Price effects of VAT reform in China:

With a focus on “refund rate of export tax” and “tax credit of investment goods”

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# 1 Introduction

China’s Value Added Tax (VAT) was introduced experimentally as a part of 1984 tax reform. China’s VAT became full-fledged with introduction of export tax credit in the tax reform in 1994. After that VAT is one of the major taxes in China and the VAT revenue is 1,560 billion RMB which reaches 32% of the tax revenue total 4,950 billion RMB in 2007. On the other, as result of international financial crisis of 2008, China also has faced a serious recession caused by decrease of export demand. Then, China’s government raised the refund rate of export tax credit several times after November 2008 and moreover introduced investment goods tax credit system in January 2009. As a result of these reforms, the tax based of China’s VAT came to be the consumption.

This essay tries to estimate the effect of these reforms on the price and tax revenue in China. The structure of this essay is as follows. The historical change and current VAT system in China will be explained in Section 2. The model will be explained in section 3. Results of some simulation analysis will be introduced in Section 4 and Section 5 is a concluding remarks.

# 2. The current tax system in China

## 2-1 Tax reform in 1994

There are two major changes in the tax reform held in 1994. The first major change is a consolidation and abolishment of tax items. The number of the tax items of 32 before the tax reform almost halved to 17 after 1994 as is shown in Table1. However, as one of the alternatives to offset the revenue decrease of this tax reform, Chinese tax authority started a full scale operation of VAT subsequently. Another major change is separation of central tax and local tax. The local governments in China have just acted as an agent to collect tax in place of the central government where the tax revenue was sent to the central government and redistributed arbitrarily from the central government before 1994. The tax reform in 1994 specified the share of tax revenue between the central and local governments. For example, the share of income tax (both company and individual) is set central 60% and local 40% as is shown table 1.

Table1 China’s tax system

|  |  |  |
| --- | --- | --- |
| Tax category | Tax items | Central or Local |
| Circulation Taxes | Value-Added TaxBusiness TaxConsumption Tax1Tariffs | Central 75%, Local 25%Central CentralCentral |
| Income Taxes | Company Income TaxIncome Tax on Foreign EnterprisesIndividual Income Tax | Central 60%, Local 40%Central Central 60%, Local 40% |
| Resource Taxes | Resource TaxUrban and Township Land Use Tax  | Central and LocalLocal |
| Specific Purpose Taxes | City Construction TaxLand Appreciation Tax | LocalLocal |
| Property Taxes | House Property TaxInheritance Tax2 | LocalNot yet determined |
| Taxes on Economic activities | Vehicle and Vessel Usage TaxVehicle Acquisition TaxStamp TaxSecurity Exchange tax2 | LocalLocalLocalCentral 97%, Local 3% |
| Agriculture Tax | Tobacco Leaf Tax3 | Local |

Notes: 1.The consumption tax is taxable to spending on luxury goods.

2. Inheritance Tax and Securities Exchange Tax are not yet legislated and levied. Security Exchange Tax is currently charged as a part of Stamp Tax.

3. Agriculture tax was abolished in 2006 except tobacco leaf tax.

Source: Author's compilation based on Chinese Tax System (1994) and Tax Revenue Statistics 2007.

Table2 China’s tax revenue

Unit: Trillion RMB

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Value-Added tax | Consumption tax | Business tax | Income tax | Others | Total | Share of VAT |
| 1993 | 82 | 97 | 80 | 15 | 124 | 398 | 20.6% |
| 1994 | 234 | 50 | 68 | 76 | 79 | 507 | 46.2% |
| 1995 | 265 | 55 | 87 | 96 | 94 | 597 | 44.4% |
| 1996 | 302 | 63 | 107 | 111 | 122 | 705 | 42.8% |
| 1997 | 334 | 70 | 135 | 133 | 149 | 823 | 40.6% |
| 1998 | 373 | 83 | 161 | 138 | 155 | 909 | 41.0% |
| 1999 | 400 | 85 | 170 | 164 | 213 | 1,032 | 38.8% |
| 2000 | 467 | 86 | 189 | 243 | 282 | 1,267 | 36.9% |
| 2001 | 545 | 93 | 208 | 363 | 307 | 1,517 | 35.9% |
| 2002 | 628 | 105 | 247 | 380 | 341 | 1,700 | 36.9% |
| 2003 | 734 | 118 | 287 | 446 | 461 | 2,047 | 35.9% |
| 2004 | 893 | 150 | 358 | 581 | 589 | 2,572 | 34.7% |
| 2005 | 1,070 | 163 | 423 | 760 | 670 | 3,087 | 34.7% |
| 2006 | 1,289 | 189 | 513 | 953 | 819 | 3,764 | 34.2% |
| 2007 | 1,561 | 221 | 658 | 1,286 | 1,219 | 4,945 | 31.6% |
| 2008 | 1,800 | 257 | 763 | 1,490 | 922 | 5,231 | 34.4% |
| 2009 | 1,848 | 476 | 901 | 1,548 | 955 | 5,729 | 32.3% |

Note: Income tax including company income tax and individual income tax.

