

**Assessing the Effects of Proposed Taxation Reform in China:
An Application of China CGE Model**

**Ming-tai Fan
Mark Horridge
Xiao-guang Zhang
and
Yu-xin Zheng***

**Presented to
“The 14th International Conference on Input-Output Techniques”
October 10-15,2002
Montreal, Canada**

* Authors are listed in alphabetical order.

Ming-tai Fan, associate professor, email: mtfan@mx.cei.gov.cn;

Yu-xin Zheng, professor, email: zhengyuxin@95777.com,

Mailing address: Institute of Quantitative and Technical Economics,
Chinese Academy of Social Sciences, Beijing 100732, China

Mark Horridge, Senior Researcher, email: Mark.Horridge@BusEco.monash.edu.au,

Mailing address: Centre of Policy Studies, Monash University, Clayton, 3168, Australia

Xiao-guang Zhang, Research Manager, email: xzhang@pc.gov.au,

Mailing address: Productivity Commission, Melbourne Office, Level 28, 35 Collins Street,
Melbourne Victoria 3000, Australia

Abstract

China is on the way to reform further her tax system. The proposed reform package include extending value added tax from industry sector to cover more business tax related sectors, partially or fully deduction of VAT on investment, altering consumption tax rates and coverage, among them. It is of primary policy concern to assess the impact of the reform package.

In this paper, we presents a CGE modelling of the Chinese economy incorporated with various major taxes and fiscal redistribution of income between economic agents, and four Policy scenarios are assessed with the model.

First, we add more details about the tax system into our China computable general equilibrium model (PRCGEM), and this update is employed to provide a base on which the effects of proposed taxation reform policies for the current Chinese economy can be analysed and quantified.

Second, the simulation results are used to illustrate how the Chinese economy might respond to those policy changes in a modelled world rather than capture the impact in a realistic world. This illustration is constrained because of the data problem as well as the limited dynamic mechanisms in the model.

Assessing the Effects of Proposed Taxation Reform in China: An Application of China CGE Model¹

1. Introduction

China's current taxation system was established in 1994 when a comprehensive taxation reform was introduced. The reform was intended to establish a system for tax assignment or sharing among different levels of government to reduce tax leakage; to define clearly rules-based taxes and to end the system of tax contracting between the central and local governments and between enterprises and governments.

At the beginning of 1994, the number of taxes was significantly reduced and the taxation treatment of all types of enterprises was made uniform. The reforms aimed to simplify the taxation system and make it more efficient, as well as to increase the central government's share of tax revenue.

The most important changes introduced in this reform were:

- * Extending the value added tax (VAT) to all industrial sectors. The VAT applies to imported and domestic goods (but not exports) and a few services that are directly related to the processing and preparation of goods;

- * introducing a uniform corporate income tax rate for both domestic and foreign enterprises, except for those in special economic zones and open cities, and central government-owned banks and extractive industries;

- * standardising personal income tax, applying it equally to foreign and Chinese nationals;

- * assigning most taxes to either central or local governments, and

¹ This research got support from China Ministry of Finance's World Bank Program. However, the views expressed herein are those of the authors and not necessarily those of any institutions.

sharing the remainder between the two levels of government on a uniform formula across provinces;

* imposing uniform accounting standards for tax purposes by the State Taxation Bureau under the new Tax Administration Law. While China's taxation policies generally follow sound taxation principles, tax administration is not yet uniform in application. Moreover, the tax collection system is weak and considerable effort will be required to improve efficiency and upgrade systems throughout China.

The 1994 taxation reform has been regarded as a success. The taxation revenue has been on the increasing ever since. However, as macroeconomic environment has changed in recent years, some problems inherited in the current taxation system become apparent.

There are two major problems with the current taxation system. The first is the incomplete nature of the current VAT system. The current VAT system does not cover most services sectors, which are subject to business tax. The second problem is that the current VAT is a production type VAT and the purchasers of investment goods have to bear full VAT.

The main problems with mixing VAT with business tax are :

Unequal tax burden. VAT and business taxes have different rates. The sale of a good attracts VAT if it is sold by its producer, wholesaler and retailer, and attracts business tax if it is sold by other firms.

Tax on tax. If service is provided along with some commodities, when business tax is paid, no rebate is given to the VAT already paid on the purchase of the commodities.

Destroying the internal control mechanism of a VAT system. For service suppliers using commodities as intermediate inputs, VAT receipts are not required. For commodity producers using services as intermediate inputs, if special deduction is granted, conventional receipts can be used. For service suppliers using services as intermediate inputs, no receipts are required.

Difficulties in tax collection for mixed sales and mixed operations.

There are three types of VAT systems, according to the extent to which the VAT paid on the purchase of capital investment goods is rebated.

--Production type VAT. VAT is not rebate-able for capital goods purchases. This implies that VAT is levied on GDP.

--Income type VAT. VAT paid for capital goods purchased is rebate-able annually on the basis of fix capital depreciation. This implies that VAT is levied on national income.

--Consumption type VAT, which allows a full rebate of VAT on the purchase of capital goods. This implies that VAT is levied on consumption only.

The problems with a production type VAT are its adverse impact on investment because the purchases of capital goods are taxed heavily likthat Vf can onhe rco

~ Partial investment VAT-deducted (e.g., machinery).

~ Extend VAT to cover more business-tax sectors (e.g., construction and road transport).

~ Alter consumption tax rates and coverage.

These policy changes normally affect more than one sector or enterprise and may have widespread impacts on the rest of the economy. To trace the impact of these policy changes, a general equilibrium framework is required. In this paper, a computable general equilibrium (CGE) model is used to analyse the quantitative effects of these policy measures on the economy.

2. Model and database

The model is based on a CGE model of the Chinese economy, named ‘PRCGEM’, developed jointly by the IQTE of the Chinese Academy of Social Sciences (CASS) and the Centre of Policy Studies (CoPS) of Monash University. The model has been used for analysing China’s trade policies and environmental policies.¹ This section will briefly describe the model’s structure and the database. The description of the model’s structure and the database will concentrate only on the incorporation of China’s taxation system. The core structure of the model and its database are referred to its published applications.

Model structure

The model’s structure is modified to incorporate China’s current taxation system. China currently has 22 types of taxes. They are value added tax, luxury consumption tax, business tax, enterprise income tax (income tax on foreign invested and foreign owned enterprises), individual income tax, house tax, urban land tax, vehicle use tax, urban real estate tax, vehicle license tax, natural resource tax, fixed capital investment direction adjustment tax, urban maintenance and construction tax, land appreciation tax, stamp tax, contract tax, slaughtering tax, banquet tax, agriculture

¹ For some applications of the model, see Zheng and Fan (1999) and Adams, Horridge, Parmenter and Zhang (2000).

(animal husbandry) tax, cultivated land occupation tax, tariff, vessel tonnage tax, (refund of VAT and LCT on exports).

In addition to tax revenues, the government also receives income from other sources such as administrative fees and charges, state enterprise profits and extra-budgetary revenues. The composition of government income in 1997 is listed in Table 1. Total government income comprises budgetary and extra-budgetary revenues. The budgetary revenue comprises tax revenue and other fees or charges, net of subsidies for state-enterprise losses. Extra-budgetary revenue is mainly state-owned enterprises' and other institutions' depreciation funds.

The taxes that are explicitly modelled are as follows: value-added tax on industrial sectors; business tax on services sectors; consumption tax on selected luxury goods; enterprise income tax; individual income tax; import tariff and export tax refund. It can be seen in the table that these taxes account for more than 80 per cent of total tax revenue.

The model divides the Chinese economy into 124 sectors, consistent with that of the 1997 input-output table. The description of the sectors is presented in Appendix 1.

There are only two general VAT rates applied to different goods or industries. The goods or industries for each VAT rate are listed in Table 2. The agricultural products that are sold by producers themselves are exempted from VAT. Note also that Trade (100) is the only non-industrial sector that is subject to VAT.

