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# The role of taxation in tobacco control and its potential economic impact in China

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## ABSTRACT

**Objectives** To identify key economic issues involved in raising the tobacco tax and to recommend possible options for tobacco tax reform in China.

**Methods** Estimated price elasticities of the demand for cigarettes, prevalence data and epidemiology are used to estimate the impact of a tobacco tax increase on cigarette consumption, government tax revenue, lives saved, employment and revenue loss in the cigarette industry and tobacco farming.

**Results** The recent Chinese tax adjustment, if passed along to the retail price, would reduce the number of smokers by 630 000 saving 210 000 lives, at a price elasticity of  $-0.15$ . A tax increase of 1 RMB (or US\$0.13) per pack of cigarettes would increase the Chinese government's tax revenue by 129 billion RMB (US 17.2 billion), decrease consumption by 3.0 billion packs of cigarettes, reduce the number of smokers by 3.42 million and save 1.14 million lives.

**Conclusion** The empirical economic analysis and tax simulation results clearly indicate that increasing the tobacco tax in China is the most cost-effective instrument for tobacco control.

## INTRODUCTION

China grows about one-third of the world's tobacco crop and consumes one-third of the world's cigarettes. The 2002 National Smoking Prevalence Survey estimated there to be about 300 million current smokers in China.<sup>1</sup>

The health and economic consequences of smoking are alarming. A recent estimate of mortality attributable to smoking in China is 673 000 deaths per year if limited to cancer, cardiovascular disease and respiratory disease.<sup>2</sup> And because diseases caused by smoking can take several decades to develop, China has yet to catch up to the high smoking-related mortality seen in the West.<sup>3</sup> Smoking attributable deaths in China are projected to rise to 2 million by the year 2020.<sup>4</sup>

The health burdens of smoking also can be measured in monetary cost, which includes medical treatment costs (direct costs) and loss of productivity from morbidity and mortality (indirect costs). A study that used the 1998 China National Health Services Survey estimated the smoking-attributable total costs of three major diseases—cancer, cardiovascular (CV) disease and respiratory disease—at 41.0 billion RMB (or US\$5.0 billion, US\$1=8.20RMB for the 2000 exchange rate) measured in 2000 value, or about 208 RMB (US \$25.43) per smoker ( $\geq$ age 35).<sup>5</sup> The direct medical costs of smoking accounted for 3.1% of China's national health expenditures in 2000.<sup>6</sup>

To reduce this cost burden in the future, effective tobacco control programs and sustained efforts are needed to curb the tobacco epidemic and economic losses. One of the most important instruments a government can use in tobacco control is taxation. Worldwide experience has shown that raising the tax on cigarette sales is very effective in reducing consumption.<sup>3</sup>

The objectives of this paper are to identify key economic issues for evidence-based policy analysis, including the various aspects of tobacco taxation and to recommend possible options for tobacco tax reform in China.

The remainder of this paper is organised as follows. The next section reviews the tobacco economy in China. The third section provides a review of China's tax system with particular emphasis on the tobacco leaf tax and the cigarette tax. The fourth section describes tobacco price, affordability, consumption and demand analysis. The fifth section provides a simulation of the impact of tobacco tax income on China's economy and population health. Recommendations are included in the final section.

## THE TOBACCO ECONOMY IN CHINA

The Chinese government plays an important role in the production of tobacco leaf and cigarettes through its national monopoly, the State Tobacco Administration (STMA) and the China National Tobacco Company (CNTC), one organisation with two names. The STMA sets overall government policy on tobacco, beginning with the allocation of tobacco production quotas among the provinces, the pricing of tobacco leaf, the setting of production quotas for cigarettes and the managing of international trade. The CNTC has the overall responsibility of setting national tobacco leaf production quotas for all provinces.