Source: Author's calculation using SAT's Tax Revenue Statistics, and Ministry of finance PRC.

Table 2 show the tax revenue of major taxes in China. The share of VAT in 1994 was extremely high of 46% of the total tax revenue. Though the share of VAT decreased to 30% after 2000 because of income tax increase, it still keeps the largest share in the tax revenue.

## 2-2 Background of VAT reform

The full scale operation of VAT started in 1994 while VAT those days did not allow the firms to deduct VAT include in the purchased tax credit. Then the VAT included in the capital goods was a burden of firms and VAT was an obstructive factor of new investment. In order to solve this problem, tax credit system for capital goods experimentally introduced in such industrialized northeast regional as Liaoning, Dalian, Jilin, Heilongjiang in July 1st 2004, and six provinces as Shanxi, Anhui, Jiangxi, Henan, Hubei, Hunan in July 1st 2007. After the preliminary introduction for two years, a large scale VAT reform started in January 1st 2009.

## 2-3 Tax refund for export goods

The tax deduction for exports, where the tax rate for exports is zero, was introduced as one of the export promotion measures at the same timing as 1994 VAT reform. This system, however, was forced to change since a lot of false claims by forged receipts happed.

Table 3 shows the system adjustment of export tax refund after 1995. The refund rate decreased to 3%，6%, and 9% in 1995. As a part of the export promotion measures after the Asian financial crisis in 1997, the tax refund rate raised again in 1998. During three years after that, however, China’s export had increased rapidly, and then delay of export tax refund became serious around 2002. As a result, the refund rate again decreased in 2004.

After 2005 Chinese government started to use tax refund rate as a tool of trade poly of individual trade items. The refund rate of textiles decreased while those of ICT goods increased in 2005. The refund rate of high energy intensive goods, high pollution goods, and resource consuming goods are cancelled and the refund rate of textiles further decreased while those of ICT goods further increased in 2007. Nevertheless, the refund rate of textiles and wooden goods again was raised to accommodate world economic recession in 2008.

Table 3 Transition of export tax refund

|  |  |  |
| --- | --- | --- |
|  | Execution | Rate of export tax refund |
| 0 | January, 1994 | Refund the full amount (17%) |
| 1 | January, 1995 | 3%，6%，9% |
| 2 | January, 1998 | 5%，13%，15%，17% |
| 3 | January, 2004 | 5%，8%，11%，13%，17% |
| 4 | January, 2005 | 5%，9%，11%，13%，17% |
| 5 | July, 2007 | 5%，9%，11%，13%，17% |
| 6 | August, 2008 | 5%，9%，11%，13%，17% |
| 7 | November, 2008 | 5%，9%，11%，14%，15%，17% |

Source: Author's compilation based on Ministry of Finance P.R.C and SAT's documents.

# 3. The model

## 3-1 the price model in I-O analysis

Let us confirm the price model in I-O analysis. When we look at each column of the I-O table, we have the following relation:

 (1)

where, (*j* = 1,…,*n*) stands for the price of domestic product for *j*-th industry, (*j* = 1,…,*n*) stands for the price of imported products for *j*-th industry，(*j* = 1, …, *n*) stands for the output for *j*-th industry, (*i,* *j* = 1,…,*n*) stands for the input of domestic intermediate products from *i*-th industry to *j*-th industry, (*i,j* = 1,…,*n*) stands for the input of imported intermediate products from *i*-th industry to *j*-th industry, (*j* = 1,…,*n*) stands for the value added for *j*-th industry.

Here, we assume that the domestic input coefficient (), the imported input coefficient () and the value added ratio () are all fixed, then we get the price equation for *j*-th industry before imposing VAT as follows:

 (2)

Solving the equation (2) with the price for all industries gives the price model in I-O anaysis.

