Analysis of the effect of the VAT on the size of the government and recommendation on the reform of the VAT in China

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Abstract

Since the implementation of the value-added tax (VAT) in 1994, such tax has become the most prominent source of taxation income in the Chinese taxation system. However, its reform is far from complete as the VAT is not fully deductible and its coverage is incomplete within industries causing the future roadmap of the reform to be unclear. This article resulted in two conclusions based on the analysis of the relationship between the VAT and governmental size. Firstly, the VAT is a significant factor that leads to the expansion of the government. Secondly, the VAT reform was not only an economic reform, but also a political reform. Subsequent reforms will have to depend on the balance of economic and political interest and also the balance of power between the central and local government.

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1. Proposition

In public economics, the size of government could be measured by the ratio of government expenditure to GDP (factor cost), to GDP (market price), to GNP (factor cost) or to GNI (factor cost).[21,i] In political science, the size of government could also be measured by the proportion of government employed workers to the total number of employed and the number of government administrative organisations in a country.[22] Rosen[23] had proposed that annual government expenditure is a more reasonable and popular method to measure the size of a government, in which government expenditure is divided into three categories: purchases of goods and services, income transfer to individuals, companies and other levels of government and interest payment. Nevertheless, calculating the size of the government can be very subjective and no single measuring method is absolutely correct. The usefulness of the different measuring methods would depend on the purpose of the research.[24]

There are various explanations on the size and expansion of the government. Keynes, in 1936, had proposed that the size of the government would follow the increasing economic growth in order to rectify market inefficiency.[25] In political science, the two major theories on the size of the government are the Citizen-over-State Theory and the State-over-citizen Theory. The former considered the size of the government being linked to the level of governmental response to the demand of the needs of the civil society while the latter considered the expansion of the government a result of the inefficiency in the bureaucracy and the incentives offered to the bureaucrats.[26] Apart from that, the average income of voters,[27] expansion of governmental functions, increase in administrative costs,[28] and the

[21] C. V. Brown and Peter Jackson, *Public Sector Economics* (China Renmin University Press, 2000) 134-5.
[22] Mei Jixi, 'Expansion and limitation on the size of the government' (2005) 1 *Administrative Forum* 6-8. 梅继霞 "论政府规摸的扩张与限制"，《行政论坛》2005 第 1 期，第 6-8 页.
[23] Harvey S. Rosen, Public Finance (China Renmin University Press,4th ed, 2000) 13.
[24] C. V. Brown and Peter Jackson, *Public Sector Economics* (China Renmin University Press, 2000) 134-5.
[25] John Maynard Keynes, The General Theory of Employment, Interest, and Money (Harcourt Brace, 1936).
[26] Thomas A. Garrett and Russell M.Rhine, 'On the Size and Growth of Government' (2006) January / February *Federal Reserve Bank of St. Louis Review* 13.
[27] Allan H. Meltzer and Scott F. Richard, 'A Rational Theory of the Size of Government' (1981) *Journal of Political Economy* 916.
[28] Lu Da and Cao Ku, 'Few important factors that could restrain size of the government' (2003) 4 *News of the National Administrative Academy* 25. 吕达、曹琨："制约政府规摸的几个主要因素"，《国家行政学院学报》2003 年第 4 期，第 25-28 页.

development of the third sector are also factors that could be considered in measuring the size of the government.[29]

In recent years, public economists had discovered that the value added tax could be used indirectly in expanding the government. In fact, in almost all countries with VAT, their tax rate increased over time, meaning that the proportion of taxation income in the countries' GDP grows.[30] For example, in Denmark, the VAT had increased from 10% in 1967 to 22% in 1978, while the proportion of taxation income on GDP increased from 36.1% to 43.6%.[31] In the Eurozone countries, the average VAT rate was initially 13.9% but increased by 40% to 19.3% in 2001.[32] In 2011, the average VAT tax rate was 20.7% and increased to 21.0% in 2012.[33]

VAT would lead to an expansion of the government sector since the VAT is a consumption tax that had excludes intermediate goods and services from the tax base.[34] The ability of the VAT to generate large sums of taxable income is due to its taxation on final consumption of goods and services. If the United States were to impose a VAT of 5%, it would be expected to raise an extra 500 billion dollars of taxation income.[35] Moreover, since the VAT would be hidden in the price of final consumption, it would not be seen as a direct taxation burden, thus it is politically beneficial to legislators but detrimental to taxpayers. [36] Fiscal decentralisation was seen to be the most effective method to suppress the expansion of the government, as it would incentivise local governments to increase competition in order to maintain taxation income from residents and companies, thus reducing the over expansion of the government.[37]

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[29] Kang Xinhang, 'Reasonable size of government – an economic analysis' (2004)1 *Soft Science* 15.康新航：“合理政府规模——经济学的分析”，《软科学》2004 年第 1 期，第 15-16 页

[30] Harvey S. Rosen, Public Finance (China Renmin University Press,4th ed, 2000) 435.