According to law, the CNTC is the only legitimate buyer of tobacco leaf in China. In 2005, China produced 2.435 million tons of tobacco leaf, about one-third of the world's production.<sup>7</sup> In the same year, the 1.363 million hectares planted with tobacco accounted for less than 1% of China's total agricultural cultivated land. The gross value of flue-cured tobacco was 23.23 billion RMB, or 9.54 RMB per kg, contributing 1% to 2% to the Chinese agricultural economy.<sup>7</sup>

Currently, the Chinese central government allows the local government to keep 20% of tobacco leaf tax revenues. As a result, 24 of 31 provinces in China (about 4 million farm households or about 2% of all farmers) grow tobacco.<sup>8</sup> Almost all of these households also produce other crops. Of the 24 tobacco-producing provinces,



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Yunnan, Guizhou, Henan and Sichuan are the 4 most important in terms of growing tobacco and manufacturing cigarettes. According to the 2005 China Agricultural Statistics, the net return for tobacco leaf compared to its production cost was 22% for Yunnan and 18% for Henan, but only 1.25% for Guizhou and -4.98% for Sichuan.<sup>9</sup> These production costs included the imputed cost of farmers' own labour time, but not tobacco company subsidies to farmers, which explains how a negative return for Sichuan tobacco farmers is possible.

In 2007, China's state-owned tobacco monopoly produced 106.98 billion packs of cigarettes, generating a profit and tax of 388 billion RMB, about 7.56% of central government revenue.<sup>10</sup> The cigarette manufacturing industry employed about a half a million people, or about 0.06% of the total national employment. About 3.5 million persons were engaged in retail cigarette sales. However, very few persons were sole cigarette retailers and many worked on a part time basis; they comprised 0.6% of the total employed population in 2005.<sup>8</sup>

China entered the World Trade Organization (WTO) in 2001. With the WTO removing China's longstanding restrictions on tobacco imports and the numerous domestic companies within the state monopoly, the largest Chinese tobacco company cannot yet compete directly with the transnational tobacco companies. In recent years, foreign products have set their product price comparable to the most popular domestic brands, such as Hong Ta Shan brand or Zhong Hua brand. The CNTC anticipates that before the end of the decade, foreign products may reach 8% to 10% of the Chinese tobacco market.<sup>7</sup>

To compete with the transnational tobacco companies, CNTC has consolidated many regional companies to improve efficiency. One major consequence of these mergers is increased unemployment. The 92 small cigarette companies that were closed had about 59 000 employees and 5500 retired employees. Chinese tobacco companies have begun addressing employment issues in light of this industry restructuring.

## THE TAX SYSTEM AND TAX STRUCTURE IN CHINA

China has a central government tax and a local government tax. The central government collects a value-added tax (VAT), personal and enterprise income tax, specific excise tax and custom tax among others. The local government collects a business tax, special tobacco leaf tax and city construction/maintenance tax.

Even though the central government collects a large majority of the taxes in China, revenue from some of the collected taxes is shared with the local government. This revenue sharing provides financial incentives for the local government to collect taxes on behalf of the central government. China has two tobacco-related taxes: the tobacco leaf tax and the tobacco product (mainly cigarette) tax.

Before 2005, tobacco leaf was included under the agricultural tax, which was levied at 31% of the CNTC purchase price. The revenue from this special agricultural tax was collected and used for local government purposes. In 2006, the central government decided to eliminate all agricultural product taxes to relieve farmers' financial burdens. However, tobacco leaf was not included in the tax exemption. Instead, a special tobacco leaf tax was designed and the tax rate was reduced from 31% to 20%.<sup>11</sup> This local tobacco leaf tax serves as an incentive for local officials to encourage farmers to produce tobacco leaf above and beyond the CNTC quota, which leads to a surplus of tobacco leaf, which then becomes a source for underground private cigarette companies.

Before 1 May 2009, the cigarette tax rate in China consisted of two components: (1) a specific excise tax of 0.06 RMB per pack

for all cigarettes and (2) an ad valorem tax of 45% for cigarettes with a producer price higher than or equal to 5 RMB per pack (class A cigarettes) and a 30% tax rate for cigarettes with a value less than 5 RMB per pack (class B cigarettes).

In late May 2009, the Chinese Ministry of Finance (MOF) and the State Administration of Taxation (SAT) announced an adjustment to the cigarette product tax. While the specific excise tax of 0.06 RMB per pack remained unchanged, the ad valorem tax structure was changed as follows: (1) an ad valorem tax of 56% is levied on cigarettes with a producer price higher than or equal to 7 RMB per pack (class A cigarettes) and a 36% tax on cigarettes with a value less than 7 RMB per pack (class B cigarettes), and (2) an additional 5% tax is applied to the whole price, which includes the new increases in the producer price tax.

Table 1 provides a comparison of the Chinese tobacco tax structure before and after May 2009. The government indicated that the purpose of the new adjustment is to increase government revenue from cigarette products. It requires the CNTC to absorb all of the additional tax from its profits, not allowing the new tax adjustment to be passed along to the retail level. Thus, the same cigarette tax rate is maintained at the retail level in China.

