEs easily and efficiently handle problems of redundant employees.

Last but not least, there are number of issues and potential research directions which future study could address. Firstly, in this study, the added value per labor is used as a measure for labor productivity but it is only the second best. It would be more desirable if we can use TFP (total factor productivity) as a proxy for firm's productivity because it captures more features like capital, technology. Secondly, due to time limitation, we can not examine the impacts of different type of privatization such as fully privatization or partly privatization, state hold majority shares or minority share, etc on the business performance of privatized SOEs. The in depth study with same PSM-DID method on types of privatization, though, would reveal more interesting facts and practical policy recommendations.

References

1. Ba, L. X. (2013). "Reformation of economic institutions and current issues of the reformation process" Autumn economic forum, Tri Thuc publisher, Hanoi
2. Bai, Lu, Tao, 2009 "How does the privatization work in China", *Journal of Comparative Economics* 37 (2009) pp. 453–470
3. CIEM, 2005 "Report of the study on post-equitization of state owned enterprises" Central Institute for Economic management, Hanoi, Sep 2005
4. CIEM, 2012 "The reformation of development of Vietnamese SOEs" National project, Central Institute for Economic management, Hanoi
5. Cuong Duc Pham & M Carlin, 2008, "Financial performance of privatized SOEs in Vietnam" Macquarie Graduate School of Management, Working paper 2008-2, January 2008
6. Djankov, Simeon, and Peter Murrell. 2002. "Enterprise Restructuring in Transition: A Quantitative Survey", *Journal of Economic Literature*, 40(3): 739-92
7. Estrin et.al, 2009, "The effect of privatization and ownership in transition economies" *Journal of Economic Literature*, Vol. 47, No. 3 (Sep 2009), pp. 669-728
8. Gal, P. N. (2013), "Measuring Total Factor Productivity at the Firm Level using OECD-ORBIS", *OECD Economics Department Working Papers*, No. 1049, OECD Publishing.
9. General Statistic Office- Vietnam, 2016 "Efficiency of business of domestic enterprises in the period 2005-2014" Statistic Publishing House
10. Heckman J.J., Ichimura H., Todd P., 1997. "Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme". *Review of Economic Studies*. 64, 605-54.
11. Heckman J.J., Ichimura H., Todd P., 1998. "Matching as an econometric evaluation estimator" *Review of Economic Studies*. 65, 261-94.
12. Heinrich, Maffioli & Vazquez, 2010 "A primer for applying propensity score matching- impact evaluation guideline" Inter- American Development bank
13. Jefferson & Su, 2005, "Privatization and restructuring in China: Evidence from shareholding ownership, 1995–2001", *Journal of comparative economics*, 2006, vol. 34, issue 1, pages 146-166
14. Minh, D.T (2013) "Current situation of enterprises" Chapter 2 in "Vietnam Macroeconomic Report 2013: facing with coming challenges" Economic committee of Vietnamese congress
15. Pham The Anh, Nguyen Duc Hung (2014) "Institutions and Firm Performance", in 2014 Autumn Economic forum, Economics committee of Vietnam national assembly.
16. Phuc, N., and Lin Crase (2011) . "Vietnam's state-owned enterprise reform An empirical assessment in the international multimodal transport sector from the Williamson's TCE perspective," *Asia Pacific Journal of Marketing and Logistics*, Vol. 23, No. 3, page 411-422.
17. Rosenbaum P.R., Rubin D.B., 1983. "The central role of the propensity score in observational studies for causal effects". *Biometrika*. 70, 41-55.
18. Saravia & Chen. (2008). "The Theory of Corporate Governance: A Transaction Cost Economics - Firm Lifecycle Approach", University of Surrey
19. Saul Estrin, Jan Hanousek, Evžen Kočenda and Jan Svejnar, 2009, "The effect of privatization and ownership in transition economies" *Journal of Economic Literature*, Vol. 47, No. 3 (Sep., 2009), pp. 699-728
20. Sjöholm, 2006 "State owned enterprise and equitization in Vietnam" Stockholm School of Economics, Working paper 228, August 2006

21. Todo, Inui& Yuan, 2012, "Effects of Privatization on Exporting Decisions: Firm-level evidence from Chinese state-owned enterprises", RIETI discussion paper series 12E015, March 2012
22. Tran Toan Thang, 2014, "Productivity Spillovers from Foreign Direct Investment: What If Productivity is No Longer a Black Box?", The South East Asean Journal of Management, March 2016
23. Tran Xuan Lich et.al, 2014 "The state business corporations in Vietnam", Ministry of Planning and Investment
24. Worldbank, 2010, "Handbook on Impact evaluation- quantitative methods and practices" The international bank for reconstruction and development, the world bank