The second type of taxes is luxury consumption tax imposed on selected goods or industries. Goods from five industries are subject to different rates of luxury consumption tax: Wines (19), Tobacco (21), PetrolRef (36), RubbPro (46) and MotorVhc (68).¹

The third major type of taxes is business tax, applicable to all services that are not covered by VAT. The nominal rates for different sectors are listed in Table 3. Four levels of tax rates, 3, 5, 8 and 10 per cent, are used

¹ At the moment, luxury consumption tax is imposed on the value of total output of those industries. This treatment may overestimate the tax base as not all goods from those industries are subject to this tax.

for different services sectors. The tax is imposed on the output value of services. The public administration sector is exempted from business tax.

Other types of production tax are also levied on the output value of goods, such as agriculture tax and resource tax. The government also provide subsidies for loss-making state-enterprises. These taxes and subsidies are aggregated in the model as other production taxes.

Border taxes are all levied on imports. Imported goods attract tariffs and VAT, as domestically produced goods do. The tariff rates are calculated from 6-digit China's tariff schedule. As there are numerous tariff exemptions, the nominal import tariff rates are re-scaled by a uniform factor in order to match the reported import duty collected by the customs office.

China's taxation law allows exporters to reclaim the VAT that was invoiced on the purchases of the goods they export. The rebate rate for most manufactured exports is about 3-4 per cent of the producer value of exports concerned in 1997.

Two direct taxes are modelled: corporation tax and personal income tax. A uniform corporation tax rate of 33 per cent on operation surplus is applicable to enterprises in all industries.¹ China has a progressive individual income tax. As there are only two types of households in the model: rural and urban households, individual income tax is charged on total income for each type household. The amount of income tax collected is so adjusted as to match the reported amount by the Statistical Bureau.

The modelling of most taxes is quite straightforward as they are levied directly either on the value or on the quantity of the product to be taxed. The effect of those taxes on the value of output can be readily captured by the nominal rate of those taxes. In the remainder of this sector, we will concentrate only on modelling one type of taxes, VAT, as it requires some special treatment for measuring its net effect on the output of the product

¹ Additional taxes or higher corporation tax rates are applied to state-owned financial enterprises, such as state banks and insurance companies. These are treated as extra production taxes for those industries concerned in the model.

concerned.

Unlike most other taxes, '[A] value added type tax (VAT) is a tax on goods or services collected in steps by enterprises but which is ultimately charged in full to the final purchasers. ... VAT is described as 'deductible' tax because producers are not usually required to pay to the government the full amount of the tax they invoice to the customers, being permitted to deduct the amount of tax they have been invoiced on their own purchases of goods or services intended for intermediate consumption or fixed capital formation. VAT is usually calculated on the price of the good or service including an other tax on the product. VAT is also payable on imports of goods or services in addition to any import duties or other taxes on the imports'. (SNA 1999, pp.170-71)

A conventional way of modelling such value added type tax is to convert it into an ad valorem rate of tax on output price so that it can then be treated in the same way as other taxes.

In this model, attempt has been made to calculate VAT exactly in the same way as it is in the real world, that is, the VAT payable on the value of output net of deductible VAT on the value of intermediate inputs. The advantage of this treatment is that it enables us to capture the effect of changes in VAT rates on both inputs and outputs.

To calculate VAT actually paid by the producers of industries, input-output information on those industries is needed. This information is available from the input-output table or the model's database.

China's 1997 input-output table provides detailed information on the intermediate input usage for 124 industries. However, the prices used in the table are the producer's price, not the basic price, recommended in the SNA 1993.¹ China's input-output table is valued at the producer's price, which includes non-deductible VAT. This complicates the calculation of

¹ 'The table is valued at the producer's price. Since 1994, China has introduced a system of value added tax in production and circulation. To keep the consistency in definition between 1997 table and 1987 and 1992 tables, the producer prices in 1997 includes the value added tax payable. It should be noted that this definition of producer's prices is not the same as that of 1993 SNA, which does not include the value added tax.' (National Bureau of Statistics, 1999).

net VAT paid by producers in the model.

A simple example may be helpful in understanding how VAT is calculated in the model. Suppose that an industrial product is subject to VAT. To produce this product, the producer needs to purchase a number of intermediate goods and services. The purchases of some intermediate goods are also subject to VAT. Upon the purchase of the VAT-able intermediate goods, the producer is given a VAT receipt, indicating the amount of VAT that has been paid, which will be deductible for the producer when it pays VAT on its final product. The cost structure of this product is shown in Figure 1.

The producer uses the VAT-able intermediate inputs and other inputs, together with the inputs of primary factors of production (labour, capital and land), to produce that final product. The final product is assumed to be subject to some other taxes as well, such as luxury consumption tax. These taxes are levied on the basic price of the output, which covers the full cost of production, including the invoiced VAT on some intermediate goods. The basic price plus non-value added tax equals the producer's price of the product.

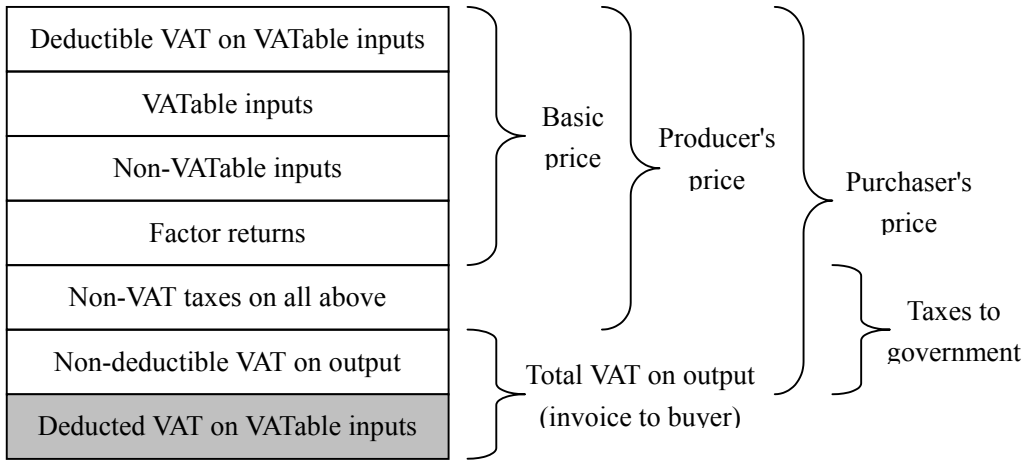
The VAT payable by the producer, or the non-deductible VAT on output, can then be calculated as the difference between the invoiced VAT on the final output and the invoiced VAT on the VAT-able intermediate inputs. The invoiced VAT on the final output should be calculated by multiplying the producer's price, net of deductible VAT on the intermediate inputs, by the relevant nominal VAT rate.

The purchaser's price is therefore the producer's price plus the non-deductible VAT on output. The amount of VAT invoiced on the purchaser is equal to the gross VAT on the output, which comprises the deductible VAT on the VAT-able intermediate inputs and the non-deductible VAT on the final output.

According to the tax law, the sales of agricultural products by producers themselves are VAT exempted. Therefore, the purchasers of agricultural products are not invoiced with a VAT receipt. However, the price of agricultural products actually includes some VAT, because the purchase of

some intermediate inputs used in agricultural production is taxed with VAT. As a result, the producers who use agricultural products as intermediate inputs in their production are allowed to a 3 per cent VAT rebate on the sale of their final products. This specific VAT rebate on the intermediate inputs of agricultural goods is also explicitly incorporated in the model.

Figure 1. Schematic presentation of VAT calculation



Note: Output = inputs (excluding deductible VAT) + value added + non-VAT taxes

Database description

The model database is constructed around China's 1997 input-output table (Statistical Bureau 1999). The table contains input-output information on 124 industrial sectors. Each of the sectors uses domestic and imported intermediate inputs and primary factors of production to produce a distinctive good or service for domestic consumption, investment and export. The detailed description of the model's database structure is referred to the model's published applications.

