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# TECHNICAL PAPER

Emerging Economies

## The Unified Enterprise Tax and SOEs in China

JOHN WHALLEY  
LI WANG

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Technical Paper No.2  
April 2007

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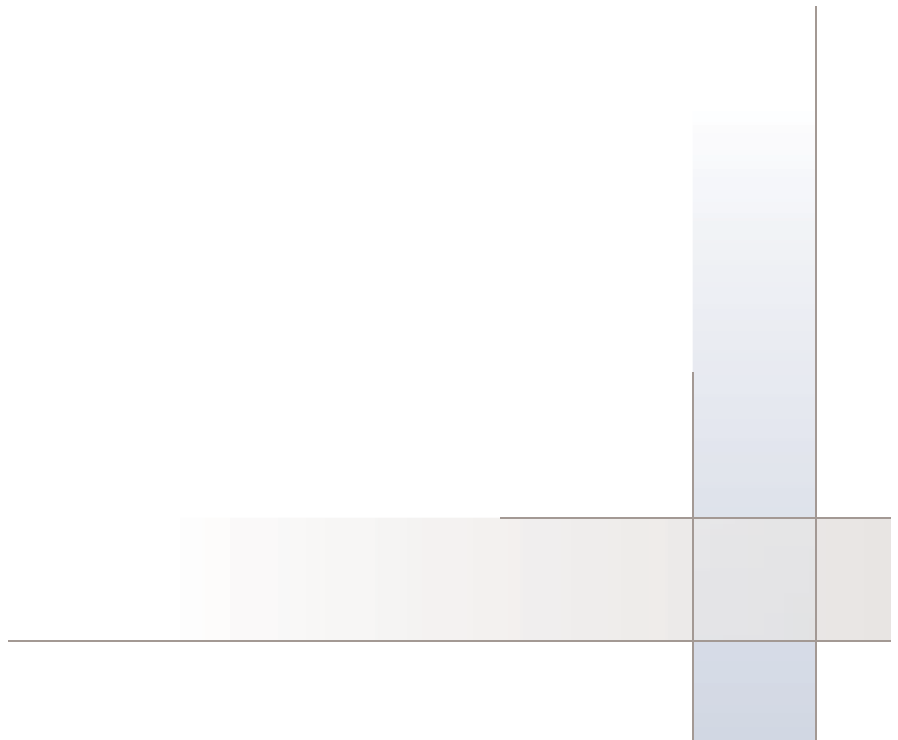
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## **Author Biographies**

John Whalley, FRSC, is one of Canada's most pre-eminent experts in the field of global economics. Currently, he holds a number of academic positions, including William G. Davies Professor of International Trade and Co-Director of the Centre for the Study of International Economic Relations, Department of Economics, University of Western Ontario. He is also a Distinguished Fellow at CIGI, Research Associate at the National Bureau of Economic Research in Cambridge, MA, Coordinator, Global Economy Group, CESifo, University of Munich, and a former Visiting Fellow at the Peter G. Peterson Institute for International Economics in Washington, DC.

Dr Whalley has written and co-authored dozens of scholarly articles on a variety of subjects, including international trade and development, public finance, general equilibrium theory and computation, soviet and transition economies, environmental issues and the economy, and Canadian trade policy. He holds a BA in Economics from Essex University (1968), an MA from the University of Essex (1969), and an MA (1970), M.Phil (1971), and a PhD (1973) from Yale University.

Dr Li Wang is an Associate Professor of Economics at the Chinese Academy of Social Sciences (CASS). She holds an MA (1996) from the Graduate School of CASS, and a PhD (2005) from the University of Oldenburg, Germany. She is a Post-Doctoral Fellow (2006-2007) at the University of Western Ontario, Canada and a guest lecturer at Tsinghua University, China.

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## **Abstract**

Currently proposals are actively circulating in China to move to a unified enterprise tax structure with similar tax treatment of state-owned enterprises (SOEs), other private enterprises (OPEs) and foreign investment enterprises (FIEs). FIEs presently receive significant tax preferences through a sharply lower tax rate, tax holidays and other provisions. Here we use analytical representations of SOE behaviour, which differ from that of the competitive firm, to argue that a unified tax structure may not be a desirable tax change and that typically a higher tax rate on SOEs is called for on efficiency grounds. Using a worker control model with endogenously determined shirking, taxes on SOEs reduce shirking and a reduced SOE tax rate under a unified tax relaxes discipline on SOEs and losses result. Our results indicate a 0.26% of GDP welfare loss using 2004 data from a unified tax, and larger loss relative to an optimal tax scheme. Alternatively, if we use a managerial control model variant, we find a 0.19% welfare loss from a unified tax, and larger losses relative to initial higher SOE tax rates.

## 1. Introduction

A central element in China's recent strong growth performance has been large inflows of foreign direct investment (FDI),<sup>1</sup> facilitated in part by substantial tax preferences. The tax preferences currently given to foreign investment enterprises (FIEs) are complex. If they are in special economic zones, national high-tech industrial zones, or national grade economic and technical development zones, they pay a reduced enterprise tax rate of 15% compared to the general rate of 30%. FIEs in coastal regions and all provincial capitals pay 24%. FIEs also receive extensive tax holidays with a full exemption for two years, a 50% exemption for the next three years and (if in particular geographical zones) a tax reduction of 15-30% for a further three to five years. In addition, local governments frequently exempt them from local surcharges applied to other enterprise of 3% of taxable income, and taxable income can again be reduced if income is reinvested. There is also differential tax treatment of wages paid to employees between FIEs and other enterprises. There are no formal estimates of effective tax rates on Chinese enterprises comparable to those for economies of the Organisation of Economic Co-operation and Development (OECD), but instead indications that widely circulate FIEs on average may face tax rates in the 10-15% range, while non-FIEs face tax rates of between 22% and 28%.<sup>2</sup> This paper proposes a unified and single equal yield tax rate to apply to all enterprises and for tax preferences towards FIEs to be removed.

