China’s Olympian Challenge From The Environment: Motor Vehicles And The Role Of Taxation

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1 Introduction

China’s economic growth has brought unprecedented spending power to its rapidly growing middle class. Aspirational consumerism has led to a massive increase in the purchase and use of passenger motor vehicles, particularly in the more affluent cities and regions in the east of the country.

The Chinese Government has adopted a range of fiscal and other instruments to meet the environmental dangers that are emerging from the country’s growing industrialisation and affluence. These are achieving some success but, in the context of transportation, the explosion of China’s vehicle population with its attendant emissions calls for greater resolve and bigger steps from the Government.

Part 2 of this paper examines the environmental situation in China, and introduces the impact of motor vehicles. Part 3 focuses on the general role of motor vehicles in damaging the natural environment. Part 4 considers the taxes and other economic instruments currently imposed in China in respect to motor vehicles over six phases: producing (or importing), sales, purchasing, using, holding, and disposal. This will cover such aspects as VAT and import taxes, usage taxes, and tax incentives for alternative fuels. It will also look at some non-financial measures such as the imposition of emissions standards. Part 5 makes some suggestions for the way ahead with consideration of which other approaches could prove effective in China. Part 6 concludes with an assessment of the current tax treatment of transportation in China and the outlook for the future.

Transportation covers a wide gamut. The paper focuses on passenger vehicles.

2 China And The Environment

(a) General Environmental Performance

China has a difficult path to tread in balancing economic growth with effective responses to
the threat to its natural environment. While economic growth continues on its stellar path, environmental damage has been considerable, despite determined governmental attempts to curb it.

Although a relatively low polluter on a per capita basis, China is now the world’s second greatest emitter of greenhouse gases and home to 16 of the world’s 20 most polluted cities. In the 2008 Environmental Performance Index report, China was ranked 104 of the 149 countries measured. As well as having serious health consequences for individuals, the cost to the economy is estimated at about 5.8 per cent of Gross Domestic Product.

(c) Motor Vehicles in China

The Chinese Government has made significant progress in addressing industrial pollution such as coal combustion in its urban areas. Many coal-fired power plants and polluting factories have been relocated away from cities, and the domestic use of coal replaced with liquefied petroleum gas (LPG) and natural gas. For some time, air quality was improved or stabilised in many cities. However, the results of rapid urbanisation and the proliferation of motor vehicles have eroded those gains.

In 2006, there were 43 million private motor vehicles in China with an annual growth rate of 18 per cent. China is now the world’s third largest vehicle market and third largest vehicle producer. With China’s vehicle ownership rate of 3 vehicles per 100 people, compared to a world average of 12 vehicles per 100 people, there is considerable scope for further growth. There are predictions that the Chinese passenger car fleet will match that of the United States by the year 2030.

Urban air pollution is shifting from industrial air pollution to vehicle-based pollution. A Chinese State Environmental Protection Agency (SEPA) study of major Chinese cities revealed that while steps taken from 1998 to 2003 had effectively reduced emissions of mostly industrial-sourced air pollutants like sulphur dioxide (SO2) and Total Suspended Particulates (TSP), the more vehicle-sourced pollutants like PM10 (respirable particles 10 microns or less in diameter) and mono-nitrogen oxides (NOx) – nitric oxide (NO) and nitrogen dioxide (NO2) – were little changed or even slightly higher.

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>Number of cities under supervision</td>
</tr>
<tr>
<td>Percentage of cities where annual average air quality meets standards (%)</td>
</tr>
<tr>
<td>Annual average SO2 concentration (mg.m-3)</td>
</tr>
<tr>
<td>Annual average NOx concentration (mg.m-3)</td>
</tr>
<tr>
<td>Annual average TSP concentration (mg.m-3)</td>
</tr>
<tr>
<td>Annual average PM10 concentration (mg.m-3)</td>
</tr>
</tbody>
</table>

*Data are for nitrogen dioxide (NO2) rather than NOx as the standard was changed.

This increased impact of vehicle-based pollution reflects the experience of OECD countries through the latter part of the 20th century. In more recent years, with advances in vehicle emission standards and clean fuel, this trend has been reversed in developed countries such as the United States and Europe. For China, with its burgeoning motor vehicle population, this may be a slow process even with stricter controls than those currently in place.