The taxes incorporated in the model's database are listed in Tables 4 and 5. Table 4 lists the aggregated indirect taxes and other charges levied on producers. Table 5 shows the aggregated border taxes on exports and imports as well as direct taxes on corporation income and household income.

As mentioned earlier, the VAT is imposed in steps in the model. For those industries that are subject to VAT, they are entitled to reclaim the VAT invoice on the purchase of the intermediate inputs when their output is sold. As a result, the net rate of VAT actually levied on the value of their output is lower than the nominal rate of VAT invoiced to their purchasers. Using China's input-output coefficients and nominal VAT rates, the net VAT rates can be calculated in the database. They are listed in Table 6. Note that these rates are adjusted by a common factor to match the total amount of VAT actually collected by the government in 1997. This common factor can be interpreted as the 'complying rate'. It shows to what extent VAT is actually paid by all producers concerned. The complying rate is found to be about 41 per cent.

The net VAT rates for most industries are only 2 or 3 per cent of the output value, much less than the full nominal rate of 13 or 17 per cent. The net VAT rate for a particular industry depends on the size of VAT invoiced on the cost of its intermediate inputs and the general VAT complying rate. If 50 per cent of an industry's intermediate inputs are subject to VAT and the general VAT complying rate is 40 per cent, the net VAT rate for the industry would be $17\% \times 0.5 \times 0.4 = 3.4\%$.

The basic structure of the database can also be seen in the form of a social accounting matrix (SAM). Appendix 2 provides the structure of a simplified SAM, which indicates the cost structure of goods and services and the primary distribution and redistribution of national income between sectors and between economic agents. Each row in the table shows the sources of income and each column shows the destination of expenditure. For households, government and enterprises, the differences between their income and expenditure are savings. For the rest of the world, the current account balance is its net investment. In equilibrium, total saving equals total investment. As a result, the SAM can also be used to validate the database.

Table 7 fills the above SAM with actual figures drawn from the model's database. Note that in the table, government expenditure column v is split into current expenditure and investment expenditure. The latter is taken from total investment column vi.

The figures in the first column and the first and the sixth rows are taken directly from the input-output table. They show the cost structure of current production and the usage of final goods and services. Other rows and columns reflect redistribution of income among economic agents and between domestic agents and the rest of the world.

The table shows that the gross output of the economy is RMB ¥19,985 billion, of which RMB ¥7,570 billion is value added. Total saving is RMB ¥3,079 billion (40.7 per cent of GDP), in which RMB ¥2,742 billion is invested in the domestic economy in the forms of new fixed capital assets and new inventory, and the remainder RMB ¥337 is invested overseas in the forms of net exports and outflow capital investment.

3. Simulation results

The above model can be used for various policy analyses concerning taxation reforms. To demonstrate the use of the model, four policy scenarios are examined with the model. The simulation results are presented and discussed briefly in this section.

Taxes are collected by government not only to finance their expenditure but also for purposes of stabilisation and allocation. The overall level of taxes may be chosen in an attempt to stabilise the level of employment, prices or the balance of payments. Governments also try to influence the distribution of income and wealth by varying the tax structure. In addition, taxes may be selected for their re-allocative effects. Almost all taxes have some effects on resource allocation and they generally impose certain costs on society. Thus one of the objectives of taxation is to minimise these costs and perhaps to encourage particular activities like savings or investment or to discourage other activities like consumption of tobacco. Our concern here will be primarily with the distributive and re-allocative effects of taxes.

The simulation results of the model for a particular policy depend on the macroeconomic closure of the model. Macroeconomic closure determines what model's variables should be set as exogenous or endogenous. In so doing, it in fact defines a specific set of external macroeconomic conditions in which the modelled economy is supposed to function. Based on different macro closures, the model's simulation

results for a given policy would be different.

Two closures may be selected for the following simulations: a short-run closure and a long-run closure. The short-run closure has the following features:

(i) Capital stocks are exogenous. We only need equations to determine investment by industry.

(ii) For endogenous investment industries we link investment-capital ratios to capital rental rates (deflated by new capital prices).

(iii) For exogenous investment industries, the investment is fixed.

Alternatively, the long-run closure has the following features:

(i') The investment-capital ratio for each sector is fixed. The allocation of capital across sectors is determined by the gross rate of return.

(ii') The allocation of real investment across sectors is proportional to sectoral capital growth.

(iii') Total labour supply is fixed. The supply of sectoral labour is responsive to changes in relative wage rates.

In both cases, we also assume the following:

- All technical change variables are exogenously set to zero.
- Except those to be analysed, all policy variables, such as various nominal tax rates, are exogenously set to zero.
- The world demand for China's exports is a function of their prices. The demand elasticity for exported goods with respect to their prices is set at -5 .
- The world prices of imports are fixed exogenously, implying China being a price taker in the world market for its imports.
- The real consumption of each type of households moves along with real GDP.
- The nominal exchange rate is fixed as a numeraire for the model.

It should be noted that these are only two of many possible macroeconomic conditions that one can choose from for policy simulations. Alternative macroeconomic closures can be selected if different assumptions are adopted.

Policy scenario I: Raise consumption tax on tobacco

The first policy scenario is to raise luxury consumption tax on tobacco by 10 per cent. The tobacco industry is one of the five industries in this model that are subject to a luxury consumption tax. The consumption tax rate for tobacco in the base-year is 60 per cent. It is assumed that this rate is to be increased by 10 per cent to 66 per cent.

This policy change will increase luxury consumption tax revenue by RMB ¥3.8 billion or 5.6 per cent. As a result, government's nominal income increases by 0.28 per cent. As GDP deflator increases by 0.06 per cent, government's real income rises by 0.22 per cent.

As the price of tobacco increases by 3.8 per cent, however, the demand for tobacco falls. As a result, the real output of tobacco falls by 2.7 per cent. The corporation tax falls. Although nominal GDP increases by 0.03 per cent, GDP deflator rises by 0.06 per cent, leading to a slight fall in real GDP by 0.02 per cent. The aggregated effects can be seen in Table 8, which shows the changes in the SAM indicators after the policy change is introduced.

The rise in consumption tax rate on tobacco results in a fall in the output of tobacco. The resources originally used to produce tobacco are reallocated to other industries. The effects of this policy change on sectoral real output are presented in Figure 2, which is drawn from Column I of Table 12. The tobacco industry has the biggest fall in real output, 2.7 per cent. The second biggest fall in real output is in the recreational services sector. Agricultural sectors, other food industries and light industries are among the major beneficiaries. However, the overall reallocative effect on the real outputs of most industries is relatively minor.

Policy scenario II: Extension of VAT to services sectors

The problems with the current taxation system of mixing VAT with business tax have been discussed above. To solve these problems, a policy option may be considered to move some industrial sectors from business tax to VAT. The following analysis considers one such option: moving the construction industry from business tax to value added tax.

The simulation results show that such policy change will result in a loss of business tax from construction of RMB ¥37.7 billion. It will then be more than compensated by a rise in VAT of RMB ¥42.7 billion on the same sector. This leads to a net increase in tax revenue of RMB ¥5 billion from the construction sector alone. However, the rise in construction costs leads to a fall in the demand for construction and other industrial outputs. As a result, the government nominal revenue increases only by RMB ¥3.9 billion, or 0.35 per cent.

In the short run, capital is fixed at sectoral levels so there is no increase in gross output. Despite the upward pressure for the price of capital, the demand for capital remains the same. As a result, gross output is expected to remain unchanged or increase marginally.

In the long run, on the other hand, capital is mobile across sectors while the rate of return to capital is responsive to policy changes. The price of construction increases by 0.27 per cent, leading to a fall in the demand for construction by 0.06 per cent. The demand for capital also falls, leading to a fall in gross output. GDP deflator increases by 0.07 per cent while real GDP falls by 0.02 per cent. However, the effects of both short-run and long-run simulations are quite small. The aggregated effects on SAM indicators are presented in Table 9.

