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VEPR Working Paper
WP-07

Impact of Stimulus Package on Firm-level Performance

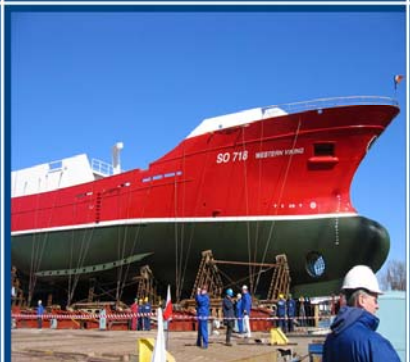
An Econometric Assessment from 2009 PCI Data for Vietnam

To Trung Thanh and VEPR Research Team

Vivid

Effective

Practical



Rigorous

University of Economics and Business, Vietnam National University Hanoi

Impact of Stimulus Package on Firm-level Performance

An Econometric Assessment from 2009 PCI Data for Vietnam*

To Trung Thanh† and VEPR Research Team

Abstract

Our analyses on the PCI 2009 survey show that the positive impacts of the loan subsidy program upon firm performance is not very significant. The size of impact on labor employed before and after the subsidy program introduced is found to be relatively small. Firms in the mining sector or of medium size seem to have a propensity to employ more labor rather than have more investment in machinery or equipment. This might imply that the subsidy package has helped these firms in short-term performance but not in the longer term.

Keywords: Interest subsidy, stimulus package, Vietnam.

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* This paper is mainly extracted from a VEPR report submitted to Vietnam Competitiveness Initiative (VNCI) on January 2010. We would like to thank VNCI for kindly providing us a full dataset of the PCI 2009 survey to conduct relevant analyses.

† Lecturer at Faculty of Economics, National Economics University; Email: totrungthanh@gmail.com.

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Introduction

Earlier 2009, in the midst of the world crisis, the Vietnamese Government launched an economic stimulus package worth US$ 8 billion to support domestic enterprises suffering from the global economic downturn. The package included tax incentives, public investments in infrastructure, and, of particular interest, 4% interest rate subsidy program. The interest rate subsidy scheme is unique in the world, thus it has been paid much attention and among endless controversies on its impact on the domestic economy.

Most of the previous studies have applied qualitative analysis or computable general equilibrium modeling technique to investigate the macroeconomic effects of the stimulus package[‡]. Given the 2009 PCI datasets, in which 3,225 of the 9,890 respondents received the 4% interest rate subsidy, the stimulus package evaluation at the firm level would be feasible, and this helps to get more convincing conclusions on the effects of this policy on private investment, performance and growth. That is also the objective of this study, which is structured into three main parts. The first part presents the rational for methodology and description of variables. Next come the estimation results and comments, and the study is finalized by conclusions and implications.

Methodology and Variables

Methodology

Denote G as the expected gain in firm performance due to interest rate subsidy program, then

$$\mathbf{G = E(R_{1i} - R_{0i}|P_i=1)\ (1)}$$

where P_i is the ith firm's access to subsidy, which takes the value 1 if the firm participates in program, and 0 otherwise, R_{1i} (R_{0i}) is the performance outcome of the ith firm if the firm access (does not access) to subsidy. G is the conditional mean impact, conditional on accessing to the subsidy program, which is called the *treatment effect*. To estimate G, there are two possible methods that we apply for this study.

[‡] See Nguyen Duc Thanh et al. (2008), Nguyen Thi Nhung and Ha Thi Hieu Dao (2009), James and Hoang Nhi (2009).

The first method is to estimate the regression: $\mathbf{R_i = a + bP_i + cX_i + e_i}$ **(2)**, where X_i are observable characteristics of the ith firm that could determine the firm's performance outcome. The regression itself controls the different characteristics of firms and let the estimated coefficient **b** be understood as the program impact on firms' performance. However, there might be a problem of endogeneity in that regression, and instrumental variable technique rather than OLS technique should be applied in that case. The instrumental variables are variables that matter to program participation but not to outcomes given participation. It is, nevertheless, difficult to identify those variables and given limited relevant datasets can not provide such variables even when those are identified. In addition, this method makes strong assumptions about regression functional form. Therefore, besides this method, we also make use the second method for result robustness.