Under the tax structure in effect before May 2009, the Chinese government claimed that China's cigarette tax was about 65% at the producer price level.<sup>6</sup> Using the  $t/(t+1)$  equation and a 65% tax rate ( $t$ ) at the producer price level, the cigarette tax rate in China would be about 40% at the retail price level. International practice calculates the cigarette tax at a retail price level to reflect consumers' financial outlay in buying cigarettes.

If the Chinese government were to pass along the additional producer/wholesale tax increase to the retail price, the weighted tax rate at the producer price level would be an additional 11.7 percentage points, assuming the recent mark-up between producer price and wholesale price and the weighted sales value distribution among the two classes of cigarettes.<sup>12</sup> Thus, the adjusted tax rate at the producer price level would be 76.7% (65% + 11.7%), and the new retail price tax rate would become 43.4% (76.7%/(1+76.7%)), an increase of 3.4 percentage points.<sup>12</sup> More than 50 countries around the world have higher retail cigarette tax rates than these effective tax rates in China.<sup>13</sup>

To maintain sufficient local government revenue, the central government transfers 25% of the VAT revenue to the local government. Furthermore, the central government also transfers 40% of enterprises' income tax revenues to the local government. This form of tax revenue sharing provides an incentive to local government to protect its local tobacco industry by controlling tobacco leaf production, marketing and pricing. The national tobacco monopoly industry becomes many localised monopolies.

One reason the Chinese government pays significant attention to the tobacco industry is the latter's contribution to the central government's collected revenues. The CNTC is a government-owned monopoly that combines its profit and tax revenue as revenues. In 1995, the tobacco industry contributed about 11.4% of total central government revenue; its contribution

**Table 1** Comparison of Chinese tobacco excise tax structure before and after 1 May 2009

	Before 1 May 2009	After 1 May 2009
Specific excise tax per pack	0.06 RMB	0.06 RMB
Ad valorem tax		
Price per pack	≥5RMB 45%	≥7RMB 56%
Price per pack	<5 RMB 30%	<7RMB 36%
Wholesale price tax*	0%	5%

\*Wholesale price includes the amount of ad valorem tax.

declined to 7.56% in 2007. The recent fall in the proportion of the tobacco tax to total tax is due to higher tax revenues from China's burgeoning export market rather than any reduction in tobacco production or manufacturing of tobacco products. However, even though its relative share in government revenue has been declining, the tobacco industry is still a very important source of revenue for the central government in China.

### PRICE, AFFORDABILITY, CONSUMPTION AND DEMAND ANALYSIS

The price of cigarettes is a key variable when considering the use of taxation as an instrument for tobacco control. In 1990, the nominal retail price per pack of cigarettes in China was 1.088 RMB; it then increased gradually to 6.641 RMB in 2007, as shown in table 2. According to the consumer price index (CPI), using 1990 as 100, the overall price of cigarettes increased 2.28 times during that period; using the CPI to deflate the nominal cigarette price, the per pack price in 2007 measured at the 1990 price level, was 2.91 RMB per pack.

To address the affordability of cigarettes, one can divide per capita disposable income by the price per pack of cigarettes each year. Then, using the base year (1990) ratio as a denominator for each subsequent year (eg, 1991, 1992 and so on), one can derive an affordability index, a measure of price relative to income. With rapid economic growth in China between 1990 and 2007, the nominal proxy index of the per capita disposable income increased from 1637 RMB in 1990 to 19 033 RMB in 2007, about 11.63 times. This increase in disposable income indicates that Chinese consumers' income increased much faster than the price of cigarettes, by almost 2.34 times between 1990 and 2007. Thus, cigarettes in China became more than twice as affordable between 1990 and 2007. As shown in table 2, given that the relatively low increase in the real price has made cigarettes more affordable over time, per capita cigarette consumption has been increasing since 2000.

#### Demand analysis and price elasticity

Determining the impact of taxation on cigarette consumption and subsequently on government revenue requires an analysis of

the relation between price and consumption of cigarettes. The relationship can be expressed in quantitative measures. Price elasticity is particularly important since it measures the effect on consumption of a change in price.