The feature of China's economy we focus on here in the design of a unified tax is state-owned enterprises (SOEs) whose behaviour departs from that of competitive firms due to either worker or managerial control. SOEs dominated the Chinese economy before China's economic reform process began in the late-1970s. From the early-1980s on a management contract system was implemented for SOEs to improve their efficiency within the state ownership structure. But in 2004, SOEs and collective enterprises still accounted for 42.4% of value added of all enterprises in the industrial sector and 46.2% of employment. They also had lower productivity than other types of firms in the Chinese economy.

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<sup>1</sup> Whalley and Xin (2006) report in a recent growth accounting study on China that FIEs, a special legal form that embodies most FDI, now account for over 20% of GDP, nearly 50% of manufacturing output, and over 50% of exports. Simultaneously, however, they only account for 3% of employment and have labour productivity nearly eight times that of the rest of the economy (admittedly including agriculture).

<sup>2</sup> See note #7.



Table 1. National Government Revenue and Enterprise Tax Revenues in China

	Total national government revenue (billion RMB)	Total tax revenue (billion RMB)	Enterprise tax revenue from SOEs* (billion RMB)	Enterprise income tax from all enterprises (billion RMB)	Share of enterprise tax revenue from SOEs and OPEs** (%)	Share of enterprise tax revenue from FIEs (%)
1985	200.5	134.5	69.6			
1986	212.2	139.8	69.2			
1987	219.9	147.6	66.5			
1988	235.7	171.4	67.6			
1989	266.5	202.7	70.0			
1990	293.7	210.6	71.6			
1991	314.9	225.9	73.1			
1992	348.3	257.6	72.1			
1993	434.9	357.7	67.9			
1994	521.8	441.9	70.8			
1995	624.2	515.9	87.8			
1996	740.8	594.1	96.8			
1997	865.1	823.4	96.3			
1998	987.6	926.3	92.6			
1999	1144.4	1068.6	81.1	122.7	82.3	17.7
2000	1339.5	1258.2	99.9	177.1	81.6	18.4
2001	1638.6	1530.1		263.1	80.5	19.5
2002	1890.4	1763.6		308.3	76.2	23.8
2003	2171.5	2001.7		291.9	76.9	23.1

Notes: \* Prior to 2001 data is only separately available for tax revenues from SOEs, and after 2001 only available for all enterprises and FIEs according to Chinese Statistical Yearbook. Tax revenue data for SOEs and FIEs in 1999 and 2000 are taken from Ministry of Finance, PRC and can be accessed at <<http://www.mof.gov.cn>>.

\*\* Shares in this column and last column in this table are calculated by the authors using data published by Ministry of Finance, PRC. <<http://www.chinatax.gov.cn/data99-04.jsp>>.

Source: 1. Chinese Statistical Yearbook 2005 and 1996. 2. State Administration of Taxation, PRC.

Here we argue that while in tax policy models used in OECD countries a change to a unified tax may appear desirable since all firms are similar, things are for less clear in a tax model of China which incorporates analytical representations of SOE behaviour. We consider two simplified treatments of SOE behavioural response which build on models used in Whalley and Zhang (2006). In the first treatment, which we term a worker control model, enterprises are assumed to receive capital allocated through the banking system via credit rationing with any losses incurred subsequently recapitalized. In essence, capital is freely allocated to SOEs through this mechanism.

Workers are guaranteed jobs at a fixed wages, and the enterprise must meet a budget constraint which implies that the value of output must cover the wage bill plus any surplus required by the state. Shirking is thus endogenously determined as workers collectively engage in satisficing behaviour. Hence, a tax on enterprise income (on the surplus) acts to reduce shirking and raise output.

In the second treatment, which we term a managerial control model, enterprises are controlled instead by managers, who again receive credit allocated recapitalizable loans (effectively capital at zero cost). With political appointed managers, we assume managers act so as to maximize their own political and business connections and maximize the size of enterprises rather than profit. This implies average product pricing of labour, and enterprises which are too large relative to Pareto efficiency. Taxes on any required surplus in this case reduce the enterprise size, and a higher tax rate on SOEs compared to other enterprises is again preferred.

We explore the influence of these effects on tax design using calibrated general equilibrium models of the Chinese economy capturing four sectors with each assumed to produce heterogeneous outputs using capital and labour as inputs. The four sectors are: agriculture production; SOEs; FIEs; and, one other private enterprises (OPEs). We use the two different formulations of SOE behaviour described above in alternative model variants. We use data for 2004 from the Chinese Statistics Yearbook for calibration, and assume values for key unobservables in the base year (such as the level of shirking in SOEs in the worker control model).

We conduct a series of counterfactual experiments with these models. We then investigate model outcomes when moving to a uniform tax treatment across all four sectors (relative to the current tax treatment of preference to FIEs) which preserves government tax yield. In both worker and managerial control models losses occur. We then evaluate losses relative to higher initial tax rates on SOEs and find that the losses involved are even larger.