The second method to deal with subsidy program evaluation is to compute the difference in performance outcome between participants (*treatment group*) and a *comparison group*. Because we can not observe the performance of participants if they had not accessed to subsidy, the *comparison group* has to be extracted from non-participants. This group is used to identify the counterfactual of what would have happened without the program. The *comparison group* should be very similar to the participants in terms of characteristics and the only one main difference between these two groups is whether they access to subsidy package or not.

Identifying this *comparison group*, however, is not easy task due to some possible biases. *The first type of biases* is due to differences in unobservable characteristics. For given values of observable characteristics (X_i), there could be a systematic relationship between subsidy package participation and outcomes in the absence of program. In other words, there could be some unobservable variables which jointly affect the outcomes and participation conditional on the observed variables. In this case, one should apply "double difference" method[§], which compares the *treatment group* and the *comparison group* (first difference) before and after the subsidy program (second difference). To apply this method, there must be a panel data where outcomes and the determinants both before and after the program introduced are collected, for both treated and untreated groups. Due to the data availability, we cannot apply this method.

[§] See more in Imbens and Wooldridge (2008).

The second type of biases is due to observable characteristics, where the set of control variables for which outcomes and participation are observed is different between the *treatment group* and the *comparison group*. This bias will be eliminated if one could find a sample of non-participants with the same characteristics (Xi) as the *treatment group*. Given many variables to be controlled, it seems to be impossible to find a non-participant with exactly the same all observables for a participant. To deal with that problem, instead of matching all variables (X_i) to ensure they are the same for both participants and non-participants, we match the probability of accessing the subsidy program, given X_i. Applying this so called "propensity score" method[**], we follow steps as follows:

- Estimating a logit model of program access as a function of the variables that are likely to determine the participation, then calculate the predicted probability of access (propensity scores).
- For each firm in the participant sample, we find five firms in the non-participant sample that have the closest propensity scores (five nearest neighbors).
- Computing mean value of outcomes of five nearest neighbors and the difference between that mean and the actual value of the treated firm is the estimated gain due to program access.
- The mean of all individual firm gains could represent for the general impact of stimulus package on firms' performance outcomes. This is also stratified by some variables of interest to get more insight on the stimulus package impact.

Variables

Two datasets available for the analysis include PCI firm-level and PCI provincial-level datasets, with the main objective of describing firms perceptions of their local business environments. Therefore, these datasets do not provide rich data on firms' performances and characteristics in continuous forms. Given data limitation, Table 1 shows the definition and measurement of observable characteristics (X_i) and the performance outcomes (R_i), which will be used for the two applied methods.

[**] See more in Rosenbaum and Rubin (1983) and Imbens and Wooldridge (2008).

Table 1. Definition and Measurement of Variables

	Variables	Definition and Measurement
X_i	Experience	Years of operation, computed from the year established
	Ownership types	Dummy variables with four types: i) sole proprietorship, ii) limited liability, iii) joint stocks, iv) all other types
	Sectors	Dummy variables with four sectors: i) industry/manufacturing/construction, ii) service/commerce, iii) agriculture/forestry/aquaculture, iv) mining and all others
	Firm size	Dummy variables with four sizes: i) super-small, ii) small, iii) medium and iv) large. The size categories are defined following Decree 56/2009/NĐ-CP[††]
	Market orientation	Dummy variable with two orientations: i) inward-oriented if the percentage of domestic sale is more than 50% and ii) export-oriented otherwise.
	Regional characteristics	All PCI sub-indexes that explain variation in performance across provinces. These could control for the regional characteristics that have impact on firms' outcomes.
R_i	Change in employment	Change in the ordered categories of employment[‡‡] between the year 2008 (before the stimulus package introduced) and the time of survey (after the package introduced)
	Change in number of employment	Change in the number of labor from the year 2008 (before the stimulus package introduced) and the time of survey (after the package introduced)
	Change in capital	Change in the ordered categories of capital[§§] between the year 2008 (before the stimulus package introduced) and the time of survey (after the package introduced)
	Business plan in next two years	Dummy variables with four plans: i) increase size of operation, ii) decrease size of operation, iii) keep the same size of operation, iv) close the business

Estimation Results

Regression Method

Table 2 presents the regression of change in employment number, following Equation 2 with various versions to check robustness.