The effects of this policy change on sectoral real output are reported in Column II of Table 12. The percentage changes in real outputs are plotted in Figure 3. The largest fall in output is found in the construction sector, 0.06 per cent. This is because the overall tax burden is increased on construction. The rise in the price of construction causes most other industrial sector's outputs to fall, though at a very lower rate.

Policy scenario III: VAT rebate on investment goods

It has been proposed that the current production type VAT system should be converted into a consumption type VAT system or an income type VAT system, in order to encourage investment. The key to convert VAT from production type to consumption type is whether VAT paid on investment goods is deductible or not, or how much VAT paid on investment goods should be rebated.

The effect of this policy can be analysed in the model. Investment VAT

rebate is modelled as though an equivalent subsidy is paid to the purchasers of investment goods.

There is no information on the amount of VAT paid on annual investment. To calculate the VAT on investment goods, some simplified assumptions are needed. Based on the value of investment goods in the China 1997 input-output table, the official VAT rates and the estimated uniform complying rate, total VAT paid on investment goods is estimated as being RMB ¥46 billion.

It is assumed that the VAT paid on all investment goods is deducted for all industries and sectors, that is, RMB ¥46 billion is paid back from the government budget to the investors.

Short run results are not very interesting. As investment and capital stock are assumed to be fixed in the short run, no change will occur in real GDP after policy change. The impact is mainly of redistribution of existing income among various economic agents.

With a long run closure, investment capital ratio for each industry is assumed to be fixed. Sectoral investment increases with the rate of return to capital.

A rebate on all investment goods leads to the average price of capital goods to fall by 1.68 per cent and the asset price of capital to fall by 0.38 per cent. As a result, real investment increases by 0.51 per cent. As investment capital ratio is fixed, this will lead to an equal rise in capital stock. The increase in capital stock is expected to raise real GDP by 0.19 per cent. Aggregated effects are reported in Table 10.

In this simulation, the effect on the cost of capital formation does not vary much across industries. This is because, due to lack of information, the commodity composition of each industry's capital formation is assumed to be the same as that of the others'. As a result, each industry has the same average VAT rebate rate and the same effect on the price of new capital. However, as the investment capital ratio varies across industries, the effect of VAT rebate on the price of each industry's existing capital assets is different from others. This leads to different responses of industries to the policy change.

The sectoral effects on real output of VAT rebate on investment goods

are reported in Column III of Table 12, which are plotted in Figure 4. The top ten growing industries are Construction, Cement Products, Cement, Wines, Bricks and Tiles, Agricultural Machinery, Rail Equipment, Boilers, Fireproof Materials and Real Estate. The bottom ten adversely affected industries are Sporting Products, Hemp Textiles, Knitted Goods, Leather Products, Other Textiles, Cultural Products, Cotton Textiles, Tourism, Wool Textiles and Silk Textiles. This indicates that cheap capital encourages capital-intensive manufacturing industries at the expense of labour-intensive industries.

Policy scenario IV: Raising VAT complying rate

Since the introduction of VAT, there have been numerous reports of serious problems with VAT evasion or cheating. According to the official VAT rates, the annual tax revenue from VAT should have been RMB ¥801 billion. However, the actual VAT revenue was less than RMB ¥329 billion in 1997. This implies that the complying rate for VAT payment is only 41 per cent, in other words, only 41 per cent of producers paying VAT. This indicates a large leakage of tax revenue for the government.

To increase tax revenue, one option for the government may be to take necessary measures to reinforce the existing tax collection system to increase the complying rate for VAT payment. This will have the same impact of raising VAT rates.

In the following, the effect of a 10 per cent rise in the VAT complying rate is analysed as an illustrative example. The increase in the VAT complying rate raises total charged VAT by RMB ¥74 billion and total claimed VAT by RMB ¥41.4 billion, resulting in a net VAT revenue of RMB ¥33 billion. It is a 9.3 per cent rise in VAT revenue collected from domestic producers. There is also another source of rising VAT revenue through VAT collected on imports of RMB ¥6.9 billion.

The macro effects are similar to those of raising taxes. A rise in a tax rate increases the cost and the price of goods and services concerned. The demand for the goods or services falls. The rental price of capital increases so as to reduce the demand for capital. The total capital used in production contracts by 0.2 per cent and real investment falls by 0.18 per cent. The output in most sectors fall as a result. Real GDP falls slightly by

0.08 per cent.

As output and income fall, corporation and personal income taxes fall by RMB ¥1.1 billion and RMB ¥0.8 billion, respectively. Overall, government's nominal income increases by about RMB ¥35.6 billion, or 2.6 per cent. This is used to reduce the budget deficit (negative saving). The aggregated effects on SAM indicators can be seen in Table 11.

The sectoral effects on real outputs are shown in Figure 5, which are plotted from Column IV of Table 12. Few industries have an increase in their real outputs while most other industries have a decrease in their real outputs. Most adversely affected are those manufacturing industries, especially machinery industries.

4. Concluding remarks

This paper presents a CGE model of the Chinese economy incorporated with various major taxes and fiscal redistribution of income between economic agents. The model is designed to provide a base on which the effects of proposed taxation reform policies for the current Chinese economy can be analysed and quantified.

Four taxation policies are assessed with the model. These policy scenarios are selected from the current debate on further taxation reforms among Chinese economists and policy makers. The simulation results are used only to illustrate, under given assumptions, how the modelled economy might respond to those policy changes. For more realistic policy analyses, further attempt should be made to modify the model's structure and database to ensure that they reflect more closely the main features of the current Chinese economy.

Future taxation policy analysis can also be conducted in a second-best framework. Imposing a tax always involves costs to the economy. The CGE model presented in this paper can also be used to answer the questions such as how to lower the cost of tax collection, how taxes should be designed to minimise harmful distortions caused by the tax, what is the income redistribution effect of a proposed tax and how to achieve the 'fairness' of a proposed tax.

A dynamic extension of the current comparative static model is also desirable as it can capture the growth effect of a change in taxation

policies, which is crucially important for a developing country such as China.

References

- Adams, P., M. Horridge, B. Parmenter and Xiao-guang Zhang, (2000) 'Long-run effects on China of APEC trade liberalisation', Pacific Economic Review, 5(1), February, pp.15-47.
- CEC, IMF, OECD, UN and World Bank, 1993. *System of National Accounts (SNA) 1993*.
- Fan Mingtai and Zheng Yuxin(2000),The Impact of China's Trade Liberalization for WTO Accession:A Computable General Equilibrium Analysis, paper presented for *Third Annual Conference on Global Economic Analysis*, June 27-30, Monash University, Australia.
- Lou Jiwei, ed. (2000), *New China Fifty Year's Government Finance Statistics*, (Xin zhongguo 50 nian caizhen tongji), Economic Science Press, Beijing.
- Liu Zhuo (2000), *China Taxation*, (Zhongguo shuizhi gailan), Economic Science Press, Beijing.
- National Bureau of Statistics (1998), *China Fixed Capital Investment Statistical Yearbook 1998*, (Zhongguo gudin zichan tongji nianjian), China Statistics Press, Beijing.
- National Bureau of Statistics (1998), *China Industrial Statistical Yearbook 1998*, (Zhongguo gongye tongji nianjian), China Statistics Press, Beijing.
- National Bureau of Statistics (2000), *China Statistical Yearbook 2000*, China Statistics Press, Beijing.
- National Bureau of Statistics (1999), *Input-output Table of China 1997*, (Zhongguo touru changchu biao), China Statistics Press, Beijing.
- National Bureau of Statistics (2000), Data of China National Accounts (unpublished).
- Ministry of Finance (1999), Survey data on taxation, (Unpublished).
- Zheng Yuxin and Fan Mingtai eds. (1999), *China's CGE Model and Its Application for Policy Analysis* , Beijing:Social Sciences Documentation Publishing House.

