UNITED NATIONS UNIVERSITY

UNU-MERIT

#2013-059

The impact of the 2009 value added tax reform on enterprise investment and employment - Empirical analysis based on Chinese tax survey data
Dehua Wang

The Impact of the 2009 Value Added Tax Reform on Enterprise Investment and Employment
— Empirical Analysis Based on Chinese Tax Survey Data

Dehua Wang

National Academy of Economic Strategy, Chinese Academy of Social Sciences

November 1, 2013

Abstract

This paper uses the "National Tax Survey" enterprise data to assess the impact of China's nationwide VAT reform of 2009 on enterprise fixed-asset investment and employment. The main finding of our research is that the reform significantly increased business investment in fixed assets, but had no obvious effect on employment. Furthermore, the reform promoted corporate investment mainly by encouraging machinery and equipment, but not plant and building investment.

1. INTRODUCTION

Before 2009, China's value-added tax was different from that in other countries. In brief, China's value added tax (VAT) system was a production-type VAT that did not allow the deduction of input value added taxes for investment in fixed assets. After many years' of pilot experiments starting in 2004, China introduced on January 1, 2009 a nationwide VAT reform, which allowed business investment input value added taxes in machinery and equipment to be deducted from output value added taxes, but not in plants, buildings and other real estate.

This reform was China's most important tax reform in recent years. First, the proportion of VAT tax revenue in China's total tax revenue had always been more than 40 per cent. Secondly, the reform cut so much tax revenue that in 2009 tax revenue was estimated to drop by more than 140 billion, i.e. 2.35 per cent of the total national revenue. Moreover, the reform was a key step in improving VAT tax system in the long term, and one of the foremost measures to structurally reduce taxes in response to the global financial crisis in the short term.

What is the impact of the reform on enterprises' behaviour, especially during the global financial crisis? Did the reform promote the enterprises' fixed assets investment? Would it affect employment? All these questions drew the attention of the public and the Chinese decision-makers.

The impact of tax incentives for business investment is a hot topic in the academic literature. According to the new classical theory (Hassett and Hubbard, 2002), since tax policy changes the marginal cost of fixed-asset investment, it significantly affects business investment. Many people tested this conclusion when some countries changed their tax policies. Cummins et al's (1996) study on 14 OECD member countries found that the conclusion was valid for almost all countries. However, in Hassett and Hubbard (2002) and Auerbach and Hassett's (2008) overview the conclusion differed depending on the specific situation.

Compared with a focus on the income tax policy such as investment tax credits, depreciation policy changes and additional depreciation, VAT reform in China is to increase business investment deduction in the field of consumption tax. Before 2009, China conducted a pilot VAT reform in three provinces in the northeast (2004) and in 28 cities in six central provinces (2007). Theoretically, this reform should reduce the investment cost of machinery and equipment, and thus promote corporate investment; nevertheless because of the combined income and substitution effects, the reform's impact on employment is controversial. According to the CGE simulation analysis of Chen et al (2010), the VAT reform in China played a limited role in increasing investment and had a great negative impact on employment. Nie, Fang and Li (2010) studied the three northeastern provinces and found that there were both a significant increase in the fixed-asset investment and a decrease in the employment after the reform. Nie and Liu's finding (2010) on the six central provinces revealed a significant promotion on both investment and employment. Cai and Harrison (2011) came to the conclusion that, while the reform seldom increased investment, it had a great negative effect on employment. Overall, there was a lack of consensus about the impact of the VAT reform.

Contrary to the above studies, this paper evaluates for the first time the effect of the

nationwide reform of 2009. Another distinguishing feature of our research is our data source. The previous research was supported by the Chinese National Bureau of Business survey data, and our data are the joint "national tax survey" data from the Chinese Ministry of Finance and State Administration of Taxation. The data collects more information on corporate investment in fixed assets and can clearly identify the corporations affected by the policy.

The paper is organized as follows. The next section presents the data and the method of analysis. The third section of the paper presents the main results and discusses the possible problems. The last part concludes.

2. DATA AND METHOD OF ANALYSIS

The data for this analysis come from the "National tax survey" jointly collected by the Chinese Ministry of Finance and State Administration of Taxation. The survey collected information on production and operations, fixed assets investment, taxes, the financial situation and employment. After cleaning, we obtained a balanced panel data from 2007 to 2009 of about 230 thousand corporations a year.