In all versions of regression, some characteristics have statistically significant effects on firm outcome. Small and medium sized firms tend to perform better than larger sized ones. Inward-oriented enterprises seem to have employed more labors than export-oriented firms, possibly because the latter firms have been more affected from the global crisis than the former. Firms in the provinces with lack of bias against private sector seem to get better outcomes, implying the importance of private sector friendly environment on business

[††] We use number of employment as the criterion to classify firm size because the capital variables in the datasets are not matching with classifications in this Decree.

[‡‡] In the survey, the firm's employment is ordered in the categories from 1 till 8, corresponding to (<5), (5-8), (10-48), (50-188), (200-288), (300-488), (500-1000) and (>1000) labors.

[§§] In the survey, the firm's capital is ordered in the categories from 1 till 8, corresponding to (<0.5), (0.5-1), (1-5), (5-10), (10-50), (50-200), (200-500), and (>500) VND billions.

activities. Meanwhile, experience, ownership types and sectors of the firms are found not to have impact on employment change during 2008-2009.

Table 2. Estimated Coefficients of Regression Model (2)

	(1)	(2)	(3)	(4)	(5)	(6)
Access to stimulus package	3.74**	3.96**	3.96**	3.94**	3.96**	3.96**
Experience	-0.01	-0.01	-0.46	-0.44		
Ownership types						
Sole proprietorship	4.09	4.14	0.92		4.15	
Limited liability	4.43	4.45	1.00		4.47	
Joint stock	6.52	6.61	1.42		6.62	
Sectors						
Industry/manufacturing/construction	0.24	0.32		0.28	0.33	
Services/commerce	1.52	1.50		0.98	1.51	
Agriculture/forestry/aquaculture	-0.55	-0.35		-0.19	-0.34	
Firm size						
Super small	6.77**	6.95**	2.50**	2.05**	7.03**	6.08**
Small	7.18**	7.46**	2.67**	2.44**	7.53**	6.65**
Medium	9.62**	9.79**	3.29**	3.03**	9.83**	9.94**
Inward-oriented	12.47**	12.73**	6.13**	5.99**	12.72**	13.31**
Regional features						
Entry costs	-0.11					
Land access and tenure	1.08					
Transparency	-0.28					
Time costs	-0.20					
Informal charges	0.51					
Lack of bias against private sector	1.10**					
Pro-activity	-0.37					
Business support services	0.68					
Labor policy	0.10					
Legal institutions	0.23					
Infrastructure	-0.03					
Constant	-38.41**	-25.55**	-4.74**	-6.20**	-25.70**	-19.73**
R-squared	0.01	0.01	0.01	0.01	0.01	0.01

Notes: **: statistically significant at 5% level.

The coefficient of interest, access to interest-rate subsidy scheme, with all other observable variables (X_i) controlled, is positive and statistically significant at 5% level. This implies that the stimulus package has had positive impact on firm performance outcomes in terms of employment change. However, the size of impact seems to be slightly small. According to all regression versions, on average, participants have increased employment by only 4 more labors than non-participants, as a result of accessing to interest rate subsidy package. Due to some possible problems in this method as specified in the previous part, we also consult the next method to get more convincing conclusions.

"Propensity Score" Method

Table 3. Logit Model of Access to Interest rate Subsidy Program

	Access to stimulus packages	Coefficient	Standard Error	z	P>z
Experience		0.0009	0.0007	1.2200	0.2210
Types	Sole proprietorship	0.8421***	0.2555	3.3000	0.0010
	Limited liability	0.7827***	0.2547	3.0700	0.0020
	Joint stock	0.8428***	0.2576	3.2700	0.0010
Sectors	Industry/manufacturing/construction	0.1417**	0.0679	2.0900	0.0370
	Services/commerce	0.2277***	0.0689	3.3100	0.0010
	Agriculture/forestry/aquaculture	0.2301**	0.0927	2.4800	0.0130
Sizes	Supers mall	-0.5021***	0.0790	-6.3500	0.0000
	Small	0.2877***	0.0719	4.0000	0.0000
	Medium	0.8175***	0.1067	7.6600	0.0000
Inward-oriented		-0.5696***	0.0976	-5.8400	0.0000
Regional reatures	Entry costs	-0.1015**	0.0450	-2.2600	0.0240
	Land access and tenure	0.1397***	0.0343	4.0800	0.0000
	Transparency	0.0490	0.0318	1.5400	0.1230
	Time costs	0.0239	0.0293	0.8200	0.4140
	Informal charges	-0.0786*	0.0452	-1.7400	0.0820
	Lack of bias against private sector	0.1246***	0.0254	4.9000	0.0000
	Pro-activity	-0.0739***	0.0222	-3.3300	0.0010
	Business support services	-0.1616***	0.0307	-5.2600	0.0000
	Labor policy	-0.0053	0.0420	-0.1300	0.8990
	Legal institutions	0.0392	0.0344	1.1400	0.2560
	Infrastructure	-0.0064	0.0043	-1.5100	0.1300
Constant		-0.4534	0.5578	-0.8100	0.4160