 (3)

where,  stands for the domestic price vector,  stands for the import price vector,  stands for the physical domestic input coefficient matrix,  stands for the physical import input coefficient matrix.

Incidentally, VAT system has two types; Invoice Method and Account Method. The principle is the same, but the operation is different in case there are exempt industries or those who are applied a reduced tax rate. Under the system of Invoice Method invoices are issued in each transaction, firms, therefore, recognize the price of the goods and VAT separately. On the contrary, under the system of Account Method invoices are NOT issued, firms, therefore, only can know the total value of the price of the goods and VAT.

China adopts Invoice Method like European countries while Japan adopts Account Method. Though it is interesting to show the difference in operation between two systems, we here show only the models for invoice method since we set a focus on China’s economy in this research.

## 3-2 Base price model for Invoice Method[[5]](#footnote-5)

First, let us explain the model in the case that there is neither export VAT refund nor investment tax credit. We need to deal with domestic products and imported products separately since the taxation formula is different. VAT payment by *j*-th domestic industry is expressed as follows[[6]](#footnote-6).

 (4)

where  is the VAT payment and  is the gross VAT rate for *j*-th industry. Dividing both sides of equation (4) by output gives the VAT payment per unit.

 (5)

where,  is a diagonal matrix with VAT rate. Supply price after imposing VAT is given by sum of the production cost (equation (2)) and the VAT (equation (5)).

 (6)

The prices for all industries after VAT imposition are expressed as follows:

 (7)

Solving equation (7) with  gives equilibrium price vector.

 (8)

where  is diagonal matrix with net VAT rate.

## 3-3 Price model for export VAT refund and investment tax credit

If we consider export VAT refund and investment tax credit, VAT payment by *j*-th domestic industry is expressed as follows.

 (9)

where  stands for the amount of export of *j*-th industry, and  is the amount of capital goods *j-*th industry purchase from *i*-th industry. The amount of VAT payment per unit is

 (10)

where, . Supply price after imposing VAT is given as

 (11)

The prices for all industries after VAT imposition are expressed as follows.

 (12)

Solving equation (12) with  gives equilibrium price vector.

 (13)

## 3-4 Price model with Exemption without Export VAT Refund and Investment Tax Credit in invoice method

We introduce exemption in invoice method is this sub section. Here, we assume the case where only *k*-th industry is exempted. Under exemption system in invoice method, though exemption industry, *k*-th industry, has no obligation of tax payment, it does not deduct VAT included in purchasing costs. The amount of VAT payment is as follows.

, (=0) (14a)

 (14b)

Dividing both sides of equation (14b) by  yields:

 (15)

Where,  is the same diagonal matrix as  except that *k*-th element is zero. Supply price for *j*-th industry (taxation industry) after imposing VAT is as follows.

 (16)

Expressing the prices of taxation (*j*-th) industries and exemption (*k*-th) industry together, one may have:

 (17)

Where,  is a matrix in which all *k*-th column elements of  are replaced by zero. If more than two exemption industry exists, the relationship such as equation (17) holds true. That is to say, you can get the similar price equation by putting VAT rate of exemption industry zero and replacing exemption industries’ columns in  to zero.

Solving equation (17) with  gives equilibrium price vector.

 (18)

The prices of exemption industries would rise slightly when consumption tax is introduced or raised, because exemption industries have no obligation for tax payment but cannot exempt VAT included in purchasing costs.

We need to be careful to the difference between “Exemption” and “Zero Tax rate” of The amount of VAT payment, in actual the term, ‘refund’, is correct for exemption industry, takes the same form as equation (4) except that  is zero suppose that zero tax rate is applied to *k*-th industry.

 (4)

 (4b)

## 3-5 Price model with Exemption with Export VAT Refund and Investment Tax Credit in invoice method

If we consider export VAT refund and investment tax credit, The amount of VAT payment is changed as follows.

 (19a)

 (=0) (19b)

Dividing both sides of equation (19b) by  yields

 (20)

Supply price for j-th industry (taxation industry) after imposing VAT is as follows.

 (21)

Expressing the prices of taxation (*j*-th) industries and exemption (*k*-th) industry together, one may have:

 (22)

Where,  is a matrix where *k*-th column of  are replaced by zero. If more than two exemption industries exist, the relationship such as equation (22) holds true. Solving equation (22) with  gives equilibrium price vector.

 (23)

# 4．Simulation

The standard VAT rate is 17% in China and the VAT system include reduced rate, zero rate, and exemption as is shown in Table 4.

