

# **From Import Substitution to WTO Accession: Government Intervention in the Chinese Automotive Market**

## **Interim Report Provided to Corporate and Foundation Sponsors**

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## Introduction

This document contains the Interim Report discussed in our Research Proposal *From Import Substitution to WTO Accession: Government Intervention in the Chinese Automotive Market*. Delivery of this report was promised to our sponsors one year following initiation of our research. Our first round of funding arrived in the late summer and fall of 2000. However, we are delivering this report early, in June, in order to elicit feedback from our corporate and organizational sponsors.

The major topics addressed in this report are as follows:

- **Section 1** provides a historical overview of the Chinese automobile industry, starting with its genesis under the Communist regime and proceeding through the present. This section draws heavily on the earlier work of one of the project's research team members, Professor Eric Harwit of the University of Hawaii, who is the author of the leading academic study of the Chinese industry in the 1980s and early 1990s.
- **Section 2** describes the results of the project's interviews of local managers and industry observers concerning the expected impact of the Chinese government's promised timetable of liberalizations of the auto industry. This section presents three scenarios for the evolution of the post-WTO Chinese automobile industry. It also draws heavily on an earlier paper by Professor Harwit.
- **Section 3** presents the project's statistical analysis to date, which has focused on modeling demand for imported automobiles in the People's Republic. The single largest change the Chinese government has committed to make with regard to the automobile industry after WTO accession is its promised reduction of barriers to imports. In conducting this analysis, the project is able to take advantage of extremely detailed trade data from the Chinese Customs Administration, which tracks trade by commodity category, year, and geographic location of the final import. This section will include a description of the project's modeling methodology as well as the quantitative data we have collected and used.
- **Section 4** presents a summary of the project's ongoing attempts to model the Chinese automobile industry more generally. It also provides a description of the research methodology and data we will use in the second phase of our project, the final conclusions of which will be disseminated in our final report. Finally,
- **Section 5** briefly addresses the environmental implications of our research to date. This section builds upon related research carried out by ITS-Davis researchers, headed by Professor Sperling, who have been working with the Pew Center on Global Climate Change to produce a study of GHG emissions from the transport sector of Shanghai, China.

A more complete presentation of our research progress to date will be made at the sponsor's meeting at Asilomar in September, 2001.

## 1. Historical Overview of the Chinese Automobile Industry, 1978-1999

The passenger car industry was a minor part of vehicle production during the first three decades of China's socialist economy.<sup>1</sup> As late as 1985, the country produced a total of only 5,200 cars.<sup>2</sup> During the pre-reform era, government officials were discouraged from using private vehicles. The dearth of tourism and lack of disposable income among Chinese citizens also meant there was a low demand for taxis and other passenger cars as means of local transportation.

With an opening to international tourism and foreign business in the early 1980s, and relaxation of rules on perquisites for government offices, the need for passenger cars rose quickly. As domestic production could not meet demand, import totals rose dramatically (see Table 1), despite a 260 percent import duty on foreign vehicles. The country spent some \$3

**Table 1. China's Vehicle Imports, 1981-1990**

Year	Cars	Trucks	Total
1981	1,401	20,770	41,575
1982	1,101	7,730	16,077
1983	5,806	8,445	25,156
1984	21,651	28,047	88,743
1985	105,775	111,492	353,992
1986	48,276	64,570	150,052
1987	30,536	17,554	67,182
1988	57,433	14,201	99,233
1989	45,000	12,587	85,554
1990	34,063	18,395	65,430

Source: *Zhongguo qiche gongye nianjian* (China Automotive Industry Yearbook) (Tianjin: CATARC press, 1999), p. 188.

Note: Total vehicle column does not add, as it includes busses, disassembled vehicle parts kits, off-road vehicles, and other categories of automobiles.

<sup>1</sup> For more information on the early development of China's vehicle industry, see Eric Harwit, *China's Automobile Industry: Policies, Problems, and Prospects* (Armonk, NY: M.E. Sharpe, 1994), Chapter 2.

<sup>2</sup> *1996 Automotive Industry of China* (Beijing: Beijing Institute of Technology Press, 1996), p. 12.

billion to import more than 350,000 vehicles (including 106,000 cars and 111,000 trucks) in 1985 alone.<sup>3</sup> Taxi companies in particular thirsted for Japanese cars, such as Toyota Crowns and Nissan Bluebirds.