The theme that emerges from our analysis is that tax changes that do not take account of the special role and behaviour of SOEs in China can potentially mislead. Uniform tax treatment across all non-SOE sector enterprises may be desirable, but not across all enterprises. Lowered tax rates on SOEs effectively relax discipline on them, moving resource allocation further away from a Pareto efficient allocation.

## 2. The Unified Tax Reform Proposal in China

Two decades ago, the main source of tax revenue for the national government in China was taxes collected from enterprises, which were almost entirely owned by the national government.<sup>3</sup> This heavy revenue dependence of the government on the state-owned sector distorted government decision-making and caused the government to favour this heavily taxed sector through prioritized bank loans and preferential regulation. In the beginning of the 1990s, however, the Chinese government set out a long-term tax reform plan, which included "unification of taxation management, equity of tax burden, simplification of tax system, rationalization of revenue distribution relations and guarantee of the financial revenue." The aim was to improve economic efficiency, as well as to promote social fairness. This plan remained, however, as a long term goal and was not implemented in concrete form.

As Table 1 shows, after the tax reforms of 1990s, the structure of Chinese government revenue structure changed substantially. Not only was there growth in tax revenues as a fraction of GDP, but also a shift away from enterprise taxes towards other tax sources (especially the value added tax). To attract FDI during this period, tax preferences were given to almost all foreign enterprises resulting in a dual-track enterprise income tax system. First in 1991 and later in 1994, laws for separate corporate income taxes for foreign and domestic enterprises were enacted.<sup>4</sup> Under this system, most FIEs paid taxes at a rate of 15%, while other types of enterprises paid tax at a 30% rate. To qualify FIEs had to be in special economic zones, high-tech industrial zones and national grade economic and technical development zones. FIEs in coastal regions and in all provincial capitals paid taxes at a 24% rate. FIEs additionally received complete tax holidays for the first two years, a 50% exemption for the next three years, and an exemption from a 3% local surcharge collected by municipalities, and retained earnings were more lightly taxed. Also, FIEs could fully deduct wage costs while other enterprises could only deduct 40% of wage costs. Converting these tax preferences into effective tax rates by enterprise type is treacherous, as the effective tax rate varies with the time profile of returns to investment (most FIEs make no profit in their first two years, for instance), their location, their financing, and labour

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<sup>3</sup> For a discussion of the evolution of Chinese tax policy, see Brean (1998)

<sup>4</sup> The two laws are "Income Tax Law of the People's Republic of China for Enterprises with Foreign Investment and Foreign Enterprises" which was enacted in 1991 and "Income Tax Law of the People's Republic of China for Enterprises" which was enacted in 1994.

costs. There are no estimates of effective tax rates for Chinese enterprises comparable to those of OECD economies,<sup>5</sup> but various Chinese sources put the capital tax rates faced by FIEs in the range of 10%-14%, while for the non-FIEs a range of 22-28% is widely used.<sup>6</sup>

In the modelling work report below, we use a tax rate FIEs of 14% and on other sectors of 24%, which we then replace by a single rate unified tax across all enterprises. In 2004, 23% of total enterprise taxes were paid by FIEs, and 77% were paid by the other types of enterprises (see Table 1), even though FIEs accounted for a significantly larger part of the total return to capital.

With more than two decades of reform completed and accession to the World Trade Organization (WTO) accomplished, under China's so-called "Gradual Therapy" the government position now is that FDI inflows are mainly attracted by non-tax factors. These include China's economic environment, a growing domestic market, low wage rates, well trained and hard working labour, a market system and a stronger judicial system. With tax preferences seen as less important, the government proposal is thus to unify enterprise tax rates and to remove what are seen as distortions associated with the various incentive schemes for FIEs.

The most recent proposal on unified tax reform was discussed by members of the Standing Committee of the National People's Congress (NPC) at the end of December 2006. They deliberated on a draft of a new corporate income tax law which includes following items.<sup>7</sup> First, the draft bill suggests a unified tax rate of 25% for both domestic

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<sup>5</sup> Such as in Fullerton and King (1984) and the studies which have followed.

<sup>6</sup> Different sources provide different estimates which lie in these ranges. Effective tax rates will differ by the life of assets, location of investments and finance. (1) "The actual income tax rate has remained at 14 percent for overseas-funded businesses, much lower than the 24 percent rate for domestic firms, since China formulated the preferential policy for overseas-funded enterprises in mid-1980s in a bid to lure foreign investment" (China, 2006a). (2) "At present, domestic enterprises in China are subject to a nominal income tax rate of 33% while the actual rates applied to FIEs and foreign enterprises range from 15% to 24%" (Hong Kong Trade Development Council, 2003); (3) "In 2004, domestic enterprises in China are subject to an actual income tax rate of 26.29% the actual rates applied to FIEs and foreign enterprises is just around 13.87%" (China, 2006b); (4) "According to experts' evaluation, while domestic enterprises in China are subject to an actual income tax rate of 23% the actual rates applied to FIEs and foreign enterprises is just around 10%" (*Peoples Daily*, 2005).