[31] Henry J. Aaron, 'Introduction and Summary.' in Henry J. Aaron (ed), *Value-added Tax –Lessons from Europe* (Brookings Institution, 1981) 14.

[32] Sijbren Cnossen, 'Tax Policy in the European Union-A Review of Issues and Options' (Working Paper for European Union, 2002) 6.

[33] *Further increase in VAT rates in 2012*, Eurostat newsrelease, 77/2012-21 May 2012, http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/2-21052012-BP/EN/2-21052012-BP-EN.PDF.

[34] David N. Hyman and Zhang Jincang, Public Finance-A Contemporary Application of Theory to U.S. and Chinese Practice (Peking University Press, 2011) 439.

[35] Daniel J.Mitchell, Will a VAT Turn America into a Greek-style Welfare State? (23 February 2011) Reuters.

[36] Milton Friedman, *Our New Hidden Taxes* (14 April 1980) Newsweek 90.

[37] G. Breman and J.M.Buchanan, *The Power to Tax: Analytical Foundations of a Fiscal Constitution* (Cambridge University Press, 1980), 197-217.

Since the transition to the VAT in China in 2009,[ii] related research focused mainly on: (1) the analysis on the effect of the transitioning to VAT[38]; (2) the paths of expansion of the VAT[39]; and (3) the analysis on the effect of the expansion of the VAT.[40] These research were all written from the perspective of a company or an industry to evaluate the economic impact and the reform orientation of the VAT, yet none has been written from the perspective of the government. Thus, this article will analyse the relationship between the VAT in China and the size of the government, and would provide recommendations on subsequent VAT reforms.

2. Trends in the change in size of the government after the VAT reform

The evaluation of the size of the government should be based on objective standards, as using different standards may result in different outcomes. The size of the government can be determined by three factors: the number of government-employed staff, the number of government organisations, and the expenditure of the government. It was generally considered that the higher the number of government employed employees and the number of governmental organisations, the larger the size of the government, and vice versa. Having more organisations indicate a higher demand for government-employed staff and facilities, thus the size of the government should be larger. In addition, higher government expenditure would depict a larger governmental size. Alternatively, government expenditure is positively related to the value of governmental functions. The more functions that the government of a country has, the higher the related expenditure, and the larger the size of the government. Thus, government expenditure is the most frequently used indicator of the size of the government. Both the absolute government expenditure and the proportion of government expenditure on GDP are included in the measurement of government size using government expenditure.

[38] Fu Guangjun, Analysis of the effectiveness of Chinese VAT reform (Chinese Market Publising, 2010).付广军：《中国增值税转型效应分析》，中国市场出版社 2010 年版.

[39] Yang Moru, Research on the expansion of the Chinese VAT: Calculation on the change in the VAT based on business and other taxes (Chinese Taxation Publishing, 2010). 杨默如：《中国增值税扩大征收范围改革研究：基于营业税若干税目改征增值税的测算》，中国税务出版社 2010 年版.

[40] Hu Yijian, 'Analysis on the effectiveness of the reform of the VAT in the Shanghai service industry' (2012) 1 *Development in Science*; Hu Yijian, *Changing from business tax to the VAT is a structural reform* (8 August 2013) First Financial Daily. 胡怡建：上海服务业"营改增"改革试点效应分析，《科学发展》2012 年第 1 期；"'营改增'是系统性制度变革"，《第一财经日报》2013 年 8 月 8 日.