(c) Motor Vehicles and Oil

Up until 1993, China was a net exporter of oil. Since then, it has become increasingly reliant on imports, which reached 120 million metric tonnes of crude oil in 2004, a significant part of which was to meet the demand generated by motor vehicles. This has ramifications both for energy security and development, as well as for the environment. China’s per capita petrol consumption at 44.6 litres in 2003, compared to those of the United States at 1635.2 and Europe at 275.6, is still low when measured against developed countries, but the sheer weight of numbers and potential for growth are grounds for concern. Estimates are that with fuel economy improvements, about 55 million tonnes of oil per year (with a proposed low-improvement scenario) to 85 million tonnes per year (with a high-improvement scenario) could be saved by 2030.

3. The Impact Of Motor Vehicles On The Environment

Any design of tax incentives and penalties to achieve desired environmental outcomes requires an understanding of the processes by which motor vehicles affect the environment and the means to counter that effect. Only then can tax instruments be best directed. The paper now briefly considers the processes and alternatives.

Motor vehicle emissions are influenced by a range of factors, particularly engine design, vehicle maintenance, operating conditions, and fuel characteristics. Motor vehicles contribute to pollutants such as CO₂, carbon monoxide (CO), nitrous oxide (N₂O), hydrocarbons (HC), methane (CH₄), ozone (O₃), and fine particulate matter (PM₁₀ and PM₂.₅). A 2005 study found that in typical Chinese cities, vehicles contributed 45–60 per cent of NOx emissions, 40–90 per cent of volatile organic compound (VOC) emissions, and about 80–90 per cent of CO emissions. The damage caused by vehicle emissions to health is exacerbated because they occur at ground level and nearer to people’s breathing zones than other pollutants such as smoke stacks. With their growing prosperity, Chinese people are increasingly concerned and vocal about the state of their air. According to SEPA, there were 51,000 pollution-related disturbances in 2005 and 60,000 in 2006.

Responses include improved roads and traffic management (to reduce idling times), better public transport, technological advances in engine design, alternative fuel vehicles, and alternative fuels. Naturally, these work best in combination. For example, low sulphur fuels, while important in their direct reduction of SO₂, from conventional engine emissions, are also critical for the effective operation of advanced technologies in emission controls such as three-way catalysts and catalytic emission control systems.

4. The Role Of The Chinese Government

While enjoying fewer restrictions on its activities than western governments, the Chinese Government does not have unfettered power. In the energy context, it is subject to influence from
External sources such as energy companies (albeit state-owned) like the China National Petroleum Corporation (CNPC) and China Petrochemical Corporation (Sinopec), and other vested interests more concerned with expanding supply than reducing demand. Its primary environmental protection agency, SEPA, has been described as a "toothless watchdog" due to its low position in the state hierarchy and lack of funds.

Nonetheless, there are a number of steps the government could take to address the situation. From financing research into alternative vehicles and fuels through grants and low-interest loans, to education programs, to encouraging the use of green vehicles and fuels through regulation and the tax system. Many of these steps are already being taken, some tentatively and others more forcefully.

### Current Chinese Steps Towards Green Transportation

(i) **Taxation instruments**

The Chinese government employs a wide range of taxes on the purchase and operation of motor vehicles. The most important of these and their various points of imposition are summarised in Table 2.

#### Table 2

<table>
<thead>
<tr>
<th>Stages</th>
<th>Types of Tax</th>
<th>Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producing (Importing)</td>
<td>VAT</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>Consumption Tax (vehicle)</td>
<td>3–20%</td>
</tr>
<tr>
<td></td>
<td>Vehicle Import Tax</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Fuel Import Tax</td>
<td>1%</td>
</tr>
<tr>
<td>Sales</td>
<td>VAT</td>
<td>17%</td>
</tr>
<tr>
<td>Purchasing</td>
<td>Vehicle Purchasing Tax</td>
<td>10%</td>
</tr>
<tr>
<td>Using</td>
<td>Vehicle Tyre Consumption Tax</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Tolls (bridge tolls included)</td>
<td>0.4–0.5 Yuan/km according to the types of vehicles and the miles</td>
</tr>
<tr>
<td></td>
<td>Consumption Tax (fuel)</td>
<td>Petrol 277 Yuan/tonne</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diesel 117.6 Yuan/tonne</td>
</tr>
<tr>
<td>Holding</td>
<td>Insurance Fee</td>
<td>Mandatory Third Person Insurance + Other insurances</td>
</tr>
<tr>
<td></td>
<td>Vehicle and Vessel Usage Tax</td>
<td>60–660 Yuan/vehicle year</td>
</tr>
<tr>
<td></td>
<td>Road Maintenance Fee</td>
<td>70–220 Yuan/month/tonne</td>
</tr>
<tr>
<td>Disposal</td>
<td>VAT</td>
<td>0</td>
</tr>
</tbody>
</table>