Past empirical estimated price elasticities range widely from  $-0.007$  to  $-0.84$ ,<sup>14–21</sup> due mainly to variations in the data sets (time series vs cross section; aggregate vs individual observations), model specification and estimated methods. However, they can be grouped into three categories based on their magnitudes. (1) The high-end price elasticities, around  $-0.80$ , were obtained from two time series studies.<sup>14 15</sup> Although international literature often cites  $-0.80$  as the price elasticity among developing countries, it seems unlikely that Chinese smokers would have such a high response to price change in the short term; this could be a long-term price elasticity.<sup>16</sup> (2) The middle range of elasticities, from  $-0.50$  to  $-0.60$ , represents almost half of all estimated results and is cited mostly in the literature from middle-income or high-income countries.<sup>17–19</sup> (3) The low-end price elasticities, from  $-0.007$  to  $-0.154$ , are from the most recent Chinese studies and based on much larger nationally representative data sources.<sup>20 21</sup> One possible explanation for the low price elasticity in China is the availability of cigarettes with a wide range of prices, from 2.0 RMB (US\$0.15) to 200 RMB (US\$24.4) per pack, suggesting that smokers can easily switch to lower priced brands without quitting. Furthermore, due to the rapid income growth in the Chinese economy, cigarettes have become much more affordable, thus reducing the price effect.

Since the magnitude of price elasticity is one of the most important parameters used to simulate the impact of a cigarette tax on cigarette consumption, government revenue, population health and the overall economy, we will use two different price elasticities of  $-0.15$  and  $-0.50$  for a short-term tax impact sensitivity analysis. The estimated elasticity of  $-0.15$  of the demand for cigarettes consists of two components: the probability of being a smoker, that is, the participation elasticity was  $-0.06$  and the price elasticity of the demand for the amount of cigarettes conditional on being a smoker was  $-0.09$ .<sup>21</sup> Thus, approximately 40% of the decline in cigarette consumption in China was from quitting (or not initiating) smoking, and 60% of the decline was from current smokers reducing their consumption.

**Table 2** Cigarette prices, affordability index and consumption (1990–2007)

Year	Nominal retail price (RMB/pack)	Consumer price index (1990=100)	Real retail cigarette price (1990=100) (RMB/pack)	Proxy disposable income per capita (RMB)	Affordability index	Per capita consumption (packs/year)
1990	1.088	100.0	1.088	1637	1.000	65.97
1991	1.207	103.4	1.168	1884	1.038	67.64
1992	1.328	110.0	1.207	2298	1.150	66.15
1993	1.421	126.2	1.126	2975	1.391	68.99
1994	1.564	156.6	0.998	4014	1.706	68.29
1995	1.736	183.4	0.946	4938	1.890	70.17
1996	1.944	198.6	0.979	5731	1.959	67.77
1997	2.177	204.2	1.066	6314	1.928	68.54
1998	2.316	202.5	1.144	6654	1.910	65.82
1999	2.464	199.7	1.234	7034	1.897	64.50
2000	2.585	200.5	1.289	7732	1.988	60.95
2001	2.793	201.9	1.383	8467	2.015	64.60
2002	3.086	200.3	1.541	9271	1.997	68.09
2003	3.420	202.7	1.687	10460	2.033	69.57
2004	3.899	210.6	1.851	12277	2.093	72.09
2005	4.522	214.4	2.109	14128	2.076	71.81
2006	5.384	217.6	2.474	16214	2.328	77.41
2007	6.641	228.0	2.913	19033	2.340	80.96

Sources: China's Statistics Yearbook (1989–2008), China National Bureau of Statistics, Beijing, China; China Tobacco Statistics Yearbook (1989–2008), China National Tobacco Company, Beijing, China.

## SIMULATION OF THE IMPACT OF SPECIFIC EXCISE TAX INCREASES

### Impact on cigarette consumption, government tax revenue and health

Two different potential tax increases are used for the simulation: (1) the new 43.4% tax rate that would result from the May 2009 tax adjustment structure if the producer tax adjustment was passed on to the retail level by the Chinese government and (2) an increase of 1 RMB per pack specific excise tax (currently less than 0.06 RMB per pack), above and beyond the recent tax adjustment, a more administratively effective strategy with a potentially larger impact on tobacco control. The results discussed below are shown in table 3.