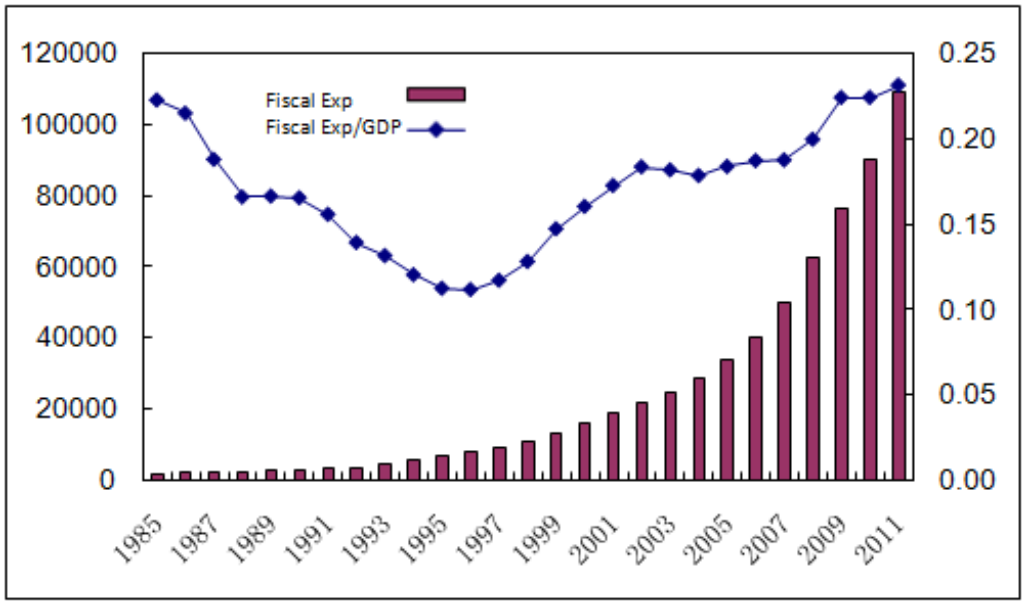

Figure 1: 1985- 2011 Size of the Government

Source: *Chinese Statistical Yearbook 2012*

Figure 1 shows the government expenditure and the proportion of government expenditure on GDP between 1985 and 2011. In terms of absolute value, government expenditure seems to increase continuously. It has increased from 200.425 billion dollars in 1985 to 10.924779 trillion in 2011, which is almost a 55-fold increase, depicting a continuous increase in the size of the government. In relative terms, the value of government expenditure over GDP had a curve in U-shaped, reaching its lowest of 11.22% in 1995 and highest of 23.10 % in 2011.

The continuous increase in expenditure was a result of the rapid increase in government financial income. As the contribution of the VAT to total taxation income is of the highest proportion and yields the highest value within the current taxation system it led to the rapid increase in government financial income.[iii] It is well known that the taxation income from the VAT before the 1993 tax system reform was minimal.[iv] Yet, after the publication of *Provisional Regulations of the People's Republic of China on Value Added Tax* in 13 December 1993 by the State Council, and the *Provisional Regulations of the People's Republic of China on Value Added Tax Detailed Rules for Its Implementation* in 25 December 1993 by the Ministry of Finance, with its official implementation from 1 January 1994,

income from the VAT had increased rapidly, so as its proportion to total GDP. The proportion of the VAT income to total GDP in 1985 was only 1.64%. It increased to 4.79% in 1994, reached its peak of 5.91% in 2006 and maintained at a level above 5% since then. This trend had proven Rosen's view that a higher proportion of the GDP consist of income from the VAT. The increase in income from the VAT led to an increase in government expenditure. Hence, this could be an important factor in the expansion of the government.

3. Empirical Investigation of the Relationship between the VAT and the Size of the Chinese Government

3.1 Source of Samples and the Selection of Variables

1 Source of Samples

In this investigation, the size of the government has been chosen as the dependent variable and the VAT as the independent variable. Based on data from 1985 to 2011 from China, this article investigates the impact of VAT on the size of the government. Main sources of data include the Statistical Yearbook of China[41] and the Financial Statistical Yearbook of China.[42, 43]

2 Selection of the VAT indicator (the independent variable) and the Characteristics of such Data

This article uses the VAT data of China (excluding VAT on imported goods) from 1985 to 2011. As shown in Exhibit 2, the VAT as a taxation income for the government grew rapidly. The growth exceeded 15% p.a. for most years within the sample period. In 1985, the VAT was merely $14.77 billion RMB, whereas in 2011 the VAT provided an income of $2426.663 billion RMB to the government. In order to investigate the impact of VAT on the size of the government, this article uses the growth of VAT (g_vat) as the dependent variable.

[41] 中华人民共和国国家统计局 [National Bureau of Statistics of China], 《中国统计年鉴》 [Statistical Yearbook of China], (中国统计出版社 [China Statistics Press]).
[42] 中华人民共和国国家统计局 [National Bureau of Statistics of China], 《中国财政统计年鉴》 [Financial Statistical Yearbook of China], (中国统计出版社 [China Statistics Press]).
[43] This work has used the internal VAT figures between 1985 and 2011 in the China Statistical Yearbook (“中国统计年鉴”). Although in the 1994 reform, the VAT structure was fundamentally changed, this work focuses on the correlation between VAT and sizes of governments. In other words, this work focuses on the quantitative analysis, irrespective of change of the underlying taxation system.