### Notes

1. Fuel import tax on diesel, gasoline, and kerosene was reduced from 2 per cent to 1 per cent effective 1 January 2008. Import tax on coal and fuel oil remains at 3 per cent.

2. China also imposes a resource tax on the extraction of certain raw materials. The rate on coal has been increased substantially in recent years and the rate on other products, including oil, is expected to rise in 2008.
The only significant express concession to greener vehicles is that a 30 per cent reduction on vehicle consumption tax is granted to manufacturers whose vehicles meet the Euro-based emission standards according to the Government’s timetable (see Table 5, below). The consumption tax rates do, however, favour smaller vehicles. In 2006, in an attempt to encourage buyers to choose cars with smaller engines, the rates on smaller cars were lowered while those on larger vehicles were raised significantly (refer to Table 3). Vehicle and vessel usage tax is also determined according to the size of the vehicle, but again there is no specific concession to greener vehicles.

**Table 3 — Consumption Tax Rates**

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Engine capacity</th>
<th>Tax Rate</th>
<th>Tax rate before the 2006 adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Vehicles (including the sports utility vehicles)</td>
<td>Less than 1.5 L</td>
<td>3%</td>
<td>1.0L - 3%, 1.0L to 1.5L - 5%</td>
</tr>
<tr>
<td></td>
<td>1.5L - 2L</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>2.0L - 2.5L</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>2.5L - 3L</td>
<td>12%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>3.0L - 4.0L</td>
<td>15%</td>
<td>8%</td>
</tr>
<tr>
<td>Medium-sized business passenger vehicles</td>
<td>Above 4.0L</td>
<td>20%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td>Below 2.0L - 3%, Over 2.0L - 5%</td>
</tr>
</tbody>
</table>

Beyond these concessions, there is little evidence here of encouragement for the manufacture or purchase of lower level emission vehicles. Other taxes, particularly those on the consumption of fuel and the vehicle purchasing tax, are regressive and do nothing to encourage green manufacturing or consumer choices. Moreover, the taxes are mainly directed at the producing and purchasing stages, leaving little incentive to reduce mileage during the holding period.

The 17 per cent VAT is also a disincentive for green vehicles. In the case of fixed costs such as plant, a manufacturer must pay the VAT but has no customer to recover it from. This additional tax burden discourages investment in the costly new plant and equipment necessary to produce low emission vehicles. It would also affect pricing and sales volumes.

These considerations do not mean the Chinese Government is unconcerned or unresponsive on the issue of vehicle emissions, but it does indicate that it prefers to use non-tax incentives and regulations in its approach to the matter.

**ii) Non-tax incentives and regulations**

Walsh (2007) points out that a comprehensive strategy to reduce vehicle emissions includes four critical components: strict emissions standards, specifications for clean fuels to ensure that...
emission standards can be met, programmes to ensure vehicles are properly maintained, and transportation planning and demand management to reduce vehicle usage. China is progressing well on some of these components and less well on others.

China has adopted vehicle emission standards established by the European Union ("Euro standards"). Although China’s implementation dates lag some years behind Europe’s, in many respects China imposes stricter standards than those applied in Australia and much of the United States.

In recognition of different local conditions within China, regulatory requirements vary between regions. Most notably, Beijing (with an eye to the 2008 Olympics) and other major cities such as Shanghai and Guangzhou with their combination of higher vehicle populations, greater affluence, and inhabitants’ demands for cleaner air, are generally subject to the most stringent standards. This is reflected in the adoption of Euro 1 – Euro 4 which required implementation by Beijing and Shanghai before the rest of the country (Table 5).