<sup>7</sup> The draft can be found in Zhu (2006).

and foreign-funded businesses. Second, for small business enterprises, according to the draft law, the income tax for small businesses will be 20%. Depending on what region and what industry they are active in, small businesses now pay either 18% or 27%. Third, the bill allows domestic companies to deduct employees' full salaries from taxable income as foreign companies now do. And fourth, there will be transitional measures for FIEs under which the current two-year full tax exemption and three-year partial tax exemption for foreign manufacturers will be removed and export-oriented foreign-funded businesses will no longer enjoy an additional 50% tax reduction. But existing FIEs will continue to receive tax preferences for five years after the new law is implemented and will only gradually face increased income taxes. The bill also extends some existing tax preferences. For instance, all high-tech companies will enjoy a 15% tax rate to stimulate innovation, while at present only those in state high-tech zones enjoy this privilege. Investments in equipment for environmental protection and water conservancy purposes and for production safety will be able to be used to offset taxes payable. The new enterprise tax structure is expected to take effect in 2008 if the bill is adopted by the NPC plenary session in March 2007.<sup>8</sup>

### **3. General Equilibrium Models of China Incorporating SOE Behaviour**

An immediate reaction to any proposal to analyze the efficiency and distributional impacts of the unified tax proposal is to use competitive equilibrium models of tax policy changes that are well documented in the literature; beginning with Harberger (1962) and further developing in Shoven and Whalley (1972; 1984).<sup>9</sup> Some representation of the applied tax rates before and after the change would be used, and transitional arrangements would be ignored. Typically, constant returns to scale goods and factor production functions are assumed in these for competitive firms, with demands generated from utility maximization. Tax revenues, for simplicity, we redistributed to consumers in lump sum form. Market clearing in goods and factors then characterizes equilibrium. For a closed economy, this occurs in both goods and factor markets, with both goods and factor prices being endogenously determined. For a small open

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<sup>8</sup> Since this paper was accepted for submission, the National Peoples Congress passed legislation unifying corporate income tax rates for domestic and foreign companies at its plenary session. Additional details can found at: <<http://www.10thnpc.org.cn/english/2007lh/203185.htm>>.

<sup>9</sup> See Lockwood, Ahmad, and Singh (2005) for the use of such a model to analyze Chinese value added tax (VAT) reforms which would combine what is effectively now a manufacturing level VAT at 17% and a turnover tax on services at 3%.

economy which is a taker of goods prices, only factor prices are endogenously determined with factor market clearing. Taxes on both goods and factors along with income taxes in multi-consumer variants change equilibrium behaviour, and distorting taxes impose welfare costs usually captured in Hicksian measures such as the equivalent or compensating variation. The sum of Hicksian measures across consumers is usually taken as the aggregate welfare measure of impact. The presumption in a standard competitive model is that unified and common tax treatment across all sectors is welfare preferred.

However, if there is different behaviour by type of enterprise, and SOEs behave differently from competitive firms, things are less clear. To explore how this applies to the unified tax proposal we can thus consider similar models, but with the added element of explicit representation of the SOE sector in alternative form. To do this, we consider agriculture and manufacturing sectors to represent the Chinese economy, but we subdivide manufacturing into three different subsectors: foreign invested enterprises, other private enterprises; and state-owned enterprises,<sup>10</sup> each producing a distinct output.

For the first three subsectors, we consider a sectoral production function of the form.

$$Y_i = F_i(K_i, L_i) \quad i=AGR, FIE, OPE \quad (1)$$

where  $Y_i$  refers to output,  $K_i$  and  $L_i$  are capital and labour inputs.

We assume constant elasticity substitution (CES) forms, but we can alternatively use Cobb-Douglas or some other variant. Both capital and labour in these sectors are treated as intersectorally mobile among the three sectors, but internationally immobile with factors hired up to the point that their marginal value product equals the corresponding factor price (the wage or rental rate).

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<sup>10</sup> In the Chinese Statistical Yearbook, value-added data for manufacturing is given for 10 different types of enterprises: Manufacturing 1 = State-Owned Industry; Manufacturing 2 = Collective-Owned Industry; Manufacturing 3 = Co-operative Enterprises; Manufacturing 4 = Joint Ownership Enterprises; Manufacturing 5 = Limited Liability Co-operations; Manufacturing 6 = Share Holding Enterprises; Manufacturing 7 = Private Enterprises; Manufacturing 8 = Other Enterprises; Manufacturing 9 = Enterprises with Funds from Hong Kong, Macao, and Taiwan; and, Manufacturing 10 = Foreign Funded Enterprises. We treat the first two as the SOE manufacturing subsector, 3 to 8 are aggregated as other private enterprise (OPEs) subsector, and the latter two as the foreign investment enterprises (FIEs) subsector.

We then consider two alternative variants of submodels for the SOE sector, even though in reality the Chinese SOE sector is highly complex with a variety of arrangements, and any simplification is inevitably an abstraction from a more diverse and complex reality. Each variant assumes different forms of control and optimizing behaviour. It is difficult to consider these two forms simultaneously in a single model since different optimizing behaviour is assumed in each, and so we separately consider two different model variants each of which point in the same direction for tax policy implications.

### **Worker Control SOE Submodel**

The first of these we designate as a worker control SOE submodel, and this can be thought of as reflective of traditional SOEs in the 1970s. In this formulation of SOE behaviour we assume workers have both job and wage guarantees with the membership of the enterprise fixed. We model the sector in the form of a single representative enterprise.