As Nie, Fang and Li (2010), Nie and Liu (2010), Cai and Harrison's (2011), we also use the difference-in-differences method, i.e. we measure the impact of VAT reform by comparing the difference between the treatment group and the control group before and after the reform. There were two kinds of corporations in our control group, one was the non-VAT taxpayers and small-scale VAT taxpayers that were irrelevant to the subtraction of input taxes for fixed assets investment, another was the corporations that had been included in pilot experiments before 2009 and the foreign-invested corporations，which were allowed to deduct input tax for fixed asset investments before and after 2009. The treatment group was the ordinary VAT-paying enterprises that were not included in the pilot before 2009 and were affected by the 2009 reform. The model specification is as follows:

$$y_{it} = \alpha + \beta \, policy_{it} + \rho Treat_{it} + X'_{it}\delta + \eta_i + \eta_t + \varepsilon_{it}$$

where y_{it} is the company's investment in fixed assets (FAI) or the annual average number of

employees (EMP), $policy_{it}$ is the variable capturing the effect of policies, that is, the product of

the year dummy for 2009 and the treatment group dummy. The control variables X'_{it} include the

size of enterprise assets (Assets), the total profit (Profit), the profit margin (Profit rate) and the tax burden rate (Tax rate). Among them, the tax burden of enterprises is the sum of all the taxes paid by the enterprise.

Except for fixed asset investment (FAI), which is very special and can only be obtained through complex calculations, the above variables are directly available in the "National Tax Survey" dataset or can be obtained through a simple calculation. The previous papers using the data from National Bureau of Statistics could only get the fixed assets investment data by taking

the first differences in the fixed assets balance. Thus we design four fixed asset investment (FAI) indicators. This is the unique character of our paper.

FAI1 covers all the enterprise's fixed assets investment, FAI2 focuses on fixed assets investment on operation, FAI3 and FAI4 are somewhat the same as FAI2, but they are only a part of FAI2,the former pays more attention on machinery and equipment, while the later cares more about housing and building. Because the 2009 VAT reform is to allow enterprises to deduct input tax of machinery and equipment in operation, we can expect that the FAI3 is the most important variable affected by the reform.

Another important point is that the reform itself affects the book value of the fixed assets. According to China's accounting system, relevant taxes and fees are also included in the book value of the fixed assets investment. For the corporation affected by the reform, the book value of the fixed assets investment after 2009 loses the input VAT deduction. Therefore we made an adjustment: the book value in 2008 remains unchanged, the adjusted fixed assets investment of the treatment group in 2009 is calculated as follows: adjusted value = original value +"the input VAT tax on import machinery and equipment "+" the input VAT tax on domestic machinery and equipment purchase ".

3. MAIN RESULTS

The main results of the estimation are given in Table 1 and 2. Table 1 uses all the data available, that is, it includes all the enterprises in the control group listed above. As we can see from Table 1, it is only when we use FAI3 to measure corporate investment in fixed assets that the impact of the reform is significantly positive on investment, and the reform has little impact on employment (EMP). Table 2 only includes the enterprises in the industrial department that are subject to VAT tax.[1] As is shown in Table 2, whether we use FAI1, FAI2 or FAI3 to measure corporate investment in fixed assets, the impact of the reform is significantly positive, whereas the impacts on corporate plant and building investment (FAI4) and on employment (EMP) are not significantly different from zero. With the estimation, we get the conclusion that the VAT tax reform in 2009 significantly enhanced the company's physical investment in machinery and equipment, but had no impact on employment. The conclusion regarding the impact on investment is almost the same as the findings by Nie, Fang, and Lie (2010) and Nie and Liu's (2009) findings, but different from Cai and Harrison's (2011) study. When comparing physical investment and employment in 2007 with 2008 and 2009, we find a reduction in trend, which may reflect the impact of the global financial on Chinese business. The total corporate profits and profit margins have little impact on business investment and employment, while asset size and the tax burden show a significant positive impact. That the tax burden has a positive effect on investment and employment is counterintuitive. In our opinion, in China, more tax may mean more glorious prospects for the company.[2]

---

[1] The industrial department includes manufacturing, electricity, gas, steam and air conditioning supply, mining and quarrying , water supply, sewerage, and waste management and remediation.