**Table 5 — Implementation in China of Euro Emission Standards: Light-Duty Vehicles**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Date</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro 1 (implemented in Europe in 1993)</td>
<td>2000.01 (2000.07†)</td>
<td>Nationwide</td>
</tr>
<tr>
<td></td>
<td>2002.08</td>
<td>Beijing</td>
</tr>
<tr>
<td></td>
<td>2003.03</td>
<td>Shanghai</td>
</tr>
<tr>
<td></td>
<td>petrol: 2004.07†</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2005.07†)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>diesel: 2003.09</td>
<td></td>
</tr>
<tr>
<td>Euro 2 (Europe in 1997)</td>
<td>2005.01</td>
<td>Beijing</td>
</tr>
<tr>
<td></td>
<td>2007.07</td>
<td>Nationwide</td>
</tr>
<tr>
<td>Euro 3 (Europe in 2000)</td>
<td>2008.01</td>
<td>Beijing</td>
</tr>
<tr>
<td></td>
<td>2010.07</td>
<td>Nationwide</td>
</tr>
</tbody>
</table>

† production conformity  
a - first registration

Other measures to limit vehicles include the auction process for plates, referred to in footnote 6.

While these regulations are commendable, there are significant weaknesses in the overall policy. As Walsh (2007) points out, China has not yet adopted European standards for low-sulphur fuels, thus compromising any possible benefits from its imposition of emissions standards. As already described, lower fuel sulphur levels play an important role in the effectiveness of the emissions control systems required by Euro standards. Moreover, the components of those systems can malfunction in the absence of sound inspection and maintenance programmes. China has instituted such programmes but their effectiveness is uncertain.
5. Proposals For Consideration

(ii) Taxation instruments

Part 3 of the paper showed that the tax system does go some way towards addressing the problem of vehicle emissions, but it could be used much more forcefully.

The most significant omission is that there is currently no fuel tax in place. Such a tax would naturally raise the price of fuel at the pump. The more fuel one used, the more tax one would have to pay. Fuel tax is thought to be a significant factor in the popularity of smaller, fuel-efficient vehicles in Europe, and if set at a sufficiently high rate, say 50 per cent. could be expected to have a similar effect in China. It would also encourage greater use of public transport. As is the case elsewhere in the world, such as Australia, clean fuels should be subject to a reduced/rebated or zero fuel tax.

China has been considering a fuel tax for some time but has held back, largely because of the regressive character of the tax and concerns about its impact on farming communities.24 Certainly. China is not the only country where polluting urban motorists are protected by policies designed to protect farmers. Australia, for example, allows a blanket reduction in import duty on four-wheel drive vehicles (SUVs), regardless of where they are garaged or for what purpose they are used. This concern for farmers could quite readily be overcome by reducing or exempting the fuel tax for them. While this would present opportunities for evasion, it would be better than no tax at all.

Recent announcements indicate that a fuel tax may be imminent, and would replace the current road maintenance fee, road tolls, bridge tolls, and transport management fee.25 A further user-pays approach would be to impose a tax based on actual distances driven, but this would be difficult to monitor and administer. As Sevigny (1998) has observed, odometer readings are particularly difficult to verify.26 Alternatively, the Vehicle Usage Tax could be based on vehicle emissions.27

A greater emphasis should be placed on taxes at the using stage, to discourage use and to encourage a consumer preference for fuel-efficient alternatives. There is a current imbalance among taxes at the producing, sales, and purchasing stages.

Similarly, tax benefits should be granted to manufacturers as an incentive to develop and produce green vehicles.28 These benefits could take the form of tax holidays, tax reductions for research and development, and lower rates on vehicle consumption tax and VAT. The policy of reducing vehicle consumption tax for vehicles that comply with the current Euro standards should be continued and expanded.

(iii) Non-tax proposals

To ensure a higher profile and respect for environmental initiatives, the powers and funding of SEPA need to be enhanced. This would also help achieve a more comprehensive and consistently administered approach to the issue.