Table 4 Tax rate of VAT

|  |  |
| --- | --- |
| Tax rate | Commodities |
| Tax rate | Standard rate | 17% |
| Reduced rate | Food, Water, Coal & gas products for resident, Book, Newspaper, Magazine, feedstuff, Chemical fertilizer etc. (13%) |
| Zero rate | Agriculture, Fishery, Forestry, Livestock, Second hand book, Equipment for scientific research and education, etc. |
| Exemption | Transportation, Construction, Finance & Insurance, Culture, Sports and Entertainment, etc. |

Notes: 1. An agriculture tax was abolished in January 1st 2006.

2. Because these industries pay the business tax, it exempts from VAT.

## 4-1 Data

We used “China input-output table2007” as a basic data. Incidentally, we need a fixed capital formation matrix [C*ij*] which shows the providing industries of capital goods invested by each industry, in order to estimate the effect of investment goods tax credit. China’s statistical authority, however, does not issue such a table. Therefore, we made a tentative fixed capital formation matrix [C*ij*] by spiriting the column vector of fixed capital formation using the shares in the row vector of capital consumption[[7]](#footnote-7)．

The price models showed in the previous section are based on a non- competitive import type of I-O table. The table that China’s statistical authority issues, however, is not a non-competitive type but a competitive type of I-O table. Therefore, we made a tentative non-competitive type of I-O table

A serious problem to analyze that the I-O tables that Chinese statistical office issues are of NOT a non-competitive type but a competitive type to which the above mentioned price model cannot be applied. We estimated, therefore, a non-competitive type of I-O table where the same import ratio is assumed in the same industry (import/domestic demand).

State Administration of Taxation issues a list of the refund rates of export tax in HS 10 digit (13,800 commodities)[[8]](#footnote-8). We relate the HS commodities to the industry classification of the I-O table of 135 industries and the corresponding refund rate of each is calculated by simple average as is shown in Table 5.

Table 5 Rate of VAT and Export Refund



Notes: Author's calculate rates of export tax refund using based on SAT.

## 4-2 simulation result

As we saw in section 2, investment tax credit was introduced to Chinese VAT in 2009 and the rates of export tax refund are diversified in Chinese VAT. Then, we set focus on such two “refund” systems in the following simulation analysis (Table 6).

Table 6 Simulation Scenarios

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
| Export Tax Refund | Full Amount | No | Current system | Full Amount | No | Current system |
| Investment Tax Credit | No | No | No | Yes | Yes | Yes |

### 4-2-1 Price effect

First of all, let us see the price effects of VAT which is shown in Table 9. The figures in the table show the change of price of each industry. The last row shows the average change of the all economy.

Let’s see the price effects of introduction of investment tax credit. We compare Case 3(before introduction) and Case 6(after introduction). The average price change in Case 3 is 1.080 while that in Case 6 is 1.069. That means that introduction of investment tax credit will push down the average price in China by 1.1%. Next, let’s see the price effects of export tax refund. We compare Case 4(full refund), Case 5 (no refund), and Case 6(current refund). The average price change in Case 4 is 1.057 and that in Case 5 is 1.094 while that in Case 6 is 1.069 as shown before. That means that full refund of export tax will push down the average price in China by 1.3% and abolishment of refund of export tax will push up the average price in China by 2.5%. The higher the export ratio is and the higher the investment goods purchase is, the price change of the corresponding industry gets smaller among taxed industries in Case 4 The industry whose price change is the highest is Scrap and Waste industry (15.7%), while The industry whose price change is the lowest is Radar and Broadcasting Equipment industry (-7.6%). This is because the export ratio in Radar and Broadcasting Equipment industry is large and the investment in this industry is also large.

Among non-taxed industries, the industry whose price change is the highest is Construction (5.4%). The reason why the price change is large in Construction is that “exemption”, where the VAT in the intermediate input is not deductible, is applied to Construction. On the other hand, the price change in agricultural and fishery sector is negative since “zero tax rate” is applied to those sectors.

Table 7 Summary of price effect (average of all industry)

|  |  |
| --- | --- |
|  | Export Tax Refund |
| Full Amount | No | Current system |
| Investment Tax Credit | No | (Case1)1.067 | (Case2)1.106 | (Case3)1.080 |
| Yes | (Case4)1.057 | (Case5)1.094 | (Case6)1.069 |

Notes: Assume pre tax price as 1.