[2] In our survey, business managers and front-line tax collectors and management staff provided us with this view.

Table 1 Full sample estimation（units：thousand yuan for investment and persons for employment）

Variables	FAI1	FAI2	FAI3	FAI4	EMP
Policy effect	−2638.0	3301.3	3185.4*	115.9	−11.40
	(−0.52)	(1.50)	(1.88)	(0.10)	(−1.48)
Treatment group dummy	−331.6	−1733.6	−1523.1	−210.5	6.37
	(−0.16)	(−1.00)	(−0.96)	(−0.40)	(0.98)
Year dummy for 2009	1807.9	−3194.8*	−2644.6	−550.2	−11.63
	(0.39)	(−1.73)	(−1.64)	(−0.91)	(−1.56)
Year dummy for 2008	−1320.0*	−867.8	−496.7	−371.0	−10.99***
	(−1.89)	(−1.32)	(−0.90)	(−1.18)	(−5.16)
Profit	0.177	0.0934	0.106	−0.0131	0.00
	(0.99)	(0.71)	(0.91)	(−0.54)	(1.45)
Profit rate	−0.0936	−0.00847	−0.0321	0.0236	0.00
	(−0.46)	(−0.05)	(−0.23)	(0.81)	(0.03)
Assets	11169.6***	8891.3***	4271.2***	4620.1*	59.50***
	(3.97)	(2.98)	(3.20)	(1.93)	(5.42)
Tax rate	65.05*	51.81*	24.02*	27.78	0.35**
	(1.87)	(1.68)	(1.72)	(1.38)	(2.04)
constant	−97302***	−74995.8***	−32904.4***	−42091.3*	−345.4***
	(−3.49)	(−2.64)	(−2.72)	(−1.82)	(−3.26)
Nb of observations	691469	691469	691469	691469	691469

Notes：Coefficients and t statistics are reported. Significance levels of 1 per cent, 5 per cent and 10 per cent are represented by ***,** and * respectively.

Table 2 Estimation based on industrial department data（units: thousand yuan for investment and persons for employment)

Variables	FAI1	FAI2	FAI3	FAI4	EMP
Policy effect	4602.6**	4630.1**	3422.0**	1208.0	−1.02
	(2.41)	(2.44)	(2.33)	(1.51)	(−0.22)
Treatment group dummy	−2560.3	−2267.0	−2207.7	−59.36	−1.61
	(−1.26)	(−1.16)	(−1.21)	(−0.17)	(−0.27)
Year dummy for 2009	−5849.0***	−4880.5***	−3503.7***	−1376.8***	−29.36***
	(−4.14)	(−3.42)	(−2.82)	(−3.44)	(−6.51)
Year dummy for 2008	−2671.1***	−1944.4**	−1155.1	−789.3**	−13.47***
	(−2.82)	(−2.09)	(−1.45)	(−2.04)	(−6.15)
Profit	−0.218	−0.224	−0.179	−0.0445	0.00
	(−1.16)	(−1.18)	(−1.19)	(−0.78)	(0.94)
Profit rate	3.581	2.294	1.646	0.648	0.02
	(0.54)	(0.35)	(0.31)	(0.34)	(1.03)
Assets	15793.9***	14235.5***	9872.0***	4363.5**	67.41***
	(5.36)	(4.93)	(6.41)	(2.46)	(9.84)
Tax rate	1914.8***	1799.6***	1254.5***	545.2**	7.47***
	(3.51)	(3.40)	(3.74)	(2.09)	(4.25)
constant	−132899***	−120219.0***	−80944.9***	−39274.1**	−369.5***
	(−4.77)	(−4.41)	(−5.73)	(−2.29)	(−5.47)
Number of observations	405188	405188	405188	405188	405188

Notes : Coefficients and t statistics are reported. Significance levels of 1 per cent, 5 per cent and 10 per cent are represented by ***,**, *

Three questions could be raised to put in doubt the positive effect of the VAT reform on physical investment in fixed assets. First, is it because we adjust the book value of the treatment group's fixed assets in 2009 that we get the above conclusions? Second, is it because in the firms of the treatment group investment in fixed assets just tended to increase in recent years? Are the conclusions affected by the fact that in our sample around 30 per cent of the corporations did not add any new investment in fixed assets?