(1) China sold 106.98 billion packs of cigarettes in 2007. Under the new adjusted tax rate of 43.4%, the 2007 retail price of 6.64 RMB per pack would have increased to 6.87 RMB (or 0.23 RMB), and 0.54 billion fewer packs would have been sold at  $-0.15$  price elasticity and 1.82 billion fewer packs sold at  $-0.50$  price elasticity. An additional 1 RMB excise tax would result in a reduction in sales, respectively, of 3.0 billion packs and 9.96 billion packs.

Under a price elasticity of  $-0.15$  and a smoking participation elasticity of  $-0.06$ , the prevalence rate of smoking would be reduced from 31% to 30.8% or from 308 million smokers to 307.37 million smokers, a reduction of 640,000 smokers with the passing of the latest tax adjustment to the retail level. Using the estimated epidemiology analysis reported by the *Tobacco Atlas* that indicates one-third of smokers (a high estimate could be half of all smokers) will die from tobacco-related illness,<sup>13</sup> a 3.4% tax increase would mean 210 000 lives could be saved. At the same time, government revenue would increase by an additional 22.58 billion RMB (US \$3.01 billion at US\$1=7.5 RMB, 2007 exchange rate).

At a price elasticity of  $-0.50$  (ie, smoking participation elasticity at  $-0.20$ , or 40% of  $-0.50$ ) with a 3.4% tax increase, the prevalence rate of smoking would be reduced further from 31% to 30.5%, a reduction of 2.09 million smokers. If one-third of smokers will die prematurely, about 700 000 lives could be saved. Total government revenue could be increased by 19.63 billion RMB (US \$2.62 billion).

(2) With an additional 1 RMB per pack increase, or at a retail price of 7.87 RMB per pack under a total price elasticity of  $-0.15$ , smoking participation elasticity would be  $-0.06$  and the prevalence rate of smoking would be reduced from 31% to 30.13%, a reduction of 3.42 million smokers. Assuming one-third of smokers will die from tobacco-related illness,<sup>13</sup> a 1.00 RMB specific excise tax increase would mean 1.14 million lives could be saved. At the same time, the total government cigarette tax revenue would increase by 129.4 billion (or US\$17.25 billion).

This same methodology also was used to estimate the impact of adding an additional 1 RMB excise tax per pack of cigarettes on cigarette consumption, health and government revenue assuming a total price elasticity of  $-0.50$  (ie, smoking participation elasticity at  $-0.20$ ). In this scenario, the prevalence rate of smoking would be reduced further from 31% to 28.13%, a reduction of 11.41 million smokers. Again assuming one-third of smokers will die from tobacco-related illness, an additional 1.00 RMB specific excise tax would mean 3.80 million lives could be saved. The total government cigarette tax revenue would increase by 101.8 billion RMB (US\$13.57 billion).

Not included in table 3 are the potential cost savings in medical services and increased productivity resulting from the decreased number of smokers attributable to the increase in the tobacco tax. Under the cost of smoking analysis,<sup>4</sup> per smoker medical costs were about 200 RMB (US\$26.67). If the Chinese government decides to pass along the additional 3.4% tax to smokers, 630 000 fewer smokers would result in savings of 126

**Table 3** The impact of cigarette tax increases on tobacco-attributable mortality and government tax revenue using different price elasticities

	2007 levels	Recent tax adjustment	Increase in specific excise tax of additional 1 RMB
Increase in cigarette tax per pack (RMB)			
Cigarette retail price (RMB/pack)	6.64	6.87	7.87
Producer price	3.98	3.98	3.98
Tax per pack	2.66	2.89	3.89
Total tax as % of retail price	40%	43.4%	50.6%
Reduction in cigarette consumption (billion packs)			
0.15*		0.54	3.00
0.50*		1.82	9.90
Reduction in number of smokers (millions)			
Price elasticities†			
0.15		0.63	3.42
0.50		2.09	11.41
Number of lives saved (millions)‡			
0.15		0.21	1.14
0.50		0.70	3.80
Prevalence of adult (aged 15+) current smokers (millions)			
0.15	31%	30.8%	30.13%
0.50		30.5%	28.13%
Total number of current smokers (millions)			
0.15	308.0	307.37	304.6
0.50		305.91	296.6
Additional total tax revenues (billions RMB)			
0.15		22.58	129.4
0.50		19.63	101.8
Total annual cigarette tax revenue (in US\$)§			
0.15		3.01	17.25
0.50		2.62	13.57

\*Price elasticity.