*Notes: Pseudo R^2 = 0.0465: ***, **, *: statistically significant at 1%, 5% and 10% levels*

Table 3 shows the logit model as the first step of this method, in which, the determinants of access to program are identified. Accordingly, firm experience and some regional features are likely not to have impact on probability of accessing subsidy, meanwhile ownership types, sectors, size, market orientation and some PCI sub-indexes are found to be the significant determinants of subsidy access.

In detail, sole proprietorship, limited liability and joint stocks enterprises have more propensity to participate in the subsidy program than all other ownership. Firms in the agriculture, forestry and aquaculture sector have the highest probability to access to subsidy,

possibly because one of the package objectives is towards this sector[***], meanwhile mining firms get less access to the stimulus than all other sectors. Super-small firms with less than 10 workers seem to get difficult in approaching the subsidy package, whereas medium size firms (50-200 labors in trade sector and 200-300 labors in other sectors) have the highest propensity to subsidized loans. Export-oriented firms are found to have higher access probability than inward-oriented ones, possibly because the former have more rational to access to program due to badly affected by the world crisis. In terms of regional characteristics, firms located in provinces with lower entry cost sub-index, higher land access and tenure sub-index, lower informal charge sub-index, higher sub-index of lack of bias against private sector, lower pro-activity sub-index and lower business support services sub-index have more probability to access the interest rate subsidy.

Table 4 presents the policy evaluation, following the "propensity score" method. All numbers in the table are understood as the mean of difference in outcomes between participants and the *comparison group*, which is now representing the program's impact. It should be noted that except for change in labors employed, all other performance variables are the forms of ordered categories or dummy variable, thus the mean value of change in these variables during 2008-2009 and then policy evaluation on those variables will be assessed based on the sign of impact rather the value.

As revealed by Table 4, the policy impacts on employment and capital are positive, implying that the interest rate subsidy has helped enterprises to employ more labors and invest more capital for the business. The impact of number of labors employed is found to be 3.27, implying that, on average, the participants tend to employ 3 – 4 more labors due to the stimulus package, which is comparable to policy impact estimated in the regression method. This size of impact, thus, is slightly small. In addition, firms accessing to the stimulus package are found to have more optimistic attitudes toward future business. More participants are likely to plan to expand operation size in the next two years rather than decrease or keep the current operation or close the business.

[***] See Decree 497/QĐ-TTg dated on 17 April 2009.

Table 4. Impact of Interest rate Subsidy Package on Firms' Outcomes

		Mean	Std. Dev.
Impact on performance outcomes	Impact on employment	0.04	0.42
	Impact on number of employment	3.27	41.5
	Impact on capital	0.04	0.49
Impact on plan in the next two years	Increase operation size	0.05	0.51
	Decrease operation size	-0.03	0.50
	Keep current operation size	-0.01	0.17
	Close the business	-0.01	0.14

Table 5 provides more insight about the policy impact across different categories of firms. In terms of employment, most of the categories have employed more labors as a consequence of accessing subsidized loans, except for firms in other types of ownership such as household, cooperative, and firms in the agriculture, forestry and aquaculture sector. The firms on other types have performed badly not only in employment but also in capital change due to access to the subsidy program. This raises a suspicious question on how these firms have utilized the subsidized loans. Meanwhile, the firms in agriculture, forestry and aquaculture sector, though employed less labors, have gained in capital change and this impact is even highest across different sectors. This fact seems to reflect one of the package stimulus's objectives, which is giving more supports for firms in this sector to buy machinery and other mechanical equipments. Table 5 also reveals that firms with experience of less than 10 years, in joint stocks type, in mining sector, of large size, in inward-oriented category, or in haft bottom PCI ranking provinces are likely to get highest subsidy impacts on employment changes within corresponding categories.