China's answer to the import binge was to sign a series of joint-venture passenger car production agreements. In 1983, American Motors Corporation (AMC - later acquired by Chrysler Corporation) signed a 20-year contract to produce their Jeep-model vehicles in Beijing. The following year, Germany's Volkswagen signed a 25-year contract to make passenger cars in Shanghai, and France's Peugeot agreed to another passenger car project to make vehicles in Guangzhou.

Though joint venture agreements provided a window for foreign manufacturers to tap the China market, there were limits on their participation. Vehicle manufacturers could not own a majority stake in a manufacturing plant – Volkswagen's venture took the foreign limit of 50 percent foreign ownership. Manufacturers also had incentives and pressures to source parts from Chinese suppliers, with a 40 percent local-content rate bestowing reduced parts import duties to some 30 percent for the foreign partner.<sup>4</sup> The Chinese also kept control of distribution networks for the jointly-produced automobiles.

The various incentives, combined with maintenance of import tariff duties, helped achieve success for at least some of the new joint venture companies. Volkswagen's Shanghai plant was by the far the winner under the regime, as it produced cars that could function as taxis, vehicles for government officials, and transport for the newly emerging business elite. As car imports fell to some 34,000 in 1990, Shanghai-Volkswagen's (SVW's) production of its Santana

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<sup>3</sup> Harwit, *China's Automobile Industry*, p. 29.

<sup>4</sup> At 60 percent local content, the import duty fell to 24 percent, and 80 percent local content meant only a 16 percent import tax. From summer, 2000 interview in Shanghai.

models reached nearly 19,000 vehicles that year. By 1993, SVW's output had reached an economy of scale 100,000 vehicles.

Volkswagen's efforts were aided by some Shanghai municipal efforts. Various restrictions on engine size, as well as incentives to city taxi companies, helped ensure that a safe market in the company's relatively wealthy home arena. Volkswagen also encouraged its foreign parts suppliers to create joint ventures in China, and their resulting product helped SVW achieve an 85 percent local content rate by 1993.

VW's competitors did not fare as well. AMC's Beijing Jeep venture never found a mass market for its high-platform vehicles, and the company struggled to produce more than 15,000 – 20,000 vehicles into the 1990s. Peugeot's venture did even worse, as it found little heavy industry in southern China to support its venture. The quality of its product also alienated southern Chinese, many of whom benefited from large-scale car smuggling operations over the region's porous borders. Peugeot withdrew from its joint venture in 1997, though the facility soon reached a new agreement with Japan's Honda Motors to continue manufacturing small cars.

The market for both cars and trucks expanded in the mid-1990s, as Deng Xiaoping's invocations to speed expansion and spur private enterprise led to high-speed growth. As GDP rose at annual clips of 10 to 14 percent from 1992 to 1995, car production rose dramatically. Total passenger car production reached 325,000 in 1995, and totaled 508,000 in 1998.<sup>5</sup> As Table 2 shows, Shanghai Volkswagen's factory production topped 200,000 cars in 1996, and a new VW factory in Changchun, Jilin province made some 64,000 Jetta and Audi vehicles in 1998. A Tianjin manufacturer that licensed technology from Japan's Daihatsu corporation made some 100,000 "Charade" model cars in 1998.

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<sup>5</sup> *Zhongguo qiche gongye nianjian* (China Automotive Industry Yearbook) (Tianjin: CATARC press, 1999), p. 5.