We assume that capital is allocated to the SOE sector by credit rationing through a state controlled banking system, and that any losses incurred by banks on loans through non-repayment of interest and principal are recapitalized by the central bank. We assume that SOEs behave as if loans need not be repaid, and as such, capital is freely allocated to enterprises once rationed credit is assigned. Members of the enterprise collectively decide on enterprise output, but must meet an enterprise budget constraint which covers wages plus any surplus to be returned to the state. After meeting the enterprise budget constraint, workers can either shirk (enjoy the leisure) or pursue second jobs by moonlighting.

This is a strong simplification since from the 1990s on there has been progressive discipline applied to state owned enterprises and major efforts to reduce the size of SOE non-performing loans in the banking system. Today in China many of the large SOEs in banking, telecoms, petrochemicals and other sectors are highly profitable, but the simplicity of the formulation serves our end of demonstrating the need to differentiate tax policy toward SOEs.

We consider a single representative SOE and write the SOE production function as:

$$Y_{soe} = A (\lambda \bar{L})^{1-\alpha} \quad (2)$$

where  $Y_{soe}$  is output,  $\bar{L}$  is the enterprise membership, and  $\lambda$  denotes the degree of effort extended by workers ( $\lambda=0$  implies complete shirking;  $\lambda=1$  implies full effort).  $a$  ( $a < 1$ ) is an exponent giving decreasing returns to labour input, and  $A$  is an efficiency parameter.

The collective budget constraint for enterprise members is:

$$P_{soe} Y_{soe} = \bar{\omega} \bar{L} + S_{soe} \quad (3)$$

where  $S_{soe}$  represents the surplus to be returned to the state.

From the production function,  $\lambda$  (the degree of effort) increases as  $Y_{soe}$  increases. Simple substitution of (2) into (3) implies that a tax imposed on  $S_{soe}$  as an enterprise income tax will increase  $Y_{soe}$  and hence  $\lambda$ .

We complete the model in the following way. We consider households to have preferences defined over both the four goods in the model and leisure but differently treat workers in SOEs and other enterprises. SOE workers collectively decide on their level of shirking so as meet the enterprise budget constraint and so do not make labour supply decision based on utility maximizing behaviour. For SOE members, leisure enters preferences but leisure consumption is implied by the satisfying behaviour of them collectively meeting their enterprise budget constraint which is necessary for workers to retain their job. SOE members thus optimize over the consumption of goods, but satisfice in their leisure and labour supply behaviour.

Because of this behaviour in the SOE sector we partition consumers into those working in SOEs and elsewhere. For the former (SOE workers) utility maximization takes the form:

$$\begin{aligned} \max U(X_1, \dots, X_4, (1-\lambda)\bar{L}) \\ \text{st. } \sum_{i=1}^4 (P_i X_i) = \bar{\omega} \bar{L} + R_{soe} \end{aligned} \quad (4)$$

where  $(1-\lambda)\bar{L}$  is shirked labour and defines the amount of leisure entering preferences. In this structure, since workers satisfice in their shirking behaviour in order to retain their SOE jobs, leisure is not derived from conventional first order conditions.  $R_{soe}$  is government revenues redistributed to workers in the SOE sector.



For the non-SOE workers utility maximization takes the more conventional form:

$$\begin{aligned} & \max U(X_1, \dots, X_4, Le) & (5) \\ \text{st. } & \sum_{i=1}^4 P_i X_i = \omega(L - Le) + r\bar{K} + R_{non-soe} \end{aligned}$$

where  $L$  represents their labour endowment,  $Le$  is leisure consumption,  $\bar{K}$  is the economy wide endowment of capital used in the three non-SOE sectors and  $R_{non-soe}$  is government revenues redistributed to workers in the non-SOE sector.

Equilibrium in this model version implies clearing in all goods markets, factor market clearing in capital and labour across the three non-SOE sectors and government budget balance with tax collection equalling revenue distributed. Taxes can be applied to either or both of goods and factors. Because of the differential treatment of the SOE sector, taxes on capital income applied to SOEs as a tax on their surplus to be transferred to the state will increase output and lower shirking. However, because of the presence of leisure in preferences it will not be optimal to tax  $S_{soe}$  so as to force  $\lambda$  to 1. An optimal tax scheme will typically involve a tax rate on the SOE sector different from that on the non-SOE sector, and depending on the configuration of initial tax rates a move to a unified tax may no longer be desirable.

### **Managerial Control SOE Model**

In our second SOE model variant, we assume managerial rather than worker control. Capital is again assumed allocated freely to the SOE by credit rationing with a recapitalization mechanism as before, but now managers not workers decide on the output level of the firm. In this case, both employment and shirking are assumed monitorable by management and hence shirking is absent. We assume managers are politically appointed and pursue personal gain rather than state enterprise profit, and so they seek to maximize the size of the enterprise so as to yield maximal personal network benefits rather than profit. If there is no surplus to be returned to the state by the SOEs, this implies hiring labour up to the point that the wage paid to labour equals average rather than marginal product.