Appendix

1. Robustness test for matching and estimation (2002-2012)

1.1 Radius matching

Outcome	Mean for treatment group	Mean for control group	Difference	SE	t statistics
Labor productivity	-1.32713061	-42.8428303	41.5156997***	12.00745	3.46
	1.55707548	-30.2997522	31.8568277**	15.8808	2.01
	5.23271581	-12.0604572	17.293173	17.32812	1
ROE	0.771166748	-0.547275721	1.31844247***	0.292637	4.51
	1.33802768	0.062208749	1.27581893***	0.35132	3.63
	1.82834503	0.80699226	1.02135277**	0.417203	2.45
Employment	-16.8112927	-25.2203655	8.40907281	11.60316	0.72
	-22.8812538	-22.206135	-0.675118811	15.39734	-0.04
	-31.4280895	-25.7919942	-5.63609527	18.38464	-0.31
Revenue	13787.2087	6591.30192	7195.90679	22819.89	0.32
	36558.5708	49803.7591	-13245.1882	31974.49	-0.41
	54053.0673	72264.9245	-18211.8572	37010.65	-0.49
Liability	-0.010842099	0.005869088	0.016711187***	0.004023	-4.15
	-0.020927672	0.002918267	-0.023845939***	0.005015	-4.76
	-0.028256707	0.000614709	-0.028871417***	0.005979	-4.83
ROA	0.295206731	-0.28427326	.579479991***	0.100419	5.77
	0.652162955	0.039911113	.612251843***	0.126986	4.82
	0.98347286	0.328621442	.654851418***	0.153176	4.28

1.2 Nearest neighbor matching (n=1)

Outcome	Mean for treatment group	Mean for control group	Difference	SE	t statistics
Labor productivity	6.52813728	-13.7786033	20.3067406**	8.6009425	2.36
	10.433396	-3.83420516	14.2676011	9.77435184	1.46
	5.30335132	-11.5749432	16.8782945*	9.46381676	1.78
ROE	2.17163363	0.765367145	1.40626648***	0.48687146	2.89
	2.74534763	1.38745142	1.35789621**	0.52932181	2.57

	1.85723787	1.23273371	0.62450416	0.55518446	1.12
Employment	-18.6394092	-23.1904808	4.55107164	6.65238536	0.68
	-23.1750338	-16.9289438	-6.24608998	9.11861769	-0.68
	-31.466982	-28.23296	-3.23402201	9.34830078	-0.35
Revenue	16106.4151	8437.18594	7669.22919	10689.8362	0.72
	39990.4573	41584.0307	-1593.57335	11684.3035	-0.14
	54130.3837	58486.5778	-4356.19403	13525.6422	-0.32
Liability	-0.011223773	0.003523552	-0.014747325**	0.00637709	-2.31
	-0.018877567	0.002489573	-.02136714***	0.00733633	-2.91
	-0.028513444	0.001466427	-.029979871***	0.00829185	-3.62
ROA	0.836278907	0.152950473	.683328434***	0.14970919	4.56
	1.21853165	0.400867782	.817663872***	0.17505099	4.67
	1.00128049	0.251975005	.749305482***	0.1942242	3.86