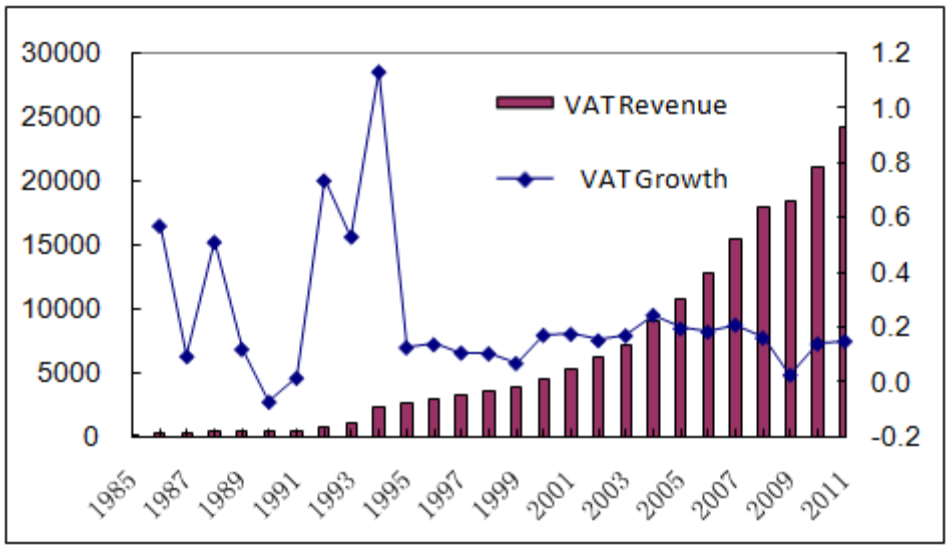

Figure 2: VAT as a taxation income for the Chinese government between 1985 and 2011 (Unit: 100 million RMB)

3 Selection of the Indicator for the Size of the Chinese Government (dependent variable) and the Characteristic of such Data

Corresponding to the selection of growth of VAT as the indicator of the dependent variable, this article uses the ratio of government expenditure over GDP (G_sg) as the indicator of government size. The average of the sample data is 0.004, with the minimum value of -0.126, maximum value of 0.149 and standard deviation of 0.073.

4 The Relationship between the Variables

Figure 3 compares the growth of VAT and the growth of the size of the Chinese government. As shown in Exhibit 3, the relationship between the two indicators is not a simple linear one. It is highly probable that the relationship is non-linear. Therefore, there needs to be an examination of the existence of non-linear terms of high orders.

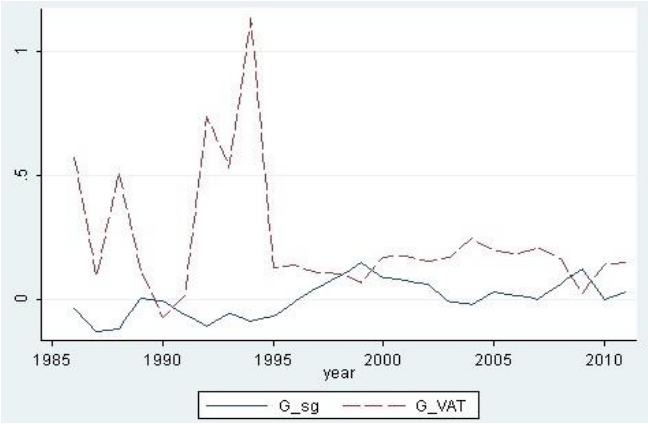

Figure 3: Correlation between VAT Growth and the Growth of the size of the Chinese Government between 1985 and 2011.

3.2 Construction of the Model and the Research Hypothesis

1 The Model

According to the hypothesis and the characteristics of the data, the following model is postulated:

$$y_t = b_0 + b_1 y_{t-1} + \ldots + b_{p_1} y_{t-p_1} + a_1 X_{t-1} + \ldots + a_{p_2} x_{t-p_2} + g_1 x^2{}_{t-1} + \ldots + g_{p_3} x^2{}_{t-p_3} + e_t + q_1 e_{t-1} + \ldots + q_h e_{t-h}$$

where y denotes the growth rate of the government size, x is the growth rate of the VAT, x^2 is the non-linear term for the growth rate of the VAT, $\{e_t\}$ is the background white noise, and the assumption that the distribution is a normal one $N(0, \sigma_\varepsilon^2)$.

2 Hypothesis

Hypothesis 1: there is a positive correlation between growth rate of taxable income from the VAT and the growth rate of the government size.

VAT is a multi-stage sales tax that excludes the purchase of intermediate products and services from the tax base. The ability of the VAT to generate large sums of taxable income is due to the use of final consumption as the tax base. As the revenue and expenditure of the government increase, the size of the government will increase. Therefore, it is hypothesized in this article that there is a positive correlation between the growth of VAT and the growth of government size.