In this model variant we assume all 4 sectors including SOEs have constant returns to scale production functions, but capital used by the SOEs is fixed to reflect capital allocation to this sector by rationed credit.

$$Y_i = F_i(K_i, L_i) \quad i=AGR, FIE, OPE \quad (6)$$

$$Y_{soe} = F_{soe}(\bar{K}_{soe}, L_{soe}) \quad (7)$$

There is again a surplus to be paid to the state and this surplus can offset the distortion in average product pricing of labour that makes the size of the enterprise too large relative to Pareto efficiency. If the size of the surplus is below that which fully offsets this distortion, a higher enterprise tax on the SOEs will be desirable. For the three non-SOE sectors.

$$w_i = P_i \frac{\partial Y_i}{\partial L_i} \quad r_i = P_i \frac{\partial Y_i}{\partial K_i} \quad i=AGR, FIE, OPE \quad (8)$$

but for the SOE sector, given size maximizing behaviour by managers:

$$w_{soe} = \frac{P_{soe} Y_{soe} - S_{soe}}{L_{soe}} \quad (9)$$

where  $S_{soe}$  is the surplus returned to the state, and  $P_i$  and  $P_{soe}$  are output prices. Equilibrium is given by clearing in goods market and the capital market across the three non-SOE subsectors and for labour across all four sectors. Here a tax on  $S_{soe}$  will reduce  $Y_{soe}$  and  $L_{soe}$  and hence can help correct a distortion in labour markets associated with average rather than marginal product pricing of labour if the original value of  $S_{soe}$  is below what is required.

In this model variant, as in the worker controlled model, taxes on SOE will optimally be set in ways which are different from those of other enterprises. A move to a unified tax may or may not improve things.

#### 4. Model Calibration and Results

We have calibrated the two model variants set out above to a benchmark data set for China for 2004 which separately identifies SOEs, FIEs and OPEs in manufacturing. We assume CES functions for the three non-SOE subsectors, agricultural production, FIEs and OPEs. For the SOE sector in the worker controlled case we have the decreasing returns function (2), and in the managerial control variation case we use a Cobb-Douglas (CD) function, implies a similar treatment to that of worker control model. We use the resulting model parameterizations in counterfactual equilibrium analyses

of moves both to a unified tax scheme across all enterprises and also of an optimal tax structure with a separate tax rate on SOEs.

The elements of the benchmark equilibrium data set we have constructed are set out in Table 2. This data set is in value form, and we use the units convention set out in both Harberger (1962) and Shoven and Whalley (1972) of defining units for output and factors, as the amount selling for 1 billion RMB in the base case for the output of the agriculture, FIE and the other private enterprise sectors. The parameter for leisure in each household is assumed to be 0.2 as we have no direct observation on leisure consumption. We later change this value in sensitivity analysis.

Table 2. 2004 Benchmark Equilibrium Data Set for China  
Incorporating SOEs

	Value added (billion RMB)	Value of labour input* (billion RMB)	Value of capital input** (billion RMB)	Surplus return to the state		Tax rate on capital (%)
				Worker control (billion RMB)	Manager control (billion RMB)	
AGRI	2076.8	1336.5	740.3			24%
FIEs	1524.1	189.0	1335.1			14%
OPEs	1635.2	920.7	714.5			24%
SOEs	2321.3	1210.6	1110.7	1110.7	1110.7	24%

Notes: \* The value of labour input is calculated by the authors using wage times employment.

\*\* This is calculated by residual and is gross of tax.

Source: Chinese Statistics Yearbook 2005.

For the SOE sector, a different calibration treatment is needed. In the worker control case, we assume a value of the SOE wage  $W_{soe}$  equal to 0.75 as this is unrelated to the market clearing wage in the rest of the economy. We also again assume a share parameter on leisure in preferences of 0.2. Setting a value using the share of labour input to total value-added for  $\alpha$  then implies a value for  $A$ . In the managerial control case, the use of labour inputs do not correspond to first order conditions for profit maximization and these are replaced in calibration by the average product condition. The share parameter on labour in the CD production function for the SOE sector in this model variant is set using the share of labour input to total value-added and  $A$  is calculated using the production function. For non-SOE sectors, we use a conventional calibration in generating parameters for the CES functions. Demand side parameters

Table 3. Model Parameterizations Generated by Calibration to the 2004 Benchmark Dataset

<i>Production</i>	<b>Worker control</b>			<b>Managerial control</b>		
	<i>A*</i>	<i>a</i>	<i>σ</i>	<i>A</i>	<i>a</i>	<i>σ</i>
Agriculture	1.739	0.922	0.24**	1.739	0.922	0.24
FIE	1.525	0.175	1.26	1.525	0.175	1.26
OPE	1.987	0.550	1.26	1.987	0.550	1.26
SOE	57.476	0.521		57.476	0.521	

<i>Preferences</i>	<b>Worker control</b>		<b>Managerial control</b>	
	<i>SOEs</i>	<i>Non-SOEs</i>	<i>SOEs</i>	<i>Non-SOEs</i>
Agriculture	0.166	0.166	0.166	0.166
FIE	0.213	0.213	0.213	0.213
OPE	0.179	0.179	0.179	0.179
SOE	0.242	0.242	0.242	0.242
Leisure	0.200	0.200	0.200	0.200

Notes: \* The CES production function used in the Agri, FIE and OPE sectors is

$$Y = A * [a * L^{(\sigma-1)} + (1-a) * K^{(\sigma-1)}]^{a/(\sigma-1)}$$

\*\* These elasticity parameters are taken from GTAP database for China. See Dimaranan et al. (2006).

are also generated by conventional calibration, with the exception of leisure parameters as noted above. We draw on the Global Trade Analysis Project (GTAP) data base for elasticity parameter estimates.<sup>11</sup> The resulting model parameterizations are reported in Table 3.