In response to the first question, Table 3 presents estimates obtained with the data that have not been adjusted for the book value in 2009. We find that the conclusions still hold. In addition, whereas the coefficient of the tax policy is insignificant for the full sample, it is significant for the sample of the ordinary VAT-paying enterprises and in the industrial department. This shows that the adjustment of the book value of the treatment group in 2009 is not what is generating the result that value-added tax reform promotes business investment.

Table 3：Estimation without adjusting the fixed-asset input tax of the treatment group in 2009 (units: thousand yuan)

Variables	Full sample	VAT general taxpayer in industry sector			
	FAI3	FAI1	FAI2	FAI3	FAI4
Policy effect	2614.0	3951.8**	3979.2**	2771.2*	1208.0
	(1.55)	(2.07)	(2.10)	(1.89)	(1.51)
Treatment group dummy	−1543.0	−2541.2	−2247.9	−2188.6	−59.36
	(−0.97)	(−1.26)	(−1.15)	(−1.20)	(−0.17)
Year dummy for 2009	−2633.9	−5807.1***	−4838.6***	−3461.8***	−1376.8***
	(−1.63)	(−4.11)	(−3.39)	(−2.79)	(−3.44)
Year dummy for 2008	−496.0	−2638.6***	−1911.9**	−1122.6	−789.3**
	(−0.90)	(−2.79)	(−2.05)	(−1.40)	(−2.04)
Profit	0.106	−0.215	−0.221	−0.177	−0.0445
	(0.90)	(−1.15)	(−1.17)	(−1.18)	(−0.78)
Profit rate	−0.0319	3.450	2.163	1.514	0.648
	(−0.23)	(0.52)	(0.33)	(0.28)	(0.34)
Assets	4191.8***	15503.6***	13945.2***	9581.7***	4363.5**
	(3.15)	(5.27)	(4.84)	(6.24)	(2.46)
Tax rate	24.19*	1869.2***	1754.0***	1208.8***	545.2**
	(1.71)	(3.46)	(3.35)	(3.67)	(2.09)
constant	−32118.3***	−130113***	−117433***	−78159.1***	−39274.1**
	(−2.66)	(−4.67)	(−4.31)	(−5.54)	(−2.29)
Nb of observations	691469	405188	405188	405188	405188

Notes : Coefficients and t statistics are reported. Significance levels of 1 per cent, 5 per cent and 10 per cent are represented by ***,** and * respectively.

In response to the second question, we have used the 2007-2008 data to redo what has been done in Tables 1 and 2. Table 4 uses the data that removed the observations in 2009. The policy variable is now defined as the product of a dummy variable in 2008 and a dummy variable for being in the treatment group. We find that no matter which sample we use and which type of fixed asset investment we consider, the regression results are not significant, some factors are even reversed and become negative. It shows that the second objection does not hold.

Table 4：Estimation with 2007-2008 data （units: thousand yuan）

Variables	Full sample			VAT general taxpayer in industry sector		
	FAI1	FAI2	FAI3	FAI1	FAI2	FAI3
Policy effect	491.2	650.1	1177.1	866.5	200.7	734.6
	(0.22)	(0.28)	(0.58)	(0.33)	(0.07)	(0.30)
Treatment group dummy	220.5	224.3	72.67	−333.4	368.0	−250.6
	(0.11)	(0.12)	(0.04)	(−0.15)	(0.17)	(−0.13)
Year dummy for 2008	−897.7	−693.4	−998.5	−3669.4	−2369.8	−2349.8
	(−0.51)	(−0.40)	(−0.67)	(−1.52)	(−0.96)	(−1.07)
Profit	5135.2	4786.5	2490.6	16665.4***	15253.9***	12787.9***
	(1.57)	(1.46)	(0.84)	(6.42)	(5.83)	(5.33)
Profit rate	0.280	0.224	0.191	−0.383*	−0.384	−0.408*
	(0.87)	(0.69)	(0.64)	(−1.67)	(−1.63)	(−1.88)
Assets	−0.213	−0.170	−0.145	14.82	14.40	19.62
	(−0.86)	(−0.70)	(−0.64)	(0.76)	(0.73)	(1.00)
Tax rate	277.4	264.8	138.6	1963.5***	1820.5***	1559.2***
	(1.14)	(1.10)	(0.73)	(2.93)	(2.85)	(2.78)
constant	−41236.9	−38905.7	−18260.8	−141537***	−130642***	−108435***
	(−1.44)	(−1.36)	(−0.71)	(−6.04)	(−5.57)	(−5.05)
Nb of observations	452143	452143	452143	265245	265245	265245

Notes : Coefficients and t statistics are reported. Significance levels of 1 per cent, 5 per cent and 10 per cent are represented by ***, ** and * respectively.