3.3 Empirical Study

1 Misspecification testing

The data was processed using Stata 11.0 and the results of the misspecification testing (see Table 2 for test results) strongly reject the assumption that omitted variables do not exist. In other words, the results suggest the existence of omitted non-linear terms of high order. The introduction of g_vat2 as a normalisation variable (denoted as g_vat2) significantly improved the result.

2 Unit Root Tests and Co-integration

The data was put through the ADF test, the PP test and the DF-GLS test. Outcomes of all tests unanimously suggest that it is "unable to rule out the existence of unit roots" (see Table 3). A recursive co-integration test with constants and time trends has revealed the existence of a linearly independent co-integration variable (See starred items in Table 4). Furthermore, through the testing it is discovered that the VAR expression corresponding to this system has a lag value of degree 4 (See starred items in Table 5).

3 Results of the VECM Regression Analysis

Johansen's MLE test was used to estimate the Vector Error Correction Model (VECM) (See Table 6 for Regression Result). For a long-term equilibrium relation to exist, the estimation function can be written as:

G_sg = 0.116 + 1.105g_vat - 1.073g_vat2

Hence, a non-linear correlation between the growth of the government size and the growth of the VAT can be inferred.

4. Policy Advice on VAT Reform

The VAT's disadvantages outweigh its advantages in developing countries when compared with other forms of sales tax.[44] However, the reform of VAT in China is unstoppable. The transformation from sales-based tax to VAT has been regarded as one of the main objectives in China's macroeconomic control in 2013. It has also been viewed as the "fuse" for a new round of financial and taxation reform and for a more comprehensive reform. This reform to VAT has been said to be an important mechanism through which the government can start the restructuring of China's economy.[45] Therefore, given the high expectations of the impact of the VAT reform requires more thorough consideration.

4.1 Cost-Benefit Analysis of the Sale-to-VAT Taxation Reform from a Macroeconomic Perspective

The advantages of VAT include its neutrality in distributing burden, and promotion of professionalism development and fair competition. These advantages have been the main reasons why policy-makers and the academia have recommended the transition to the VAT. However both the historical experience of the EU and the empirical studies within this article have suggested that the VAT will lead to expansion of the government. Countries that wish to limit the size of its government to create a more cost-efficient and service-oriented government will be faced with a dilemma.

Moreover, China's VAT reform has been based on the EU experience. It is worth-noting that countries of the EU are developed countries with market economies. Their political systems, market environment and cultural backgrounds are all fundamentally different from the less developed market economy as found in China. The advantages of introduction of VAT in less developed countries include high degree of political legitimacy, adequate preparation in the pre-reform stage, the opportunity to have trial and experimental transition within designated geographical areas, the investment of human and financial resources in tax administration etc. On the other hand, the disadvantages include the flaws in the design of the system itself, the lack of cooperative policies, the need to challenge

[44] S.R. Lewis, Taxation for Development: Principles and Applications (Oxford University Press, 1984).
[45] 高培勇 [Gao Peiyong]，'营改增'的历史使命 [The Historical Significance of transition from Sales Tax to Value-Added Tax], (2013) 1 涉外税务 *International Taxation in China* pp5-7.

taxpayers' preconceptions, the disadvantages brought by a self-reporting system, the lack of a tax refund system, the incomprehensiveness of audit systems, the lack of sophisticated data processing capabilities and so on.[46] To counteract the above weaknesses, the design of the VAT reform needs to be detailed and comprehensive, especially with regard to corresponding policies and infrastructure before it is introduced.

Currently, the proceeds from the VAT are shared between the central authority (75%) and the local governments (25%) while the business tax is a local tax. The expansion of the VAT will involve an adjustment to the financial system. The method of adjustment can be through a change in the proportion being shared between the governments, a change in the tax return value, or fixed amounts of redirection of payments.[47] But regardless of the method employed, there will be major difficulties in the adjustment of the reform. Therefore, many rounds of negotiation between the central and local governments is required. The complexity of negotiating such reform will surpass that of the tax sharing system reform in 1994. Furthermore, if the VAT replaces the business tax, the local governments will lose their main tax base. Therefore, it is important to determine what the new major tax base for local fiscal income is to enable a reconstruction of the local taxation system after implementation of the reform.[48] Certainly in terms of macroeconomics, any ends can be achieved by the government's management policy if associated costs are ignored. Nonetheless, it should be presupposed that the government would choose regulatory tools that will have minimal impact on the social welfare system.[49]