Table 1. Composition of government revenue 1997 (RMB ¥100 million)

Items	Revenue
Total government revenue	11,477
- Budgetary revenue	8,651
- Tax revenue	8,234
Value added tax	3,285
Business tax	1,325
Luxury consumption tax	679
Agriculture tax	398
Natural resource tax	57
Import tariff	310
Refund of VAT and consumption tax on exports	-556
Individual income tax	446
Enterprise income tax	1,032
Other taxes	1,258
- Subsidy to SOE losses	-369
- Other budgetary revenues (fees and charges)	786
- Extra-budgetary revenues	2,826

Source: National Bureau of Statistics (2000); Lou (2000) and Liu (2000); Ministry of Finance.

Table 2. Nominal VAT rate for goods/sectors

Rate	Good/Industry
13%	6 CoalMP, 9 FerrOre, 10 NferrOre, 11 SaltMin, 12 NmtlMine, 14 GrainMill, 15 SugarRef, 16 MeatEgg, 17 Seafood, 18 OthFood, 33 Printing, 38 RawChem, 39 Fertilizr, 40 Pesticide, 65 AgrMchn, 87 Steaming, 88 GasPro, 89 Water
17%	7 CrudeOil, 8 NatGas, 13 Logging, 19 Wines, 20 OtherBev, 21 Tobacco, 22 CottonTxt, 23 WoolTxt, 24 HempTxt, 25 SilkTxt, 26 KnitMill, 27 OthText, 28 Clothing, 29 Leather, 30 Sawmills, 31 Furntre, 32 PaperPrd, 34 CultuPro, 35 SporEqp, 36 PetrolRef, 37 Coking, 41 OrgChem, 42 ChemDly, 43 OthChem, 44 Medicine, 45 ChemFibre, 46 RubbPro, 47 PlastPro, 48 Cement, 49 CementPrd, 50 BrickTile, 51 Glass, 52 pottery, 53 Fireproof, 54 NmtlMinPr, 55 Irnsmelt, 56 StelSmelt, 57 SteelPro, 58 AllySmel, 59 NFMetS, 60 NFMetP, 61 MetalPro, 62 Boilers, 63 MtlwrkMch, 64 OthsMch, 66 SplEqp, 67 RailEqp, 68 MotorVhc, 69 Ships, 70 Planes, 71 Bicycle, 72 OthTrnEqp, 73 Genratrs, 74 HhldElec, 75 OthElcMch, 76 Computers, 77 ElctrAppl, 78 ElctrDvc, 79 OthElcEqp, 80 Meters, 81 CultEqp, 82 MaintMch, 83 Arts, 84 OthManu, 86 Electric, 100 Trade
Exemption	1 Grains, 2 Forestry, 3 Livestk, 4 Fishery, 5 OtherAg

Sources: Author's result based on the relevant code of VAT.

Table 3. Nominal business tax rate for services

Rate	Service
3%	90 Construct, 91 RailF, 92 RoadF, 93 Pipeline, 94 WaterF, 95 AirF, 96 OthTras, 97 Warehouse, 98 Post, 99 TeleCom, 102 RailP, 103 RoadP, 104 WaterP, 105 AirP
5%	101 Rstrnts, 108 RealEst, 109 PubSvc, 110 ResSvc, 111 Hotels, 112 Tourisms, 115 Health, 116 Sports, 117 SocWelf, 118 EducSrv, 119 CultSvcs, 120 Research, 121 GenealSvc, 122 AgrSvc, 123 Geologing
8%	106 Finance, 107 Insurnce
10%	113 Recreatn, 114 OthSvc
Exemption	124 PubAdmin

Sources: Author's result based on the relevant code of Business tax.

Table 4. Production taxes and charges (RMB ¥100 million)

Items	Revenue
1 Value added tax (VAT)	3,285
2 Business tax	1,325
3 Luxury consumption tax (LCT)	679
4 Agriculture and animal husbandry tax	398
5 Subsidy to SOE losses	-369
6 Natural resource tax	57
7 Other taxes	1,258
8 Non-tax budgetary revenues	786
9 Extra-budgetary revenues	2,827
Total	10,245

Sources: Model database.

Table 5. Border taxes and direct taxes (RMB ¥100 million)

Items	Revenue
1 Import tariff	310
2 Refund of VAT and LCT on exports	-556
3 Urban household income tax	852
4 Rural household income tax	861
5 Enterprise income tax	1,032
Total	2,611

Sources: Model database.

Table 6. Implicit VAT rate as a % of sectoral output (producer's price)

Industry	VAT rate	Industry	VAT rate
1 Grains	0	63 MtlwrkMch	2.48
2 Forestry	0	64 OthsMch	2.95
3 Livestk	0	65 AgrMchn	0.54
4 Fishery	0	66 SplEqp	2.63
5 OtherAg	0	67 RailEqp	2.16
6 CoalMP	0.64	68 MotorVhc	2.00
7 CrudeOil	3.57	69 Ships	2.22
8 NatGas	3.82	70 Planes	3.35
9 FerrOre	1.50	71 Bicycle	1.55
10 NferrOre	1.90	72 OthTrnEqp	1.98
11 SaltMin	3.03	73 Genratrs	2.14
12 NMtlMine	2.32	74 HhldElec	2.18
13 Logging	4.92	75 OthElcMch	1.71
14 GrainMill	2.26	76 Computers	1.69
15 SugarRef	2.23	77 ElectrAppl	1.52
16 MeatEgg	2.12	78 ElectrDvc	2.24
17 Seafood	2.48	79 OthElcEqp	2.03
18 OthFood	2.19	80 Meters	2.84
19 Wines	3.56	81 CultEquip	1.52
20 OtherBev	3.45	82 MaintMch	3.11
21 Tobacco	4.31	83 Arts	2.69
22 CottonTxt	2.31	84 OthManu	2.96
23 WoolTxt	3.01	85 Scrap	0
24 HempTxt	3.30	86 Electricit	3.95
25 SilkTxt	2.10	87 Steaming	2.21
26 KnitMill	2.36	88 GasPro	1.78
27 OthText	3.47	89 Wa0 9 259.0295 458.8394 Tmt6-018er3.47	

Table 7. The base-year SAM (RMB ¥100 million)

	1 Firms	2 GOS	3 Wages	4 Households	5 Gov Current	6 Gov Investment	7 Private Investment	8 Stocks	9 ROW	Total
1 Domestic goods	114,101			34,587	8,690	4,732	18,929	2,262	16,543	199,844
2 GOS	23,652				0				249	23,900
3 Wages	41,807								0	41,807
4 Households		1,400	41,807	168	2,018				408	45,802
5 Government	10,245	1,178		1,713					540	13,676
6 Imports	10,039			1,192	35	299	1,194	0		12,759
7 Payment to ROW		1,583	0	28	0					1,611
8 Total expenditure	199,844	4,161	41,807	37,688	10,743	5,031	20,123	2,262	17,740	339,400
9 Total income	199,844	23,900	41,807	45,802	13,676	0	0	0	14,370	339,400
10 Saving (8 – 9)	0	19,739	0	8,114	-2,097		-22,385		-3,370	0

Note: Sell(10,6) is included in Sell(10,5) and Sell(10,8) is included in Sell(10,7).

Source: Model database.

Table 8. Aggregated effect of a 10 per cent rise in luxury consumption tax on tobacco: Changes in SAM (RMB ¥100 million)

	1 Firms	2 GOS	3 Wages	4 Households	5 Gov Current	6 Gov Investment	7 Private Investment	8 Stocks	9 ROW	Total
1 Domestic goods	6			29	-2	0	-2	4	-4	30
2 GOS	-7				0				0	-7
3 Wages	-6								0	-6
4 Households		0	-6	0	1				0	-5
5 Government	38	0		0					0	38
6 Imports	0			1	0	0	0	0		1
7 Payment to ROW		0	0	0	0					0
8 Total expenditure	30	-1	-6	30	-2	0	-2	4	-4	50
9 Total income	30	-7	-6	-5	38	0	0	0	1	50
10 Saving (8 – 9)	0	-6	0	-36	40		-3		4	0

Note: Sell(10,6) is included in Sell(10,5) and Sell(10,8) is included in Sell(10,7).