**Table 2. Production at Major Passenger Car Assembly Plants, 1990-mid-2000**

Manufacturer	Vehicle Production										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	First half 2000
Shanghai Volkswagen	18,537	35,005	65,000	100,001	115,326	160,070	200,222	230,443	235,000	230,946	99,723
First Auto Works-VW (Changchun)	-	-	8,062	12,117	8,219	20,001	26,864	46,404	63,922	75,566 (Jettas only)	50,932 (including Jettas and Audis)
Beijing Jeep	7,500	12,700	20,001	13,809	14,703	25,127	26,051	19,377	8,344	9,294	3,659
Guangzhou Peugeot	3,415	9,094	15,666	16,075	4,805	6,936	2,522	1,557	2,246	N.A.	N.A.
Shenlong Citroën (Hubei)	-	-	-	-	-	1,314	9,158	30,035	36,240	40,200	23,839
Tianjin Daihatsu	2,920	11,261	30,150	47,850	58,500	65,000	88,000	95,155	100,021	111,500	45,700
Changan Isuzu (Chongqing)	-	245	5,565	10,463	10,020	13,180	13,383	28,861	35,555	51,170	26,703
Honda Guangzhou	-	-	-	-	-	-	-	-	344	N.A.	12,287
Shanghai General Motors	-	-	-	-	-	-	-	-	-	20,000	14,439

Source: *Zhongguo qiche gongye nianjian* (China Automotive Industry Yearbook) (Tianjin: CATARC press, 1999), p. 7, for 1990-1998; Asia Pulse, February 29, 2000, "Profile – China's Automotive Industry," for 1999 figures, and *Hong Kong Standard*, May 12, 2000 (for Shanghai General Motors, 1999 figure only); *Wen Wei Bao*, July 19, 2000 (for first half 2000 numbers).

Notes: Statistics from each source are compatible for comparative purposes. N.A. = Not Available

In early 1994, import duties fell from 150 percent to 110 percent for small cars, and from 220 percent to 180 percent for large cars.<sup>6</sup> Rates fell further in the next two years, averaging some 80 percent to 100 percent in 1996,<sup>7</sup> though there were no further cuts over the following four years. In January, 2001, duties fell to 70 to 80 percent.<sup>8</sup> Table 3 indicates that the country faced a second wave of imports in the middle of the decade.

<sup>6</sup> Harwit, *China's Automobile Industry*, p.171.

<sup>7</sup> Xu Zhonglun, "A Briefing of Chinese Auto Import and Export Trade," in *China Auto*, Vol. 8, no. 1 (1998), p. 20.

<sup>8</sup> *South China Morning Post*, January 4, 2001, Business section of website <http://china.scmp.com/business/ZZZRVLMPGC.html>.

**Table 3. China's Vehicle Imports, 1991-1998**

Year	Cars	Trucks	Buses	Total
1991	71,557	23,402	3,490	98,449
1992	158,294	46,685	5,227	210,206
1993	222,336	83,099	6,283	311,718
1994	184,421	74,656	19,956	279,033
1995	126,933	16,862	1,244	145,039
1996	63,857	10,611	1,395	75,863
1997	35,345	9,907	3,787	49,039
1998	27,455	8,002	4,761	40,216

Source: *Automotive Industry of China (Zhongguo Qiche Gongye)*, China Automotive Technology and Research Center Press, 1999, p. 15.

Note: Though the source of these numbers differs from that in Table 1, the totals are compatible with the numbers from the previous decade. From 1991, the import numbers were categorized to include imports of buses, and car-kit imports and other categories of imports are subsumed into the most appropriate of the three vehicle categories.

As Tables 2 and 3 show, domestic production slowed and imports plummeted in the late 1990s. The major causes of these trends were a decelerating economy (GDP growth rates fell below 9 percent after 1996) and new limits on vehicle purchases by government offices and state-owned enterprises. For imports, China continued to have quotas on the number of cars that could cross its borders, with import licenses needed to legally purchase a foreign-made vehicle. The country's 1994 industrial policy statement on the vehicle sector suggested that by the year 2000, domestic production should meet 90 percent of demand<sup>9</sup>, so falling import numbers helped conform to the state's long-term plans.

Other factors, including regional protection measures such as those noted earlier from the Shanghai municipal government for Shanghai Volkswagen, also limited the market for imported cars. Foreign auto companies were also prohibited from acting as vehicle importers, distributors, and retailers, and could not directly provide financing for vehicle purchase or offer after sales service. Higher domestic vehicle quality, in particular from Shanghai Volkswagen and VW's

Jetta facilities in northeast China, as well as from new French entrant Citroën, and, later, America's General Motors in Shanghai and Honda in Guangzhou, also made imported vehicles less attractive for current or prospective future purchase.