## 5. Some Results

We have used the resulting model parameterizations in two different types of counterfactual equilibrium analyses. In one we assess the impacts of moving to a unified enterprise tax scheme. In the other we iteratively vary the SOE tax rate to compute an optimal tax scheme with a separate tax rate on SOEs and equal yield but common tax rates on all other enterprises. Results are set out in Tables 4 and 5, and in Figures 1 and 2.

In both cases in Table 4, moving to a unified enterprise produces a welfare loss of 0.256% of GDP in the worker control model and 0.192% of GDP in the managerial

<sup>11</sup> See Dimaranan et al (2005).

control case. These indicate that the current uneven tax structure is welfare preferred to a unified tax structure in a model where SOE behaviour is differently modelled from that of competitive firms elsewhere in the economy. The equal yield tax rates also differ in the two cases because of the differences in SOE output response. An equal yield tax rate of 19.0% applies for the worker control model, but 18.7% for the managerial control model. These tax rates also differ sharply from the 25% rate proposed in the recent draft law. This difference in equal yield tax rate reflects the different output response for SOE in the two model variants. In the case of the worker control model, a lowered tax rate applies to the surplus paid to the state which relaxes the budget constraint on SOEs. This increases shirking which in turn reduces output. In the case of the managerial control model, the smaller tax on the surplus paid to the state implies that the average product of labour can now fall which in turn implies an increase in output.

These output changes have corresponding changes in factor use by sector, which are also reported in Table 4. The FIE use of capital falls in both models, reflecting the higher tax rate on capital in this sector under a unified tax. Labour input in this sector

Table 4. Model Results from Moving to a Unified Enterprise Tax in China

	Worker control	Managerial Control
Equal yield unified tax rate (%)	19.000	18.7
Aggregate welfare (EV as % of GDP)	-0.256	-0.192
Impact on output (% change)		
Agriculture	0.940	0.042
FIE	-2.372	-2.467
OPE	1.947	1.401
SOE	-2.061	1.115
Impact on capital (% change)		
Agriculture	4.568	5.053
FIE	-2.639	-2.633
OPE	3.117	3.027
SOE	0.000	0.000
Impact on labor (% change)		
Agriculture	0.565	-0.471
FIE	-1.925	-2.198
OPE	0.744	-0.241
SOE	0.000	2.152
$\lambda$ (degree of effort)	-3.918	

Note: All data are reported as % changes compared to the benchmark data except for the equal yield unified tax rate.

falls too, but less than in the case of capital. The output fall in FIEs is intermediate to the two, being a weighted average of the change in the use of the two inputs.

In the agriculture and other private enterprise sectors capital use expands in both cases reflecting the lowered tax rate on capital in these two sectors. However, different results between models apply for labour use. In the worker control case labour use expands in the two non-FIE sectors since it is in fixed supply for the three non-SOE sectors, and FIE labour use falls. In the managerial control case it contracts given the significant increase in labour use in the SOE sector.

In Table 5 we parametrically vary both the setting of leisure share parameters in the utility functions both for SOE workers and for non-SOE workers, and the size of SOE surplus in the benchmark data. When we vary leisure parameters between 0.05 and 0.5, in each case we recompute the welfare gain for the worker control and managerial control cases. Results show that varying shares of leisure in utility functions does not change the sign of welfare measures in a unified scheme. This finding supports

Table 5. Impacts of Varying Leisure Shares and the Size of Surplus of SOEs in Benchmark Data on the Welfare Impact of Unified Tax Schemes

Hicksian Equivalent Variation as % of base case income		
<i>Move to unified tax scheme</i>		
<i>Leisure Share</i>	Worker Control	Managerial Control
0.05	-0.524	-0.061
0.10	-0.414	-0.104
0.15	-0.322	-0.148
0.20	-0.256	-0.192
0.25	-0.216	-0.235
0.30	-0.209	-0.279
0.40	-0.296	-0.366
0.50	-0.508	-0.453
<i>Modified size of the SOE surplus relative to base case data</i>		
0.25	-0.326	-0.012
0.50	-0.258	-0.072
0.75	-0.234	-0.155
1.00	-0.256	-0.192
1.25	-0.289	-0.213
1.50	-0.335	-0.155
1.75	-0.390	-0.089
2.00	-0.436	-0.031

Source: Authors' calculations.

the results reported in the Table 4 and show that the sign of the model's results regarding a move to a unified tax are robust with respect to these parametric changes. In the worker control case, the size of the welfare loss under a unified tax scheme is a "reverse U shape" in the change in the leisure parameters. In the managerial model case, the welfare loss under a unified tax scheme falls continuously as the share increases.

We have also modified the size of the SOE surplus relative to base case data in sensitivity analysis by both reducing and increasing its size. The results here for the two models indicate again that varying the surplus does not change the sign of the welfare effect under a unified scheme. The welfare loss under a unified tax scheme has a maximum value at 0.75 times benchmark surplus in the worker control model and modifying the surplus shows a "reverse-U" impact on welfare. The relationship between the two variables has a "U-shape" in Managerial Control variant, with a minimum welfare gain when surplus is 1.25 times benchmark. This implies that the surplus can offset the distortion in average product pricing of labour in this model as we have discussed above.