4.2 Details and Problems of the VAT Reform from a Microeconomic Perspective

1. Selection of Strategy to Expand

There are two main strategies in expanding VAT after its introduction, namely the "one-stop" strategy and the "multi-staged" strategy. The "one-stop" strategy has the benefit of resolving all the conflicts in a concentrated manner. But given the intricate relationships and interrelatedness of the interests of the parties involved, this strategy will take a long time to design and therefore, it is unlikely that the strategy can be rolled out during the Twelfth Five-Year Plan[50] The "multi-staged" strategy can overcome some of the problems that the "one-stop" strategy has, but it will take too long to implement. The completeness and stability of the taxation system cannot be guaranteed. Comparing the two strategies, and taking into consideration the opportunity of having a trial and experimental transition within

[46] Pierre-Pascal Gendron, VAT Treatment of Financial Services: Assessment and Policy Proposal for Developing Countries, (2008) November Bulletin for International Taxation p503.
[47] 孙钢 [Sun Gang], 增值税'扩围'方式的选择 [Selected Methods for Tax-base Expansion of VAT] (2012) 地方财政改革与发展研究 *Reform, Development and Research of Local Government Finance* p247.
[48] 施文泼 [Shi Wenpo], 贾康 [Jia Kang], 增值税'扩围'改革与中央和地方财政体制调整 [Reform of VAT expansion and Systematic Reform of Central and Local Government Finances], (2010) 11 财贸经济 *Finance and Trade Economics* p51.
[49] 杨斌 [Yang Bin], 税收学原理 [Principles of Taxation] (高等教育出版社 [Higher Education Press] 2008) 198.
[50] 孙钢 [Sun Gang], 增值税'扩围'方式的选择 [Selected Methods for Tax-base Expansion of VAT] (2012) 地方财政改革与发展研究 *Reform, Development and Research of Local Government Finance* p247.

designated areas as a developing country, this article is inclined to support the "multi-staged" strategy. The "multi-staged" strategy entails the expansion of the VAT in limited designated geographical areas and industries first before expanding into other geographical areas and new industries. Through this strategy, it allows corresponding policies and infrastructure to be introduced to new areas and new industries to smoothen the transition into a VAT system based on experience and mistakes from previous stages.

2. Steps to Expand into New Industries

After the "1+6" phase in the expansion of the VAT within the designated areas and industries[51], the question as to which other service industries to introduce the VAT to will arise. The selection of industries to introduce the VAT to depends on the situation of each service industry. Scholars have suggested the method of elimination. Industries that have not been included in the business tax base or have been exempted from business tax, such as education, public health, social welfare etc. should be eliminated first. Industries into which the introduction of VAT will be met with gross difficulties and complication, such as the financial services industry should be eliminated next. Finally, industries that are consumption-intensive, that comprise mainly of small businesses and sole traders, and where tax evasion is the norm, such as the F&B industry, travel and sports should be eliminated as well.[52] After these rounds of eliminations, the second sets of industries concerned will be the rental market, the postal industry, the entertainment industry, the news and publishing industry, and the real estate industry. Subsequently, there should be gradual introduction of VAT into the F&B industries, travel, sports, and finally into the financial services, education, public health and social welfare industries.

3 Considerations in Regulating and Collecting the VAT

Effective regulation and collection of the VAT depend on the integrity of the characteristics of the tax itself and of the chain of transactions, instead of a particular transaction. Therefore, it is undesirable to impose separate VAT on every single transaction. Traditionally, whenever a new form of taxation is introduced in China, a large amount of human, material and monetary resources would be put into enforcement of the tax. This practise should not be employed in the expansion of the VAT because it will increase the costs to regulate and collect the VAT and this form of enforcement is unsustainable. The government should consider improving its information management system, upgrading its data processing capabilities, educating the public regarding their tax obligation, in order to reduce the costs of enforcing VAT regulations.

4. Pre-emptive Solutions to Potential Problems

[51] The "1+6" phase included service industries such as traffic and transportation, research and technology, IT, culture and creativity, Logistics, Rental services of movable goods, and the Forensics Consulting industry.

[52] 李艳、谭郁森 [Li Yan and Tan Yusen], 上海'营改增'试点下一步扩围行业选择研究 [Studies on Selections of Industries for VAT Expansion in Shanghai], (2013) 3 税收经济研究 *Tax and Economic Research* pp11-13.