A further factor in reducing official import numbers was a flow of “gray market” vehicles. Cars crossed borders with such countries as Russia and even North Korea – many of these vehicles were given import licenses under bilateral agreements. Cars that came in through Northeast Asia were most often made in South Korea.<sup>10</sup>

## **2. The Impact of WTO Accession on the Chinese Automobile Industry**

China's quest for WTO (formerly the General Agreement on Tariffs and Trade) membership began in 1986, and talks proceeded slowly. Some Chinese leaders agreed with arguments of those who resisted WTO membership. Opening to foreign competition could result in unemployment for Chinese workers from factories unable to compete with imported goods. For the auto industry, some of the conservative concerns were quite relevant. One area of particular worry was a proliferation of small, economically inefficient vehicle producers in nearly every province of the PRC. The number of manufacturers rose from about 20 in the 1960s to about 125 in the early 1990s.<sup>11</sup> Nearly all of these companies, which made products ranging from minivans to postal vehicles to garbage trucks, had limited annual runs of a few thousand or even a few hundred units. Should the country open to foreign competition, officials feared, these vehicle manufacturers would face tremendous pressure to close their doors. During the late

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<sup>9</sup> Xu Zhonglun, “A Briefing ...”, p. 19.

<sup>10</sup> From summer, 2000, interview with automotive official in Beijing. This official lacked precise numbers on how many “gray market” vehicles flowed across China's borders, but asserted they numbers in the “tens of thousands.”

<sup>11</sup> Harwit, *China's Automobile Industry*, p. 24.

1990s, moreover, only three or four of the factories actually were shut, as local pressures to maintain employment levels worked against market forces.<sup>12</sup>

Other potential problems existed even for the established factories. The level of domestic vehicle quality was hampered by the drive for quick localization and utilization of Chinese parts. In mid-1998, a Chinese official in a national automotive research institute estimated China needed at least nine years for the auto industry to be competitive under WTO rules.<sup>13</sup> As the actual 1999 agreement to allow China into the WTO was being negotiated, Changchun's First Auto Works (FAW) was among the most vocal of the large companies to express its worries. FAW has joint ventures with both Volkswagen and General Motors, but still fears competition from imports. "We need another two or three years" according to one FAW official, who spoke in early November, before the new deal was announced. He continued, "It's not just our company: the restructuring of the whole auto industry needs it."<sup>14</sup>

Domestic proponents of free trade found liberal economic virtue in a WTO agreement. One Chinese auto official suggested that WTO membership would provide the market forces needed to close the most inefficient of the small and medium-size producers.<sup>15</sup> Price competition would force the established joint ventures to become more competitive with imports, and prices to Chinese consumers might fall. Other benefits could come with the introduction of more fuel efficient and cleaner running imported vehicles, with the resultant energy and environmental benefits.

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<sup>12</sup> One foreign automotive official estimated that only 25 to 30 of the 125 or so companies were viable, and that the rest would eventually fail. From summer, 2000, interview in Shanghai.

<sup>13</sup> From summer, 1998 interview in Beijing.

<sup>14</sup> "China: WTO or Bust?" in *Businessweek Online*, November 22, 1999.

<sup>15</sup> From summer, 1998 interview in Beijing.

### ***Implications of the 1999 WTO Agreement***

As Tables 4 and 5 point out, the latest pact includes provisions for transforming many of the protectionist features of the auto industry over the next six years. Taken as a whole, they stand to present a potentially significant challenge to the domestic manufacturers in a relatively short time.

**Table 4. Key Issues for the Auto Industry Under the WTO Agreement**

Issue	Current Status	Agreement Proposals
Import Tariffs	80-100% on passenger cars; as low as 9% on some other vehicles	Reduced to 25% for passenger cars by July, 2006 (see Table 5). Overall average cut to 10 percent by 2006.
Import Licensing Requirements	Quotas vary by year on number and value of imported vehicles; 27,000 vehicle import licenses issued in 1999	Raised limit to \$6 billion worth of imports on accession, 15 percent annual growth until elimination in 2005
Local Content Requirements	Various incentives to speed use of domestic parts suppliers	Elimination of local content requirements on accession*
Import Arrangement Rights	Foreign enterprise cannot directly import vehicles	Import rights granted within 3 years of accession
Distribution, Retail, After Sales Service	Car manufacturers must use Chinese distributors to sell their vehicles, and domestic firms to service them	Distribution, sales and service rights for foreign firms phased in over three years
Finance	Chinese consumers have difficulty financing a vehicle purchase using domestic bank loans	Non-bank foreign firms can provide unrestricted auto financing on accession

Sources: Interviews in Beijing in 1999 and 2000; Tim Stratford, general counsel and vice chairman, General Motors (China) Investment Co.; presentation at American Chamber of Commerce, Beijing, June 19, 2000.