†Smoking participation elasticity=40% of the total price elasticity; smoking intensity elasticity=60% of the total price elasticity.

‡Assuming one-third reduction in smokers.<sup>13</sup>

§US\$1=7.5 RMB for the 2007 exchange rate.

million RMB (US \$168 million) in medical costs when the price elasticity is  $-0.15$ , or 418 million RMB (US\$55.7 million) when the price elasticity is  $-0.50$ . If the specific excise tax is raised an additional 1 RMB per pack, the resultant 3.42 million fewer smokers would result in savings of 684 million RMB (US\$92.2 million) in medical costs when the price elasticity is  $-0.15$  and 2.28 billion RMB (US\$0.30 billion) if the price elasticity is  $-0.50$ .

The indirect cost of smoking in China can be estimated using the human capital approach, which is one method for evaluating the monetary value of life years lost, based on average forgone earnings of an individual as a loss of productivity to society.<sup>5</sup> The average per person loss of productivity due to premature death would be 2935 RMB measured at the 2000 present value. With 1.14 million lives saved with an increase of 1 RMB per pack in the excise tax, productivity would increase by 3.34 billion RMB (US\$0.45 billion) at a price elasticity of  $-0.15$ . When the price elasticity is increased to  $-0.50$ , the number of lives saved would be 3.80 million and 10.27 billion (US\$1.37 billion) would be generated for the Chinese economy.

In summary, these simulation estimates indicate that a cigarette tax increase in China would save lives, reduce medical care costs and increase productivity.

### Impact of cigarette tax increases on the cigarette industry and tobacco farming

The Chinese government's concerns that an increase in cigarette taxes will reduce cigarette consumption could have a minor

effect on the cigarette industry, given the population expansion in China even if per capita consumption decreases. The potential short-term impacts of a tax increase can be simulated. When an additional tax is levied on cigarettes, the immediate impact is a reduction in sales, which will lead to a reduction in revenue as well as employment in the cigarette industry. Under the recent tax adjustment scenario, as shown in table 4, the reduction of cigarette consumption could be between 0.54 billion and 1.82 billion packs, depending on a price elasticity of  $-0.15$  or  $-0.50$ . The industry sales revenue loss (based on 3.98 RMB per pack 2007 producer price as shown in table 3) would be between 2.08 billion RMB and 6.86 billion RMB. Its employment loss would be very minimal, between 279 and 936 persons. If an additional 1 RMB excise tax were imposed, the industry total sales revenue loss would be 11.94 billion RMB. Excluding the production costs and tax contribution to the government, the net loss to the industry would be 6.71 billion RMB in sales revenue, only 0.52% (6.71/129.4) of the total additional revenue the government would gain from the increased tax.<sup>6</sup> The average profit of the cigarette manufacturing industry is 10.3% of total revenue.<sup>6</sup> Thus, the loss of profit would be 691 million RMB. Compared to the gain in government revenue of 129.4 billion RMB, the net loss to the cigarette industry would be very small.

Under the assumption of a price elasticity of  $-0.50$ , with an increase of additional 1 RMB per pack in excise tax, the reduction in cigarette sales would be 9.90 billion packs. The average producer cigarette price was 3.98 RMB; thus, the total gross sales revenue loss would be 39.4 billion RMB, as shown in table 4. The net industry loss would be 22.15 billion, and the net profit loss would be 2.28 billion RMB.

If we consider employment as a linear function of production volume, then a 1.6% loss of sales in the cigarette industry under a price elasticity of  $-0.15$ , as shown in table 4, would result in a drop in employment rates by the same percentage, or about 1606 employees. Under a price elasticity of  $-0.50$ , with a 5.3% loss of sales, the employment loss would be 5382 employees. Compared to the loss of 59 000 employees due to company merging, the employment loss from an increase in taxes would be minimal.

An increase in tax and reduction in cigarette consumption may provide further impetus to improve the efficiency of cigarette production. The effect of the reduction in cigarette consumption could lead the cigarette manufacturing industry to diversify into other products. Furthermore, the amount of money that smokers save from reduced cigarette consumption could be spent on food or household goods. Therefore, the net effect on employment could be even smaller than estimated. Studies in the USA, UK and Indonesia<sup>22–24</sup> using their national input/output industry tables, showed that a cigarette tax increase led to a gain in income and employment in other sectors greater than the decline in the true tobacco sector.