In terms of capital change, Table 5 shows some negative policy impacts. Firms in the mining sector seem to employ more labors but their capital ranking categories decrease. Medium-size firms, and to lesser extent, large-size firms and export-oriented firms share similar program impacts. The variable of capital in the data survey do not provide information on how much it is spent for working capital and how much for fixed capital. However, given the fact that they have expanded employment size, their investment on machinery and equipment may be decreased.

Table 5. Interest Rate Subsidy Impacts by Different Characteristics

		Impact on employment	Impact on number of employment	Impact on capital
Experience	>10 years	0.03	0.56	0.03
	<=10 years	0.05	3.76	0.04
Ownership Types	Sole proprietorship	0.01	1.38	0.05
	Limited liability	0.06	3.65	0.04
	Joint stock	0.08	5.4	0.01
	Others	**-0.23**	**-0.12**	**-0.11**
Sectors	Industry/ manufacturing/construction	0.09	5.09	0.02
	Services/commerce	0.03	3.6	0.04
	Agriculture, forestry and aquaculture	0.07	**-1.87**	0.13
	Mining and others	0.01	9.22	**-0.06**
Size	Super small	0.05	0.61	0.07
	Small	0.04	2.79	0.04
	Medium	0.06	7.38	**-0.02**
	Large	0.03	11.15	**-0.002**
Market-orientation	Inward-oriented	0.04	3.42	0.04
	Export-oriented	0.07	1.53	**-0.003**
PCI ranking provinces	Group of 25% top	0.04	1.64	0.05
	Group of second 25%	0.01	2.63	0.02
	Group of third 25%	0.07	4.84	0.06
	Group of 25% bottom	0.06	4.01	0.01

Notes: The bold numbers indicate the negative policy impacts.

Conclusions and Implications

Both two methods of analysis reveal the positive impacts of 4% interest rate subsidy package on employment and capital changes in the private sector. As a result of receiving subsidized loan, in general, firms seem to employ more labors, increase capital, and their attitudes toward future business plan appear more optimistic. The size of package impact on capital and then investment can not be computed, because the variables of capital in the survey are in the form of ordered categories rather than the real value. Meanwhile the size of impact on labors employed before and after the subsidy program introduced is found to be slightly small. However, these findings at least illustrate the package's credit for a good response to economic recession, helping private sector's employment not to decrease during the downturn.

By ownership type, the firms of other types except sole proprietorship, limited liability and joint stocks are likely not to gain higher employment and capital. Due to lack of authority control over this type of firms, there is a possibility that some money from subsidized loan may not be used for productive new investments. If that sum of money ends up in the stock market or real estate, this could create the bubbles, then negatively affecting the domestic economy. The next stimulus package, therefore, should more carefully define the types of firms qualified for the subsidy to make sure the money directed to the right way.

Firms in the mining sector or of medium size seem to have propensity to employ more labors rather than increase more investment in machinery or equipment. This might imply that the subsidy package has helped these firms in short-term performance but not in the longer term. Due to negative program impact on firm capital, we do not exclude the possibility that part of subsidized loans may be directed to other objectives other than to new investments. Therefore, more firm regulations of how subsidized loans are used and more administration over the loans to these types of firms should be helpful for the success of the next stimulus packages.

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VIETNAM CENTRE FOR ECONOMIC AND POLICY RESEARCH

UNIVERSITY OF ECONOMICS AND BUSINESS
VIETNAM NATIONAL UNIVERSITY, HANOI

CONTACT US

Vietnam Centre for Economic and Policy Research (VEPR)

University of Economics and Business, Vietnam National University, Hanoi

Address: #1, alley 8/41/82
Nguyen Phuc Lai str, Dong Da dist
Hanoi, Vietnam.

Tel: (84-4) 6 275 3894

Fax: (84-4) 6 275 3895

Email: info@vepr.org.vn

Website: www.vepr.org.vn