### 4-2-2 Tax revenue

Table 10 shows the tax payment of VAT by industry. The last row is the VAT revenue total for Chinese government.

Actual revenue of VAT in the tax office statistics in 2007 is 2.176 trillion RMB (1.561 trillion RMB for inland and 0.615 trillion RMB for imports). On the other hand, the simulated value in case 3 (no investment goods tax credit in 2007) is3.051 trillion RMB (2.101 trillion RMB for inland and 0.950 trillion RMB for imports), which is 35% larger than the actual revenue. We assume there are two main reasons of this over estimation: 1) illegal export tax refund by forgery of export documents for inland part and 2) exemption for imports by foreign companies for import part.

Let’s compare Case 3(without investment tax credit) and Case 6(with investment tax credit) to see the effect of investment tax credit. The tax revenue calculated in our model is 3.051 trillion RMB in Case 3 and 2.763 trillion RMB in Case6. The revenue reduction from Case 3 to Case6 is 0.288 trillion RMB or approximately 9% of the revenue in Case 3. Incidentally, as is seen in table 2, VAT revenue has been increasing after 2007 in spite of introduction of investment tax credit. This is because the increase of tax revenue by economic growth has been larger than the decrease of tax revenue by introduction of investment tax credit.

After the introduction of investment tax credit, the tax payment decreased for all the taxed industries. Among them, For example, the tax payment of Electricity was 114.6 billion RMB in Case 3 followed by Steel, Oil & Natural Gas Mining, Oil refining, and Automobile.

Table 8 Summary of tax revenue effect

(Unit：Trillion RMB)

|  |  |
| --- | --- |
|  | Export Tax Refund |
| Full Amount | No | Current system |
| Investment Tax Credit | No | (Case1)2.655 | (Case2)4.160 | (Case3)3.051 |
| Yes | (Case4)2.375 | (Case5)3.846 | (Case6)2.763 |

Next, let’s compare Case 4(with export tax refund) and Case 5(without export tax refund) to see the effect of export tax refund. The tax revenue calculated in our model is 2.375 trillion RMB in Case 4 and 3.846 trillion RMB in Case5. The revenue reduction from Case 5 to Case4 is 0.388 trillion RMB or approximately 10% of the revenue in Case 5. A system of export tax refund has relatively large effect on the VAT revenue especially in the country whose export share is large like China.

Table 9 Price effects of VAT by industry



Table 9 Price effects of VAT by industry (continued)



Table 9 Price effects of VAT by industry (continued)



Table 10 Tax payment of VAT by industry



Table 10 Tax payment of VAT by industry (continued)



Table 10 Tax payment of VAT by industry (continued)



# 5. Concluding remarks

China’s VAT has changed to EU type VAT with investment tax credit in January 1st 2009. On the other, Chinese government changes the rate of export tax refund as a tool of industrial and trade policy. We estimated, in this paper, the price changes and tax payment by industry cased by introduction of investment tax credit as well as change in the rate of export tax refund based on an input-output price mode. The main results of the estimation are summarized as follows:

1. Introduction of investment tax credit in 2009 may pull down China’s domestic price by 1.1% and decrease the total VAT revenue by 288.2 billion RMB, or 9.4% of the total VAT revenue before Introduction of investment
2. Tax revenue decrease is large in such large investment based industries as Electricity, Oil & Natural Gas Mining, Steel, Oil refining or Automobile.
3. Suppose export tax refund should be abolished, China’s domestic price will be pushed up 2.5% and the total VAT revenue will increase by 1288.2 billion RMB. On the contrary, suppose all the export tax should be refunded should be abolished, China’s domestic price will be pulled down by 1.35% and the total VAT revenue will decrease by 387.8 billion RMB．

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4. Nagoya University, fujikawa@gsid.nagoya-u.ac.jp [↑](#footnote-ref-4)
5. There are limited numbers of researches on Chinese VAT based on the framework of I-O analysis. One of those is Toh and Lin(2005). [↑](#footnote-ref-5)
6. As to imported products, VAT is imposed on at the border without tax credit. Thus VAT on imported goods is calculated by multiplying the amount of import and VAT rate of the corresponding industry. [↑](#footnote-ref-6)
7. Nakai(1981) uses the same method． [↑](#footnote-ref-7)
8. See export tax refund list on State Administration of Taxation web. http://202.108.90.146/guoshui/web/listArticle1.jsp (in Chinese) [↑](#footnote-ref-8)