Table 9. Aggregated effect of moving construction from business tax to VAT: Changes in SAM (RMB ¥100 million)

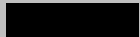
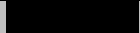
	1 Firms	2 GOS	3 Wages	4 Households	5 Gov Current	6 Gov Investment	7 Private Investment	8 Stocks	9 ROW	Total
1 Domestic goods	-37			-12	-2	6	24	-1	3	-19
2 GOS	0				0				0	0
3 Wages	-15								0	-15
4 Households		0	-15	0	1				0	-14
5 Government	36	0		-1					3	39
6 Imports	-4			-1	0	0	2	0		-2
7 Payment to ROW		0	0	0	0					0
8 Total expenditure	-19	0	-15	-13	-1	6	26	-1	6	-12
9 Total income	-19	0	-15	-14	39	0	0	0	-2	-12
10 Saving (8 – 9)	0	0	0	-1	33		-24		-8	0

Note: Sell(10,6) is included in Sell(10,5) and Sell(10,8) is included in Sell(10,7).

Table 10. Aggregated effect of VAT rebate on investment goods: Changes in SAM (RMB ¥100 million)

	1 Firms	2 GOS	3 Wages	4 Households	5 Gov Current	6 Gov Investment	7 Private Investment	8 Stocks	9 ROW	Total
1 Domestic goods	340			116	30	31	124	4	-22	624
2 GOS	38				0				-1	38
3 Wages	185								0	185
4 Households		2	185	1	-5				-1	181
5 Government	29	2		7					4	42
6 Imports	32			5	0	2	8	0		46
7 Payment to ROW		3	0	0	0					3
8 Total expenditure	624	7	185	129	25	33	132	4	-19	1118
9 Total income	624	38	185	181	42	0	0	0	49	1118
10 Saving (8 – 9)	0	31	0	53	-16		-136		68	0

Note: Sell(10,6) is included in Sell(10,5) and Sell(10,8) is included in Sell(10,7).



otal

Table 12. Effect on sectoral output of various taxation policy changes (per cent)

Industry	Sim I	Sim II	Sim III	Sim IV	Industry	Sim I	Sim II	Sim III	Sim IV
1 Grains	-0.010	-0.011	0.063	0.058	63 MtlwrkMch	-0.002	-0.029	0.271	0.059
2 Forestry	0.007	-0.017	0.114	0.040	64 OthsMch	-0.004	-0.033	0.289	-0.037
3 Livestk	0.046	-0.014	0.086	0.045	65 AgrMchn	-0.002	-0.045	0.361	-0.095
4 Fishery	0.061	-0.019	0.113	0.114	66 SplEqp	-0.004	-0.022	0.270	0.078
5 OtherAg	0.026	-0.013	0.098	0.061	67 RailEqp	-0.002	-0.041	0.347	-0.103
6 CoalMP	0.003	-0.020	0.201	-0.080	68 MotorVhc	-0.004	-0.032	0.283	-0.073
7 CrudeOil	0.002	-0.027	0.218	0.008	69 Ships	0.009	-0.016	0.125	-0.250
8 NatGas	0.004	-0.006	0.081	-0.079	70 Planes	0.003	-0.009	0.134	0.122
9 FerrOre	0.002	-0.005	0.162	0.164	71 Bicycle	0.029	0.006	0.010	-0.278
10 NferrOre	0.003	-0.011	0.145	0.027	72 OthTrmEqp	0.018	-0.037	0.308	-0.164
11 SaltMin	-0.003	-0.013	0.133	-0.011	73 Genrats	0.004	-0.012	0.170	-0.113
12 NMtlMine	-0.001	-0.033	0.287	-0.087	74 HhldElec	0.048	-0.027	0.291	-0.316
13 Logging	0.001	-0.026	0.208	0.074	75 OthElcMch	0.000	-0.024	0.228	-0.164
14 GrainMill	0.040	-0.014	0.089	0.023	76 Computers	0.001	-0.012	0.068	-0.618
15 SugarRef	0.065	-0.016	0.129	-0.092	77 ElctrAppl	0.037	-0.011	0.118	-0.537
16 MeatEgg	0.057	-0.007	0.040	-0.106	78 ElctrDvc	0.009	-0.012	0.109	-0.243
17 Seafood	0.039	-0.014	0.032	-0.071	79 OthElcEqp	0.001	-0.028	0.226	-0.226
18 OthFood	0.039	-0.015	0.122	-0.078	80 Meters	0.003	-0.006	0.077	-0.166
19 Wines	0.120	-0.045	0.390	-0.429	81 CultEqup	0.002	0.016	-0.043	-0.532
20 OtherBev	0.055	-0.026	0.224	-0.230	82 MaintMch	-0.012	-0.026	0.210	-0.062
21 Tobacco	-2.682	-0.032	0.269	-0.324	83 Arts	0.012	-0.010	0.096	-0.239
22 CottonTxt	0.012	0.001	0.002	-0.166	84 OthManu	0.003	-0.016	0.141	-0.152
23 WoolTxt	0.020	-0.007	0.016	-0.190	85 Scrap	-0.009	-0.021	0.199	-0.048
24 HempTxt	0.023	0.008	-0.130	-0.156	86 ElectRICT	0.008	-0.026	0.239	-0.106
25 SilkTxt	0.023	-0.004	0.012	-0.224	87 Steaming	0.002	-0.021	0.191	-0.088
26 KnitMill	0.009	0.006	-0.131	-0.525	88 GasPro	0.026	-0.009	0.149	-0.064
27 OthText	0.014	0.001	-0.055	-0.014	89 Water	0.008	-0.020	0.183	-0.076
28 Clothing	0.042	-0.006	0.018	-0.309	90 Construct	-0.006	-0.062	0.497	-0.180
29 Leather	0.030	0.019	-0.133	-0.290	91 RailF	0.001	-0.029	0.233	-0.062
30 Sawmills	0.006	-0.027	0.212	-0.053	92 RoadF	0.001	-0.023	0.189	-0.071
31 Furntre	0.014	-0.017	0.147	-0.182	93 Pipeline	0.002	-0.028	0.226	-0.030
32 PaperPrd	-0.072	-0.017	0.142	0.005	94 WaterF	0.003	-0.019	0.109	0.043
33 Printing	-0.100	-0.019	0.173	-0.091	95 AirF	0.006	-0.035	0.214	0.019
34 CultuPro	0.012	-0.011	0.092	-0.025	96 OthTras	-0.002	-0.025	0.181	-0.001
35 SporEqp	0.022	0.032	-0.253	-0.565	97 Warehous	-0.002	-0.027	0.231	-0.090
36 PetrolRef	0.001	-0.026	0.230	-0.047	98 Post	0.026	-0.024	0.134	-0.003
37 Coking	0.001	0.026	0.057	-0.173	99 TeleCom	0.002	-0.035	0.271	-0.076
38 RawChem	-0.008	-0.011	0.127	-0.031	100 Trade	-0.007	-0.009	0.144	-0.152
39 Fertilizr	-0.009	-0.005	0.042	0.199	101 Rstrnts	-0.017	-0.018	0.137	-0.001
40 Pesticide	-0.008	-0.009	0.076	0.021	102 RailP	0.009	-0.024	0.155	0.033
41 OrgChem	-0.003	-0.006	0.092	-0.046	103 RoadP	0.032	-0.021	0.152	0.034
42 ChemDly	-0.013	-0.017	0.148	-0.104	104 WaterP	0.009	-0.018	0.127	-0.006
43 OthChem	-0.003	0.000	0.042	0.083	105 AirP	-0.004	-0.035	0.192	0.078
44 Medicine	0.027	-0.022	0.174	-0.104	106 Finance	0.012	-0.025	0.198	-0.051
45 ChemFibre	-0.055	-0.003	0.022	-0.125	107 Insurnce	-0.002	-0.026	0.208	-0.060
46 RubbPro	0.009	-0.002	0.018	-0.215	108 RealEst	0.021	-0.042	0.308	-0.043
47 PlastPro	0.004	-0.013	0.127	-0.143	109 PubSvc	-0.008	-0.022	0.141	0.011
48 Cement	-0.003	-0.051	0.411	-0.158	110 ResSvc	0.016	-0.021	0.154	-0.023
49 CementPrd	-0.003	-0.052	0.422	-0.155	111 Hotels	-0.005	-0.035	0.226	0.037
50 BrickTile	0.003	-0.045	0.368	-0.147	112 Tourisms	-0.009	-0.027	-0.002	0.541
51 Glass	0.016	-0.020	0.184	-0.153	113 Recreatn	-0.313	-0.024	0.010	0.290
52 Pottery	0.001	-0.032	0.271	-0.182	114 OthSvc	0.002	-0.027	0.227	-0.121
53 Fireproof	-0.002	-0.038	0.323	-0.105	115 Health	0.025	-0.025	0.194	-0.058
54 NMtlMinPr	-0.001	-0.036	0.311	-0.126	116 Sports	-0.016	-0.023	0.179	-0.066
55 Irnsmelt	0.003	-0.011	0.117	-0.192	117 SocWelf	-0.016	-0.023	0.181	-0.067
56 StelSmelt	0.000	-0.029	0.272	-0.035	118 EducSrv	-0.005	-0.023	0.166	-0.040
57 SteelPro	0.001	-0.032	0.297	-0.027	119 CultSvcs	0.016	-0.024	0.173	0.004
58 AllySmel	0.001	-0.020	0.203	-0.127	120 Research	-0.020	-0.023	0.194	-0.092
59 NFMetS	0.003	-0.014	0.167	-0.025	121 GenealSvc	-0.016	-0.022	0.189	-0.087
60 NFMetP	0.003	-0.014	0.172	-0.079	122 AgrSvc	0.001	-0.016	0.108	0.024
61 MetalPro	0.003	-0.023	0.209	-0.131	123 Geologing	-0.017	-0.033	0.265	-0.098
62 Boilers	0.001	-0.036	0.325	0.006	124 PubAdmin	-0.024	-0.023	0.187	-0.083