\*Note: An official at Shanghai Volkswagen, in Shanghai, maintained that elimination of local content requirements had not yet been officially decided, and one Chinese auto official agreed with this assessment.

**Table 5. Proposed WTO Changes for Auto Import Tariffs**

Category	Accession	1/2001	1/2002	1/2003	1/2004	1/2005	1/2006	7/2006
100% tariff cars	77.5%	61.7%	50.7%	43.0%	37.6%	30.0%	28.0%	25.0%
80% tariff cars	63.5%	51.9%	43.8%	38.2%	34.2%	30.0%	28.0%	25.0%
Trucks						15-30%		
Buses						25.0%		

Source: Tim Stratford, general counsel and vice chairman, General Motors (China) Investment Co.; presentation at American Chamber of Commerce, Beijing, June 19, 2000.

The greatest challenge to the industry may come with tariff reductions. By 2006, according to the original schedule, import duties will be cut to a maximum of 25 percent for passenger cars, and, including trucks, buses, and other vehicles, should average about 10 percent by the conclusion of the trade pact's provisions. The phasing out of import license requirements and easing of restrictions on import and distribution practices will also widen the door for foreign vehicle makers.

A Chinese auto policy official familiar with trade negotiations says import numbers will definitely rise as the tariff rates fall.<sup>16</sup> "If the import tax falls, people will want dependable cars," said the official. However, she believed that domestic makers should still be strongly price-competitive players even in a post-WTO auto regime. For example, she asserts that domestic parts sourcing and low labor costs should keep prices low for producers such as Shanghai Volkswagen and new entrant Shanghai General Motors.

In the short term, other provisions of the trade pact will have mixed results, according to the Chinese official. Loan financing may have little impact in the coming few years, as China's credit rating system remains very undeveloped. Prospective purchasers often lack collateral

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<sup>16</sup> From summer, 2000 interview in Beijing.

needed to secure a large loan, and, even under WTO provisions, lenders are not allowed to register to put a lien on the vehicle if payment is not received.

Several joint venture company leaders expressed guarded optimism that their companies would do well under the new WTO rules.<sup>17</sup> Officials from General Motors, for example, maintained that their new plant in Shanghai, built at a cost of \$1.55 billion, would produce vehicles that would be competitive against imports along the quality dimension. The company would benefit, moreover, from new rules on distribution, ones that would allow it greater flexibility to sell its Buick Regal sedans throughout the nation.

As for price, the company representatives maintained the car would be competitive with an imported car of the same make, given the additional costs of transportation and the remaining tariff. For example, with a price of \$25,000 for a Buick vehicle made in the US, added costs of transport (10 percent), reduced custom duty (25 percent after all the WTO cuts), value-added tax (17 percent) and consumption tax (8 percent) would bring the price of an imported car to \$40,000, or about Renminbi 330,000. The cost of a Buick sold in Shanghai, as of mid-2000, was approximately Renminbi 369,000<sup>18</sup> (about \$45,000), so the company would only need to cut costs by some 11 percent to be competitive once tariff rates fall to 25 percent in 2006. To buttress its domestically produced product line, GM has added production of a minivan and announced in 2001 its plans to produce a compact car in Shanghai based on a model sold by its European subsidiary, Opel.

Officials at Volkswagen in Shanghai shared GM's optimism, and predicted that the government's industrial policy goal of 90 percent domestic market share (limiting imports to 10

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<sup>17</sup> The authors conducted interviews with the following companies in Beijing and Shanghai in the summer of 2000: Asimco, Beijing Jeep, Koito Manufacturing, Lear Corporation, Shanghai Volkswagen, Shanghai General Motors, and Toyota. The following discussion, unless otherwise noted, is based on these interviews.