In Figures 1 and 2 we set out results of computations designed to show how the welfare impacts of tax changes vary if the value of the SOE tax rate is set separately from that for all other sectors. In these computations, uniform tax rates apply only to the three non-SOE sectors, and a separate tax rate is used for the SOE sector. Figure 1 implies that any SOE tax rate set above 0.23 implies a welfare gain, with a maximum welfare gain at a tax rate of 0.40. This maximum occurs since a higher SOE tax rate in the worker control model will discipline shirking and increase output, but the progressively smaller value implied for leisure when entered into preferences lowers utility. The common unified tax rate of 19% as in table 4 implies a welfare loss as shown in the diagram. Similarly, results in Figure 2 shows that any SOE tax rate set above 0.227 implies a welfare gain, with a maximum welfare gain at a tax rate of 1.107 on the SOE surplus. This sharply higher rate implies negative capital taxes on the three non-SOE sectors, which is extreme.

## 6. Concluding Remarks

In this paper we consider the potential impacts of a move to a unified enterprise tax in China in a model in which the behaviour of SOEs is differently modeled for that of other enterprises in both manufacturing and non-manufacturing. The unified

Figure 1: Welfare Gain or Loss in Worker Control Model as a Function of SOE Tax Rate

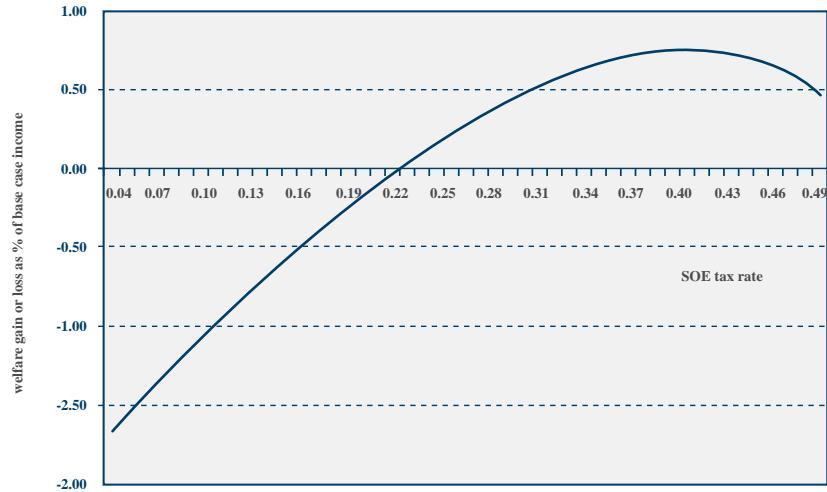
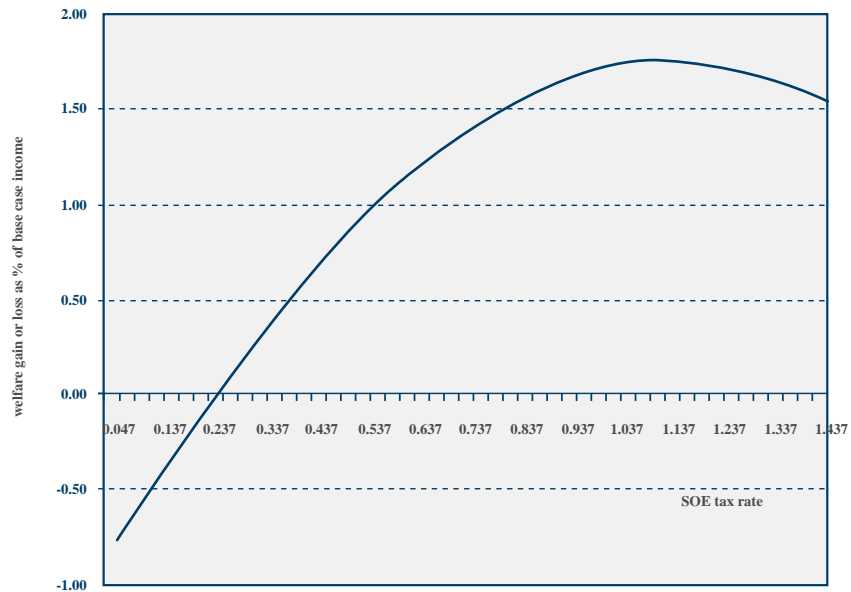


Figure 2: Welfare Gain or Loss in Managerial Control Model as a Function of SOE Tax Rate



tax has been debated for some years as a way of removing large tax preferences to FIEs, and currently draft implementing legislation is under review. The point of our paper is to argue that while moving to unified treatment across all enterprises in a simple competitive world seems to be sound policy, once different enterprise behaviour by subsector enters things are less clear. We use two different submodel variants of



SOE behaviour embodied in a general equilibrium model of China; one we term worker control and the other managerial control. In the former, workers satisfy in meeting an enterprise budget constraint and otherwise shirk. In the latter, managers seek to maximize the size of the enterprise rather than profits to gain maximal personal networking benefits. In both model variants capital is assumed allocated by rationed credit, with any losses on loans recapitalized by the central banks to state banks.

In both of these model forms, a move to a unified tax which removes tax preferences to FIEs and raises FIE tax rates while lowering others is a welfare losing change. This is because a lowered tax rate on SOEs departs further from what in the model is an optimal tax rate on SOEs given their assumed behaviour. There is also a difference in the value of the equal yield tax rate between the models due to different SOE output responses in two model variant.

In reality a move to a unified tax would involve other behavioural response, which would further modify impacts. One is the impact of higher FIE tax rates on inward FDI. Another is the impact of these tax rate changes on capital accumulation and investment. But our theme, that different and separate modeling of SOE behaviour can modify the policy prescription for tax reform in China is striking and likely robust to more complicated formulations.

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