For the last question, we use the Logit model to analysis the impact of the 2009 VAT reform on corporate fixed assets investment. If there are newly added corporate fixed assets, FAI is assigned the value 1, otherwise it is 0. The policy regression coefficient in this model represents the impact of VAT reform on the log odds ratio that a corporation will invest in fixed assets. As can be seen from Table 5, the VAT reform in 2009 increased significantly the probability of fixed assets investment, but shows no significant effect on the investment on fixed assets such as plant and building (FAI4).

Table 5：Estimation with Logit model（units: thousand yuan）

Variables	FAI1		FAI2		FAI3		FAI4	
Policy effect	0.689***	0.690***	0.688***	0.688***	0.723***	0.723***	**0.013**	**0.013**
	(27.60)	**(27.61)**	**(29.97)**	**(29.97)**	**(32.52)**	**(32.52)**	**(0.51)**	**(0.50)**
Treatment group dummy	−.344***	−.343***	−.298***	−.298***	−.264***	−.264***	−.019	−.019
	(−9.07)	(−9.07)	(−8.46)	(−8.46)	(−7.72)	(−7.72)	(−0.47)	(−0.47)
Year dummy for 2009	−.621***	−.622***	−.365***	−.365***	−.0148	−.0151	−.825***	−.827***
	(−26.62)	(−26.64)	(−17.16)	(−17.17)	(−0.72)	(−0.74)	(−34.41)	(−34.46)
Year dummy for 2008	−.203***	−.203***	−.106***	−.106***	−.017	−.017*	−.224***	−.226***
	(−17.85)	(−17.88)	(−9.85)	(−9.87)	(−1.63)	(−1.65)	(−18.68)	(−18.76)
Assets	0.543***	0.549***	0.501***	0.504***	0.472***	0.474***	0.577***	0.588***
	(30.36)	(30.16)	(28.90)	(28.72)	(27.11)	(26.97)	(25.19)	(25.30)
Profit	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.71)	(0.70)	(1.08)	(1.08)	(1.42)	(1.42)	(−0.13)	(−0.17)
Profit rate	0.001*	0.001*	0.000	0.000	0.000	0.000	0.000	0.000
	(1.66)	(1.66)	(1.56)	(1.56)	(1.19)	(1.19)	(0.46)	(0.45)
Tax rate		0.015*		0.010		0.009		0.057***
		(1.79)		(1.08)		(1.04)		(2.83)
Number of observations	144946	144946	161684	161684	172401	172401	125312	125312

Notes : Coefficients and t statistics are reported. Significance levels of 1 per cent, 5 per cent and 10 per cent are represented by ***,** and * respectively.

4. CONCLUSIONS

In this paper we used "National Tax Survey" enterprise data to evaluate the impact of China's nationwide VAT reform in 2009 on enterprise fixed-asset investment and employment. Our conclusion is that the VAT reform in 2009 significantly increased business investment in fixed assets, but had not much effect on employment. Specifically, the reform mainly enhanced the investment in fixed assets for operation such as machinery and equipment, but not the investment in plants and buildings.

According to our study, the VAT reform in 2009 is not only a critical step in improving the Chinese tax system, but it also played an important role in fighting the global financial crisis. Meanwhile, as the renovation of machinery and equipment is an important way for firms in developing countries to achieve technological progress, the VAT reform is also conducive to China's structural transformation. However, the data we used only contain information for one year after the reform, the long-term effect waits to be seen. It requires further study in the future to get a more comprehensive evaluation of this reform.

References

Auerbach, Alan J. and Kevin Hassett (2008). "Taxes and Business Investment: Lessons from the Past Decade," in A. Viard (ed.), *Tax Policy Lessons from the 2000s*, 248–270.

Cai, Jing and Ann E. Harrison (2011). "The Value-Added Tax Reform Puzzle", Policy Research Working Paper Series 5788, TheWorld Bank.