2. Robustness test for matching & estimation (2002 2006)

Kernel matching 2002 2006

Outcome variables	Time difference	Mean for treatment group	Mean for matched group	Difference	SE	t statistics
Labor productivity	$Y_t - Y(t-1)$	13.211	2.498	10.7128245	10.100	1.06
	$Y(t+1) - Y(t-1)$	15.240	18.962	-3.721	11.933	-0.31
	$Y(t+2) - Y(t-1)$	5.990	32.235	-26.245	17.467	-1.5
ROE	$Y_t - Y(t-1)$	3.203	-0.627	3.82997636	0.574	6.67
	$Y(t+1) - Y(t-1)$	4.616	0.330	4.28524807	0.892	4.81
	$Y(t+2) - Y(t-1)$	3.564	0.435	3.12851519	1.457	2.15
Employ	$Y_t - Y(t-1)$	-43.125	-24.510	-18.6142835	12.959	-1.44
	$Y(t+1) - Y(t-1)$	-42.038	-18.964	-23.0740612	21.450	-1.08
	$Y(t+2) - Y(t-1)$	0.224	-52.455	52.6790387	37.014	1.42
Revenue	$Y_t - Y(t-1)$	3646.137	2475.775	1170.36243	13713.326	0.09
	$Y(t+1) - Y(t-1)$	13285.727	13380.684	-94.9565525	24939.667	0
	$Y(t+2) - Y(t-1)$	20366.993	32011.721	-11644.7288	41067.584	-0.28
Liability	$Y_t - Y(t-1)$	-0.038	-0.003	-.035465503	0.011	-3.21
	$Y(t+1) - Y(t-1)$	-0.038	-0.020	-.017491693	0.016	-1.11
	$Y(t+2) - Y(t-1)$	-0.049	-0.025	-.024178899	0.023	-1.03
ROA	$Y_t - Y(t-1)$	1.008	-0.039	1.0475929	0.189	5.54
	$Y(t+1) - Y(t-1)$	1.419	0.085	1.33469933	0.350	3.81
	$Y(t+2) - Y(t-1)$	1.067	0.351	.716264716	0.724	0.99

3. Robustness test for matching & estimation 2007 2012

Kernel matching 2007 2012

Outcome variables	Time difference	Mean for treatment group	Mean for matched group	Difference	SE	t statistics
Labor productivity	$Y_t - Y(t-1)$	-4.50142675	-52.0036415	47.5022148***	16.1859902	2.93
	$Y(t+1) - Y(t-1)$	-3.29492107	-47.2840681	43.989147*	23.6364242	1.86
	$Y(t+2) - Y(t-1)$	-1.57288909	-23.1239497	21.5510606	29.7084466	0.73
ROE	$Y_t - Y(t-1)$	-0.728090073	-0.8260491	0.097959061	0.379456119	0.26
	$Y(t+1) - Y(t-1)$	2.5534416	-2.13849196	-0.414949636	0.452650732	-0.92
	$Y(t+2) - Y(t-1)$	-4.19917906	-2.48479164	-1.71438743***	0.552109929	-3.11
Employ	$Y_t - Y(t-1)$	-6.1457044	-22.0559663	15.9102618	18.0170028	0.88
	$Y(t+1) - Y(t-1)$	-14.5091352	-6.79847514	-7.71066006	23.0722655	-0.33
	$Y(t+2) - Y(t-1)$	-23.4917137	-14.5960027	-8.89571095	28.6926989	-0.31
Revenue	$Y_t - Y(t-1)$	16444.8099	6817.70455	9627.10531	41910.5995	0.23
	$Y(t+1) - Y(t-1)$	42581.582	102483.617	-59902.0349	62153.5696	-0.96
	$Y(t+2) - Y(t-1)$	64622.4642	84777.4562	-20154.992	70345.7949	-0.29
Liability	$Y_t - Y(t-1)$	0.00553669	0.006569041	-.012105731***	0.004639999	-2.61
	$Y(t+1) - Y(t-1)$	-0.013785462	0.006082794	-.019868257***	0.005960501	-3.33
	$Y(t+2) - Y(t-1)$	-0.020447236	0.004471114	-.02491835***	0.00753119	-3.31
ROA	$Y_t - Y(t-1)$	0.14840984	-0.3932275	.244817716*	0.137799122	1.78
	$Y(t+1) - Y(t-1)$	-0.566467815	-0.6426850	.076217204	0.176040142	0.43
	$Y(t+2) - Y(t-1)$	-0.942305695	-0.8063714	-.135934258	0.218199429	-0.62

4. Regions and industries

Regions	Freq.	Percent
No defined	688	1.79
Red river delta	13,371	34.7
Northern midlands and mountainous area	4,234	10.99
North central coast and South central c	7,188	18.66
Central Highlands	2,601	6.75
South East	7,336	19.04
Mekong River Delta	3,113	8.08
Total	38,531	100

Industry by VSIC2007

Industries	Freq.	Percent
agriculture	4,440	11.52
mining	806	2.09
manufacturing	9,493	24.64
Electricity gas	1,633	4.24
water supply& waste management	1,141	2.96
construction	5,668	14.71
wholesale &retail	6,762	17.55
transportation	2,126	5.52
Foods &hotel	1,257	3.26
Telecommunication	587	1.52
Finance& banking	539	1.4
Real estate	505	1.31
Research& Development	1,760	4.57
Administrative services	962	2.5
The Party activities &defense	2	0.01
Education	19	0.05
Health &social security	1	0
Entertainment	548	1.42
Other services	282	0.73
Total	38,531	100