The Government should lead by example through investing in advanced vehicle technologies both by increasing its involvement at the research level and in its fleet buying decisions. China’s refineries should be upgraded to produce better quality and low-sulphur fuels. The push to adopt Euro emissions standards should be pursued, but with more aggression. In-use vehicle emissions
should be managed through a more developed and better enforced inspection and maintenance programme, and urban transportation systems should be developed to encourage greater use of public transport.

Outside the tax system, financial rewards such as grants should be awarded to encourage better fuel efficiency and other advances in engine technology.

6. Conclusion

China may soon overtake the United States as the world’s greatest polluter. In that regard, China would respond to any criticism by pointing out that it has a much lower rate of emissions per capita. It could also point to the 300 million births that its strict one-child policy has avoided and that have been calculated as having averted 1.3 billion tonnes of carbon dioxide in 2005. In addition, China has made creditable progress in its attempts to address the growing emissions resulting from its rapidly expanding vehicle population. The incentives and regulations designed to achieve the desired outcomes have primarily come from outside the tax sphere, but there is an increasing recognition of the potential of the tax system to bring about valuable changes in manufacturing and purchasing decisions. It is to be hoped that in the near future, a fuel tax will be introduced, but this will require a careful consideration of the appropriate rate and proper exemptions, and no small amount of courage on the part of legislators.

Motor vehicles have brought about great improvements in the lives of Chinese people from all walks of life, just as they have in most countries, and any restrictions on their use or increases in cost are likely to be met with some hostility. As custodian of the world’s fastest growing car market, it is to be hoped that the Chinese Government has the desire and the resolve to face this hostility, and to play an increasingly effective role in the world-wide battle against vehicle emissions.

References


“Don’t Drink the Water and Don’t Breathe the Air”. Bangkok Post. 27 January. Source: The Economist.


Reduction”, Environmental Tax Series, working paper.


**Endnotes**

1. Bill Butcher is a Senior Lecturer with the School of Business Law and Taxation, University of New South Wales. Sydney, Australia.


3. <http://www.law.yale.edu/news/6104.htm>. The Index is produced by the Yale Center for Environmental Law and Policy and the Center for International Earth Science Information Network at Columbia University in collaboration with the World Economic Forum and the Joint Research Center of the European Commission. It measures across six policy categories: Environmental Health, Air Pollution, Water Resources, Biodiversity and Habitat, Productive Natural Resources, and Climate Change. China rated rather better on Climate Change with a score of 52.7 per cent, compared to Australia’s 42.5 per cent and the United States’ 56.1 per cent.
4. The 2007 World Bank study found that high levels of air pollution in China’s cities lead to 350,000-400,000 premature deaths. Another 300,000 die because of poor-quality air indoors.


7. In China. license plates for private use are limited and distributed periodically, usually once every two months. Car buyers must bid for plates at state-run auctions. The cost of the plate can be very high, which may discourage some potential buyers. and the limitation on supply plays a part in controlling vehicle numbers. The recent price of plates in Shanghai was around RMB30,000.


15. CO is indirectly responsible for increasing global warming because it raises the levels of methane and ozone.

16. Wang et al. (2005), supra n8.

17. “Don’t Drink the Water and Don’t Breathe the Air” (2008).

18. The alternative fuel industry has created winners and losers: some residents of northeast Thailand have done well from the ethanol industry (Walailak, 2008), while in Indonesia traders have suffered due to soaring soybean prices caused by a biofuel-driven switch in production from soybeans to maize (Fitzpatrick, 2008). See also, Gillies and Cleworth (2005).


20. These interests may have contributed to the decision to reduce fuel import tax on diesel, kerosene, and gasoline from 2 per cent to 1 per cent, effective 1 January 2008. Refer to <http://www.resourceinvestor.com/pebble.asp?relid=39050>.

21. “Don’t Drink the Water and Don’t Breathe the Air” (2008), supra n16.

22. There have been other, more narrowly based concessions. For example, in 2002 certain producers in Heilongjiang province were granted exemption from the 5 per cent consumption tax on ethanol production as part of a trial alternative fuels project.


27. See Lechner (2004).

28. The responsiveness of vehicle manufacturers to tax considerations was evidenced by Cadillac’s decision in 2006 to scale back its production plans in China when taxes were raised on locally assembled vehicles with a certain amount of imported parts. Webb (2006).