Note: Sim I: 10 per cent rise in luxury consumption tax on tobacco;

Sim II: Moving construction from business tax to VAT;

Sim III: VAT rebate on all investment goods;

Sim VI: 10 per cent rise in VAT complying rate.

Figure 2. Sectoral effect on real output of a 10 per cent rise in luxury consumption tax on tobacco (%)

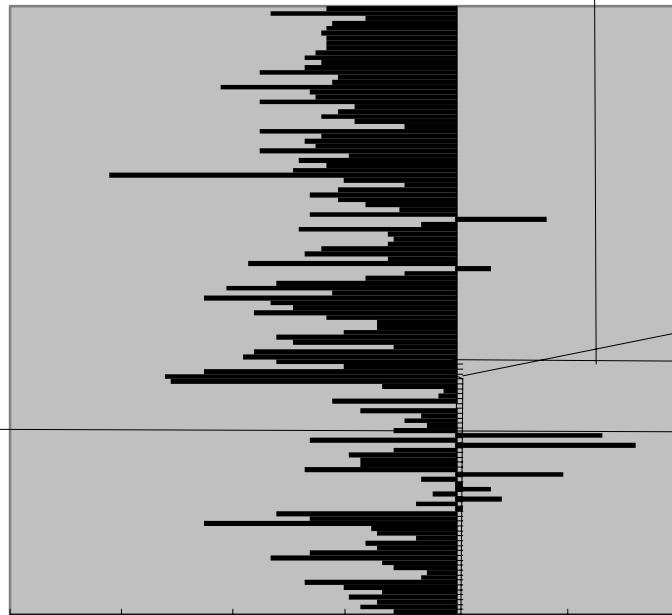
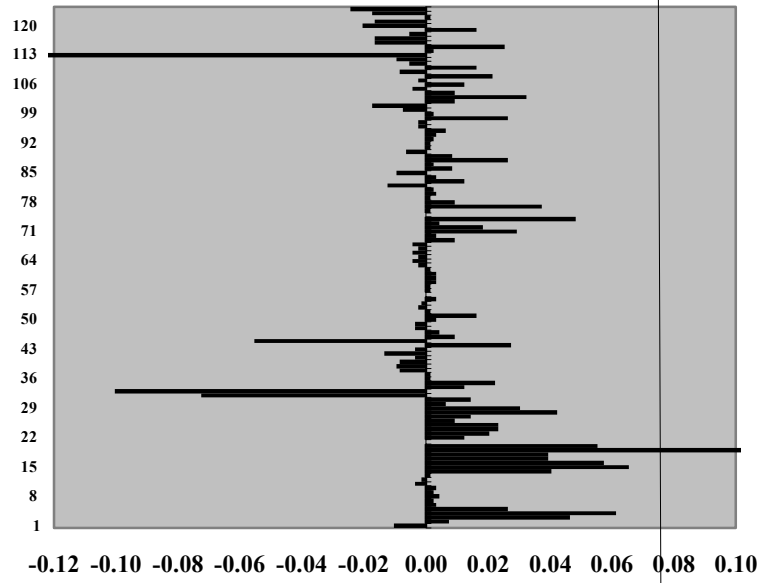


Figure 4. Sectoral effect on real output of VAT rebate on all investment goods (%)

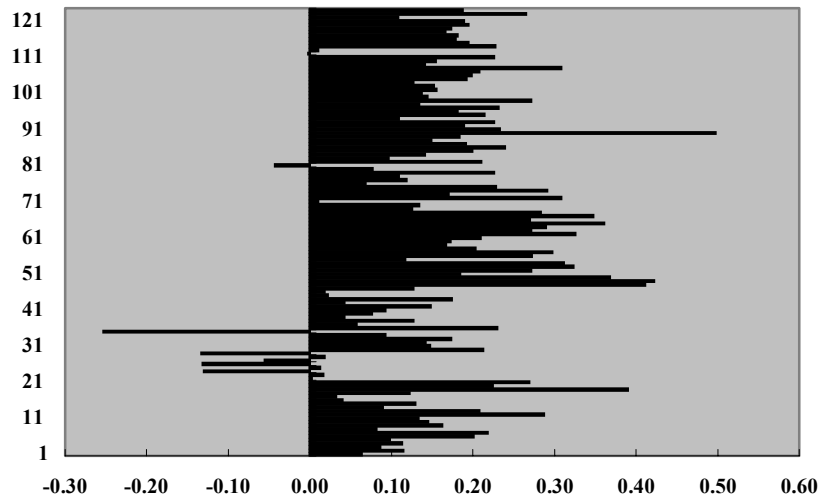
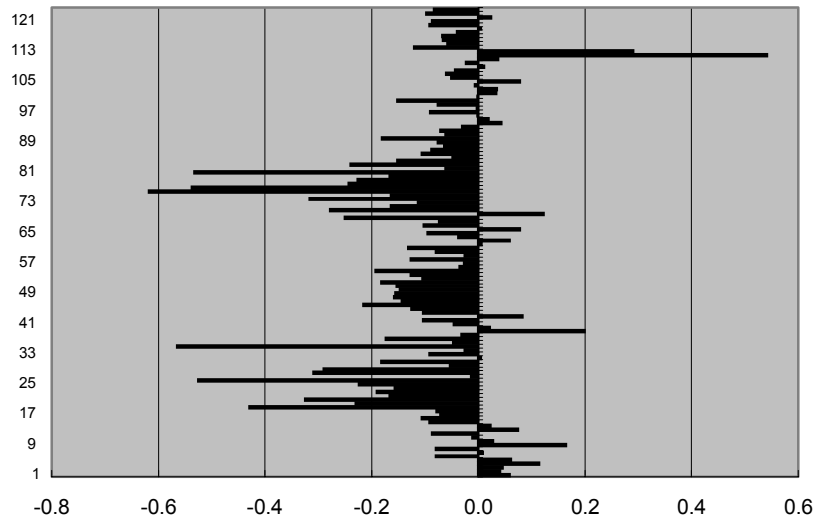