Cummins, Jason G., Kevin A. Hassett and R. Glenn Hubbard (1996). "Tax Reforms and Investment: A Cross-Country Comparison," *Journal of Public Economics*, 62(1-2): 237− 273.

Chen Ye, Gene Hsin Chang, Kou Enhui and Liu Ming (2010). VAT Tax Reform and Its Negative Impact on Employment in China: A CGE Analysis, *Economic Research Journal*, 2010-09, 29-42. (in Chinese)

Hassett, Kevin A. and R, Glenn Hubbard (2002). "Tax Policy and Business Investment". *Handbook of Public Economics*, Chap. 20: 1293-1343.

House, Christopher L. and Matthew D. Shapiro (2008). "Temporary Investment Tax Incentives: Theory with Evidence from Bonus Depreciation," *American Economic Review*, 98(3): 737-68.

Nie, Huihua, Mingyue Fang and Tao Li (2010). "China's Value-Added Tax Reform, Firm Behaviour and Performance". *Frontiers of Economics in China*, 5(3): 445-463.

Nie Haifeng and Yi Liu (2010). "Evaluation of the impact of Value-Added Tax Reform on central region". Accounting and Capital Operations Research Center of Lingnan School, Zhongshan university ,Working Paper. (in Chinese)

The UNU-MERIT WORKING Paper Series

2013-01 *Effects of innovation on employment in Latin America* by Gustavo Crespi and Ezequiel Tacsir

2013-02 *Revisiting the porter hypothesis: An empirical analysis of green innovation for the Netherlands* George van Leeuwen and Pierre Mohnen

2013-03 *Impact of external knowledge acquisition strategies on innovation - A comparative study based on Dutch and Swiss panel data* by Spyros Arvanitis, Boris Lokshin, Pierre Mohnen and Martin Wörter

2013-04 *Interactive knowledge exchanges under complex social relations: A simulation modelRobin* by Cowan and Anant Kamath

2013-05 *Innovation systems framework: still useful in the new global context?* by Michiko Iizuka

2013-06 *The importance of intrinsic and extrinsic motivation for measuring IQ* by Lex Borghans, Huub Meijers and Bas ter Weel

2013-07 *Firms' innovation capability-building paths and the nature of changes in learning mechanisms: Multiple case-study evidence from an emerging economy* by Paulo N. Figueiredo , Marcela Cohen and Saulo Gomes

2013-08 *A set of time series data labour market stocks and flows for the Netherlands 1980 to 2010* by Manuel Müllers, Joan Muysken and Erik de Regt

2013-09 *Designing an optimal 'tech fix' path to global climate stability: R&D in a multi-phase climate policy framework* by Adriaan van Zon and Paul A. David

2013-10 *Complementarity between internal knowledge creation and external knowledge sourcing in developing countries* by Jun Hou and Pierre Mohnen

2013-11 *Summarizing large spatial datasets: Spatial principal components and spatial canonical correlation* by Samyukta Bhupathiraju, Bart Verspagen and Thomas Ziesemer

2013-12 *Regional systems of innovation in the Arab region* by Samia Satti Osman Mohamed Nour

2013-13 *Development and social justice: Education, training and health in Sudan* by Samia Satti Osman Mohamed Nour

2013-14 *The economic importance and impacts of intellectual property rights (IPRs) in Sudan* by Samia Satti Osman Mohamed Nour

2013-15 *Overview of knowledge economy in the Arab region* by Samia Satti Osman Mohamed Nour

2013-16 *The importance (impacts) of knowledge at the macro-micro levels in the Arab Gulf countries* by Samia Satti Osman Mohamed Nour

2013-17 *Political determinants and impact analysis of using a cable system as a complement to an urban transport system* by Diego Escobar-García, Francisco García-Orozco and Carlos Cadena-Gaitán

2013-18 *Women entrepreneurs in the informal economy: Is formalization the only solution for business sustainability?* By Shyama V. Ramani, Ajay Thutupalli, Tamas Medovarszki, Sutapa Chattopadhyay, Veena Ravichandran

2013-19 *Heterogeneity in innovation strategies, evolving consumer preferences and market structure: An evolutionary multi-agent based modelling approach* by Salih Çevikarslan