If the VAT is successfully rolled out under the "multi-staged" strategy, it will cover all industries. Modern industries, especially the financial industry, are developing rapidly. There are always new circumstances, new products and new services. But the taxation system has to be relatively stable. There should be careful consideration given to ensure the design of the system incorporates mechanisms that maintain a stable VAT system in the midst of dynamic development within the financial industry. For example, financial companies prefer internal transactions when providing all kinds of products and services. Rules should be established in regulating and imposing the VAT for such transactions in order to avoid the problem of non-deductibility of certain financial products. For instance, a parent company in the financial industry provides IT services, which is worth $100, to its subsidiary. If the VAT rate is 17%, then the consideration for this internal transaction should be priced at $117 (including VAT) to allow the subsidiary to obtain a $17 deduction. If the subsidiary subsequently resells the services to a third party with a $100 markup, the gross price should be $234. The VAT regulation will have to mandate that the receipt, which the subsidiary will issue to such third party, indicates gross VAT of $34, in order to allow the third party to get a $34 deduction on this transaction.

5. Summary

VAT is the most significant and lucrative taxation for the Chinese government. Hence, there is growing expectation of its impact. Foreign experiences have suggested that it is not too difficult to introduce the VAT on a policy level. Nonetheless, the government should concentrate on its long-term effects, rather than viewing it merely as a stable source of fiscal income and an incentive for economic reform. These long-term effects include the VAT's growing power to collect revenue, its increasing share within the GDP, and increasing size of the government. As a matter of fact, all taxation reforms should reflect public interest rather than focus on its revenue generating power.[53] In contemporary China, the effects of the VAT, especially those on the government, will require broader and more in-depth research.

[53] John Galbraith, *Economics and the Public Purpose* (Houghton Mifflin,1973).

Appendix

Appendix1 Proportion of Domestic VAT in GDP（1985-2011）

Year	GDP（per 100 million RMB）	Domestic VAT	Proportion of Domestic VAT in GDP（%）
1985	9016.0	147.70	1.64
1986	10275.2	232.19	2.26
1987	12058.6	254.20	2.11
1988	15042.8	384.37	2.56
1989	16992.3	430.83	2.54
1990	18667.8	400.00	2.15
1991	21781.5	406.36	1.87
1992	26923.5	705.93	2.63
1993	35333.9	1081.48	3.06
1994	48197.9	2308.34	4.79
1995	60793.7	2602.33	4.28
1996	71176.6	2962.81	4.16
1997	78973.0	3283.92	4.16
1998	84402.3	3628.46	4.30
1999	89677.1	3881.87	4.33
2000	99214.6	4553.17	4.60
2001	109655.2	5357.13	4.89
2002	120332.7	6178.39	5.13
2003	135822.8	7236.54	5.33
2004	159878.3	9017.94	5.64
2005	184937.4	10792.11	5.84
2006	216314.4	12784.81	5.91
2007	265810.3	15470.23	5.82
2008	314045.4	17996.94	5.73
2009	340902.8	18481.22	5.42

2010	401512.8	21093.48	5.25
2011	472881.6	24266.63	5.12

Source：China Statistical Yearbook 2012

Appendix 2: Nonlinear TermTest

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reg G_sg g_vat2
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Source	SS	df	MS		
Model	.028297899	1	.028297899	Number of obs =	26
Residual	.104686194	24	.004361925	F(1, 24) =	6.49
				Prob > F =	0.0177
Total	.132984092	25	.005319364	R-squared =	0.2128
				Adj R-squared =	0.1800
				Root MSE =	.06604

G_sg	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
g_vat2	-.1240564	.0487059	-2.55	0.018	-.2245804	-.0235325
_cons	.0190993	.0142382	1.34	0.192	-.010287	.0484855

Appendix 3: Unit Root Tests

ADF Test

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. dfuller G_sg, lags(8) reg
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Augmented Dickey-Fuller test for unit root Number of obs = 17

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.738	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0677

D.G_sg	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
G_sg						
L1.	-.8959037	.3271881	-2.74	0.029	-1.669581	-.1222269
LD.	.1713688	.2801552	0.61	0.560	-.491093	.8338306
L2D.	-.2187381	.3075104	-0.71	0.500	-.9458847	.5084086
L3D.	.5754442	.280953	2.05	0.080	-.0889041	1.239793
L4D.	.4307822	.3096626	1.39	0.207	-.3014536	1.163018
L5D.	-.1397334	.3230167	-0.43	0.678	-.9035464	.6240797
L6D.	-.2119191	.2719859	-0.78	0.461	-.8550636	.4312255
L7D.	-.3650219	.2579174	-1.42	0.200	-.9748995	.2448557
L8D.	-.029565	.2219853	-0.13	0.898	-.5544768	.4953467
_cons	.039414	.015761	2.50	0.041	.0021452	.0766828

PP Test

```
. pperron G_sg
```

Phillips-Perron test for unit root Number of obs = 25
Newey-West lags = 2

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-7.185	-17.200	-12.500	-10.200
Z(t)	-1.989	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.2914