Figure 5. Sectoral effect on real output of a 10 per cent rise in VAT complying rate (%)



Appendix 1 . Industry classification

Code	Description	Code	Description
1 Grains	Crop cultivation	63 MtlwrkMch	Metalworking machinery
2 Forestry	Forestry	64 OthsMch	Other general industrial machinery
3 Livestk	Livestock and livestock products	65 AgrMchn	Agriculture, forestry, animal husbandry and fishing machinery
4 Fishery	Fishery	66 SplEqp	Other special industrial equipment
5 OtherAg	Other agricultural products	67 RailEqp	Railroad transport equipment
6 CoalMP	Coal mining and processing	68 MotorVhc	Motor vehicles
7 CrudeOil	Crude petroleum products	69 Ships	Ship building
8 NatGas	Natural gas products	70 Planes	Aircraft
9 FerrOre	Ferrous ore mining	71 Bicycle	Bicycle
10 NferrOre	Non-ferrous ore mining	72 OthTrnEqp	Other transport machinery
11 SaltMin	Salt mining	73 Genratrs	Generators
12 NMtlMine	Non-metal minerals and other mining	74 HhldElec	Household electric appliances
13 Logging	Logging & transport of timber+bamboo	75 OthElcMch	Other electric machinery and equipment
14 GrainMill	Grain mill products, vegetable oil and forage	76 Computers	Electronic computer
15 SugarRef	Sugar refining	77 ElctrAppl	Electronic appliances
16 MeatEgg	Slaughtering, meat processing, eggs and dairy products	78 ElctrDvc	Electronic element and device
17 Seafood	Prepared fish and seafood	79 OthElcEqp	Other electronic & communication equipment
18 OthFood	Other food products	80 Meters	Instruments, meters and other measuring equipment
19 Wines	Wines, spirits and liquors	81 CultEquip	Cultural and office equipment
20 OtherBev	Non-alcoholic beverage	82 MaintMch	Maintenance and repair of machinery and equipment
21 Tobacco	Tobacco products	83 Arts	Arts and crafts products
22 CottonTxt	Cotton textiles	84 OthManu	Other manufacturing products
23 WoolTxt	Woolen textiles	85 Scrap	Scrap and waste
24 HempTxt	Hemp textiles	86 Electrict	Electricity production and supply
25 SilkTxt	Silk textiles	87 Steaming	Steam and hot water production and supply
26 KnitMill	Knitted mills	88 GasPro	Gas production and supply
27 OthText	Other textiles	89 Water	Water production and supply
28 Clothing	Wearing apparel	90 Construct	Construction
29 Leather	Leather, furs, down and related products	91 RailF	Railway freight transport
30 Sawmills	Sawmills and fibreboard	92 RoadF	Highway freight transport
31 Furntre	Furniture and products of wood, bamboo, cane, palm, straw, etc.	93 Pipeline	Pipeline transport
32 PaperPrd	Paper and products	94 WaterF	Water freight transport
33 Printing	Printing & record medium reproduction	95 AirF	Air freight transport
34 CultuPro	Cultural goods	96 OthTras	Transportation NEC and auxiliary body
35 SporEqp	Toys, sporting and athletic and recreation products	97 Warehous	Warehousing
36 PetrolRef	Petroleum refining	98 Post	Post
37 Coking	Coking	99 TeleCom	Telecommunication
38 RawChem	Raw chemical materials	100 Trade	Wholesale and retail trade
39 Fertilizr	Chemical fertilisers	101 Rstrnts	Eating and drinking places
40 Pesticide	Chemical pesticides	102 RailP	Railway passenger transport
41 OrgChem	Organic chemical products	103 RoadP	Highway passenger transport
42 ChemDly	Chemical products for daily use	104 WaterP	Water passenger transport
43 OthChem	Other chemical products	105 AirP	Air passenger transport
44 Medicine	Medical and pharmaceutical products	106 Finance	Finance
45 ChemFibre	Chemical fibres	107 Insurnce	Insurance
46 RubbPro	Rubber products	108 RealEst	Real estate
47 PlastPro	Plastic products	109 PubSvc	Public services
48 Cement	Cement	110 ResSvc	Resident services
49 CementPrd	Cement and asbestos products	111 Hotels	Hotels
50 BrickTile	Bricks, tiles, lime and light-weight building materials	112 Tourisms	Tourism
51 Glass	Glass and glass products	113 Recreatn	Recreational services
52 Pottery	Pottery, china and earthenware	114 OthSvc	Other social services
53 Fireproof	Fireproof products	115 Health	Health services
54 NMtlMinPr	Other non-metallic mineral products	116 Sports	Sports
55 Irnsmelt	Iron-smelting	117 SocWelf	Social welfare
56 StelSmelt	Steel-smelting	118 EducSrv	Educational services
57 SteelPro	Steel processing	119 CultSvcs	Culture and arts, radio, film and television
58 AllySmel	Alloy iron smelting	120 Research	Scientific research
59 NFMetS	Non-ferrous metal smelting	121 GenealSvc	General technical services
60 NFMetP	Non-ferrous metal processing	122 AgrSvc	Technical services for agricultures
61 MetalPro	Metal products	123 Geologing	Geological prospecting & water conservancy
62 Boilers	Boiler, engines and turbine	124 PubAdmin	Public administration and other sectors

Sources: National Bureau of Statistics 1999.

Appendix 2 Schematic representation of a simplified SAM

		Cash from	Production cost i	Gross operation surplus (GOS) ii	Wages iii	Household expenditure iv	Government expenditure v	Investment vi	Inventory vii	Rest of World (ROW) viii	Row total
Cash to	Size	124	1	1	2	1	124	1	1	1	1
1. Goods and services produced domestically (purchase prices)	124	Intermediate inputs			Consumption of domestic goods	Expenditure on domestic goods	Domestic investment goods	Inventory of domestic goods	Exports to ROW	Domestic sales	
2. Gross operation surplus (GOS)	1	Capital income Land income				Transfer to enterprises			Transfer to enterprises	Total GOS	
3. Wages	1	Labour income							Transfer to labour	Total labour income	
4. Household income	2		GOS payment to household	Labour income	Inter-household transfer	Transfer to households			Transfer to households	Total household income	
5. Government income	2	Production taxes	GOS payment to government and corporation taxes		Transfer to government				Export tax Import tariff Other border tax Other transfer	Total government income	
6. Goods and services from ROW (purchase prices)	124	Imported inputs			Consumption of imports	Expenditure on imports	Imported investment goods	Inventory of imported goods		Total imports	
7. Payment to ROW	1		GOS payment to ROW	Labour income to ROW	Household transfer to ROW	Government transfer to ROW				Total ROW income	
8. Column total (expenditure)	1	Total costs	Total GOS transferred	Total labour income transferred	Total household expenditure	Total government expenditure	Total investment	Total inventory	Total ROW expenditure	Sum of row 8	
9. Row total (income)	1	Total sales	Total GOS produced	Total labour income received	Total household income	Total government income	0	0	Total ROW income	Sum of row 9	
10. Gross savings or residual (9 – 8)	1	0	GOS saving	0	Household saving	Government saving	(–) Total investment	(–) Total inventory	Total ROW net investment	0	

Notes: Indirect taxes in this SAM are net production taxes, tariffs, import VAT, and export rebates (subsidies)

All flows of goods are valued at tax-inclusive prices. The value of exports does not include export rebates.

The value of imports includes tariffs and import taxes so that ROW income is over valued. Therefore V0TAR and VAT on imports are added to ROW spending (transfer to GOV).

Similarly the value of exports does not include export subsidy so that ROW spending on exports is too high. To counteract this V4TAX (negative) is added to ROW spending (transfer to GOV).

* VROWINC = VOIMP + VTRFLOW (note tariff revenue and other IMPTAXES are included as an income and as an expenditure for ROW); V4TAX is a negative rebate