Considering the loss of revenue for the cigarette industry and income for industry employees, the government could grant subsidies to the cigarette industry and their employees to retrain workers displaced by higher tobacco taxes and transfer them to other manufacturing industries as well as provide alternative production opportunities, the same steps taken by the Chinese tobacco industry during its restructuring.

One of the major concerns of the Chinese government with respect to raising the tobacco tax is its potential negative economic impact on tobacco farmers' livelihood. To estimate the possible economic impact of a tobacco tax increase on tobacco farming, one can first examine the demand and supply relationship between a reduction in the demand for cigarettes and the

**Table 4** The impact of cigarette tax increases on the cigarette industry and tobacco farming using different price elasticities

	Recent tax adjustment	Increase in specific excise tax of additional 1 RMB
Impact on cigarette industry		
Reduction in cigarette consumption (billion packs)		
0.15*	0.54	3.0
0.50*	1.82	9.90
Total sales revenue loss (billion RMB)†		
0.15	2.08	11.94
0.50	6.86	39.40
Industry net revenue loss (billion RMB)		
0.15	1.17	6.71
0.50	3.85	22.15
Industry employment loss (number of employees)		
0.15	279	1606
0.50	936	5382
Impact on tobacco farming		
Reduction in tobacco leaf (in tons)‡		
0.15	4397	25271
0.50	14734	84677
Reduction in land use (in hectares)¶		
0.15	2429	13960
0.50	8139	44778
Reduction in farmers' revenue (in millions RMB)**		
0.15	44	253
0.50	147	847
Reduction in local government tax (in millions RMB)††		
0.15	8.7	50
0.50	29.4	169

Notes:

- \*Price elasticity.
- †Total sales revenue loss is the producer price 3.98 RMB (6.64–2.66) RMB per pack multiplied by the reduction in consumption.
- ‡Figures obtained from table 2.
- §0.041 tons of tobacco leaf produce 1 case of cigarettes (50 000 cigarettes).<sup>6</sup>
- ¶Average productivity is 1.81 tons per hectare.
- \*\*Average government purchase price was 500 RMB per 50 kg, 10 000 RMB per ton (1 ton=1000 kg).
- ††20% special tobacco leaf tax.

magnitude of a cigarette price increase (ie, due to a tax increase). Given the predicted reduction in the demand for cigarettes, one can use a simple linear production relationship between the input requirement (tobacco leaf) and a produced pack of cigarettes. One can further simulate the monetary value lost from not producing tobacco leaf by multiplying the average government purchase price by the amount of tobacco leaf not sold in the market.

Chinese tobacco industry statistics indicate that 0.041 ton of tobacco leaf is required to produce 1 case (or 50 000 pieces) of cigarettes.<sup>25</sup> Thus, an additional 3.4% tax increase would lead to a reduction in the need for 4.397 tons of tobacco leaf. An additional 1 RMB tax increase would lead to a reduction in the need for 25 271 tons of tobacco leaf, as shown in table 4. Since the impact of the recent tax adjustment on tobacco farming is very small as shown in table 4, only simulation results for a 1 RMB tax increase will be discussed here. The productivity relationship between tobacco leaf and hectares is 1.81 tons per hectare.<sup>25</sup> Thus an additional 1 RMB tax increase would reduce land use for tobacco farming by about 13 960 hectares, about 2% of total land use. The reduction in tobacco leaf sales would reduce tobacco farmers' income. The government purchase price for the middle-grade tobacco leaf ranged from 755 RMB per 50 kg for tobacco leaf from Yunnan and Guizhou provinces to 500 RMB (or top 505 RMB) for leaf from Northern Chinese provinces.<sup>7</sup> A 500 RMB price was picked for the analysis so that this purchase price could also be used to simulate the tax impact at the national level. The

estimated revenue loss to farmers would be 253 million RMB from an additional 1 RMB per pack tax increase. Compared to the total national value of tobacco leaf sales, this revenue loss would be about 2.0% of total tobacco revenue. Considering the cost of producing tobacco leaf, the reduction in local government revenue would be 50 million RMB nationally. In 2007, the local government in China collected 4.646 billion RMB in local tax; the reduction of 50 million RMB represents a loss of 0.30% of total revenue. These losses could be replenished by the gain of 129.4 billion RMB in tax revenue by the central government.