DF-GLS Test

```
. dfgls G_sg

DF-GLS for G_sg                                          Number of obs =    17
Maxlag = 8 chosen by Schwert criterion

                     DF-GLS tau       1% Critical       5% Critical      10% Critical
  [lags]          Test Statistic        Value             Value             Value
------------------------------------------------------------------------------
     8               -1.283           -3.770            -3.240            -2.611
     7               -1.239           -3.770            -3.014            -2.488
     6               -1.379           -3.770            -2.927            -2.471
     5               -1.527           -3.770            -2.946            -2.534
     4               -3.128           -3.770            -3.043            -2.654
     3               -3.176           -3.770            -3.188            -2.805
     2               -1.913           -3.770            -3.349            -2.963
     1               -2.197           -3.770            -3.498            -3.103

Opt Lag (Ng-Perron seq t) =  3 with RMSE  .0366138
Min SC   = -5.948023 at lag  3 with RMSE  .0366138
Min MAIC = -5.235958 at lag  1 with RMSE  .045623
```

Appendix 4: Cointegration Rank Test

```
. vecrank G_sg g_vat lnVAT2,lags(2) trend(trend) max

                        Johansen tests for cointegration
Trend: trend                                         Number of obs =       24
Sample:  1988 - 2011                                       Lags =        2
------------------------------------------------------------------------------
maximum                                                        5%
  rank       parms       LL          eigenvalue    trace     critical
                                                   statistic   value
------------------------------------------------------------------------------
   0          15      32.205517            .        43.6434    34.55
   1          20      43.796002         0.61935     20.4624    18.17
   2          23      52.587452         0.51935      2.8795*    3.74
   3          24      54.027201         0.11306
------------------------------------------------------------------------------
maximum                                                        5%
  rank       parms       LL          eigenvalue    max       critical
                                                   statistic   value
------------------------------------------------------------------------------
   0          15      32.205517            .        23.1810    23.78
   1          20      43.796002         0.61935     17.5829    16.87
   2          23      52.587452         0.51935      2.8795     3.74
   3          24      54.027201         0.11306
------------------------------------------------------------------------------
```

Appendix 5: Lag Order Test

```
varsoc G_sg g_vat g_vat2

Selection-order criteria
Sample:  1990 - 2011                              Number of obs      =        22
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	54.2107				1.9e-06	-4.65552	-4.62047	-4.50674
1	68.6858	28.95	9	0.001	1.2e-06	-5.15325	-5.01306	-4.55814
2	85.7208	34.07	9	0.000	6.0e-07	-5.88371	-5.63837	-4.84226
3	97.4223	23.403	9	0.005	5.4e-07	-6.1293	-5.77882	-4.64151
4	124.717	54.589*	9	0.000	1.4e-07*	-7.79242*	-7.3368*	-5.8583*

```
Endogenous:  G_sg g_vat g_vat2
 Exogenous:  _cons
```

Appendix 6: Vector Error Correction Model (VECM) Regression Results

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	2	13.92146	0.0009

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
G_sg	1	.	.	.	.	.
g_vat	-1.105254	.3803794	-2.91	0.004	-1.850784	-.359724
g_vat2	1.072796	.3332601	3.22	0.001	.4196184	1.725974
_cons	.1160772	.	.	.	.	.

[i] The difference in ratio depends on whether the denominator is GDP, GNP or GNI, whether the denominator is calculated in factor cost or market price and whether capital consumption is calculated in total value or net value. Public expenditure has the smallest proportion in GDP (market price), while public expenditure has the highest proportion in GNI (factor cost).

[ii] Reform in the VAT was to convert from a producer based VAT to a consumer based VAT. The main aim of the reform was to allow companies to deduct VAT from investment in capital goods.

[iii] In 2011, VAT was 41.1% of the total tax income, while Business Tax was 15.25%. After the changes in the regulation of the Business Tax, the proportion of VAT on total taxation income is expected to increase.

[iv] In 1979, research had been conducted to investigate the practicability of imposing the VAT. Later in 1980, VAT was piloted in the machinery and agricultural machinery industries in selected cities such as Liuzhou, Changsha, Xiangfan and Shanghai, as serious duplication in taxation charges had been observed in these industries. In 1981, VAT had been expanded to products such as bicycles, electric fans and sewing machines. In 1983, VAT was charged in all parts of the country. In 1984, the State Council published the *Provisional Regulations of the People's Republic of China on Value-Added Tax (Draft)*. Some researchers thought that the Regulations had only merely introduced methods of calculating the VAT as there are some many different tax rates and the taxation coverage does not include all products and relevant stages of circulation. In this sense it is not a real VAT system.