In summary, an additional 1 RMB tax increase on cigarettes would not have a serious effect on either tobacco farmers' income or local government tax revenue. In fact, the alternative use of this tobacco land could be even more beneficial, based on farm household survey results on costs and returns on tobacco leaf production.<sup>26</sup> As shown in table 4, under the assumption of a price elasticity of  $-0.50$ , a similar simulation can be estimated for an additional 1 RMB specific excise tax increase per pack of cigarettes. Again, farmers would use the land to produce other profitable crops. The central government would generate an additional 101.8 billion RMB, six times the loss of local government revenue. These local government revenue losses could be easily compensated for by the financial gain of the central government.

Finally, one major concern raised by the Chinese government is the regressivity of a tobacco tax increase. Low-income smokers in China pay less per pack and smoke fewer cigarettes than high-income smokers. Furthermore, low-income smokers are more price responsive than high-income smokers. Therefore, the savings from tobacco expenditures for low-income smokers could be used for other household necessities, such as food, clothing and housing, potentially leading to an improvement in their general standard of living.

## RECOMMENDATIONS

The Chinese government claims that its cigarette tax rate is about 65% of the producer price, which is about 40% of the retail price. Even if the recent tax adjustment is passed along to the retail level, it is only 43.4% of the retail price. Thus, China has room to raise the tax on cigarettes. The empirical economic analysis and tax simulation results presented in this paper clearly support the policy position that increasing the tobacco tax in China is a most cost-effective instrument for tobacco control. We therefore suggest the following recommendations.

### Increase the cigarette tax

To achieve the goal of tobacco control, the Chinese government should first pass along its recent tobacco tax increase from the producer/wholesale price to the retail price and then significantly increase the specific excise tax on cigarettes, which is currently 0.06 RMB per pack by at least an additional 1 RMB per pack. Raising the specific excise tax would narrow the dispersion between low-end and higher-end brand prices and be an effective tax instrument for tobacco control. In addition, the government should simplify the current two-tier ad valorem tax into one single rate to prevent producers from arbitrarily adjusting the brand price to pay a lower tax rate. To maintain the effectiveness of tobacco control, the specific excise tax should be adjusted by the annual inflation rate. In the long run, China should consider increasing the overall tax rate beyond 60%, a figure common in many other countries.

### Remove the tobacco leaf tax

The Chinese government should consider removing the special tobacco leaf tax. Because this is a recently established (2006) tax

## What this paper adds

- ▶ This paper provides a concrete recommendation for tobacco tax policy.
- ▶ It also provides comprehensive estimates of the impact of a tobacco tax increase on the Chinese economy.

category, the Chinese government may be reluctant to remove the tax right away because of the immediate potential negative fiscal impact on some local economic development projects. However, the current pervasive incentive for local government to encourage farmers to plant tobacco leaf leads to surplus tobacco leaf, one of the major sources of counterfeit (tobacco) cigarettes. Instead, the central government could increase the cigarette tax and then transfer part of the additional cigarette tax revenue to local government to compensate for its losses resulting from the elimination of the special tobacco leaf tax. At the same time, this strategy would free tobacco farmers to plant any crop they desire. Some of the additional cigarette tax revenue could be used by the Chinese government to subsidise tobacco farmers wishing to substitute other crops for tobacco leaf. Chinese Ministry of Agricultural and international organisations such as Food and Agricultural Organisation (FAO) should provide technical assistance for tobacco farmers on crop substitution.

### Reform revenue sharing between the central and local government

The Chinese government should consider removing the tobacco tax revenue sharing between the central government and the local government and use the existing central government revenue transfer mechanism between the central government and local government to support local fiscal needs. In the future, the contributions of the cigarette industry to government revenue may become smaller, given the increasing importance of multinational tobacco companies in the Chinese tobacco market. The role of the Chinese central government should be to pursue a more aggressive tobacco control strategy, consistent with the World Health organization Framework Convention on Tobacco Control (WHO FCTC) provision to increase the tobacco tax, without worrying about tobacco control barriers at the provincial level.

### Earmark the additional tax revenue

The Chinese government should consider using the additional cigarette tax revenue for tobacco control activities, such as media antismoking campaigns, enforcement of non-smoking legislation and coverage of healthcare expenses for the low-income population. Many other countries, such as the USA, Thailand, Australia, the UK and others have earmarked part of their cigarette tax revenues for health insurance and health promotion programs. The combined price and non-price tobacco control campaigns will maximise China's efforts towards tobacco regulation.

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