<sup>18</sup> This figure does not include high vehicle registration fees, which varied by region. In Shanghai in mid-2000, the fee was about Renminbi 80,000 (some \$9700). From summer, 2000, interview in Shanghai.

percent of consumption) would stay in place. SVW itself was modernizing its production line, and introduced its Passat model vehicle to its assembly lines in March, 2000. For this vehicle, SVW officials maintained the technical standard was the same as that used in Europe, and processes such as laser welding had been introduced at the Shanghai facility. “With good quality, we will have no disadvantages against imports,” according to one manager. In 2001, the company announced plans to produce their Polo model car in Shanghai.

Still, SVW officials admitted their prices had to come down over the next years to be cost competitive. The current price of the Santana model car is Renminbi 183,000 (about \$22,000) but VW’s goal was to cut the price by 25 to 30 percent over the next 5 to 6 years. In particular, supplier factories would have to cut their prices and raise their quality. To ensure these developments, VW offered training programs to members of their 250-company Chinese supplier network.

Other car companies, such as Beijing Jeep, face a less certain future after WTO accession. As Table 2 indicates, production has stagnated in the late 1990s, as the company’s products failed to meet market needs, and quality problems dogged production and sales. Internal problems, such as inability to control social benefits and reduce excess employment rolls, hurt the company’s profitability. The company’s joint venture partner, Beijing Automotive Industrial Corporation, has made reform more difficult, and the Chinese partner’s role as a parts supplier further complicates modernization efforts.

In late September, 2000, BJC’s current US partner, Daimler-Chrysler, announced it would invest an additional \$50 million into the venture, with the Chinese partner adding some \$68 million.<sup>19</sup> With the company’s 20-year joint venture contract due to expire in 2003, there was a theoretical chance for the venture to reinvent itself to produce a different type of vehicle,

or to perhaps modernize its facility to make a higher quality product with greater efficiency. Without major revision, this automotive project would probably face even greater challenges under the new WTO regime.

Two new Japanese entrants to China's domestic production field, Honda and Toyota, stood to change the face of the auto production landscape in the first decade of the new century. As noted above, Honda began producing cars in the Peugeot's former Guangzhou facility in 1998, and made some 12,000 vehicles in the first half of 2000. As with GM and VW efforts, the newer model car and more efficient production facilities gave Honda some instant market appeal. Toyota announced plans to build cars in Tianjin (along side its Japanese partner firm, Daihatsu) in May, 2000. Its goal was to make 30,000 cars in 2002, and later reach annual production of 120,000. The facility would make small cars, similar to their Echo and Yaris models.<sup>20</sup> Toyota's production plan places it along side Volkswagen, Citroën, Isuzu, Honda, Ford, and, now, GM as companies targeting China's compact market segment (Daihatsu may curb its production of Charades with the arrival of Toyota). This target of the vehicle sector is probably the one with greatest growth potential.<sup>21</sup>

In 1998, Toyota exported some 25,000 vehicles (both cars and trucks) to China, making it one of the leading foreign companies selling to the PRC.<sup>22</sup> Following China's entry to the WTO, then, Toyota was one of the few companies that faced a dilemma: should it push to increase

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<sup>19</sup> Calum MacLeod, "DaimlerChrysler to jump-start Beijing Jeep," from China Online (Chinaonline.com), September 27, 2000.

<sup>20</sup> *International Herald Tribune*, May 31, 2000.

<sup>21</sup> For the very low end of the market, vehicles in the \$3000 price range and lower, so-called "agricultural vehicles" seemed to be rapidly acquiring significant market share. These truck-like vehicles had engines too small to be classified as trucks, but many were of a size similar to small pick-up vehicles. For some citizens, they could even substitute for small cars, and there were some 3 million vehicles produced in 1999. (From summer, 2000 interview with Asimco in Beijing). With high rates of pollution and low quality of performance, however, the Chinese government in mid-2000 considered measures to curb their production, and they were generally not allowed to run on the street of major Chinese urban areas. A more comprehensive discussion of this market sector goes beyond the scope of this essay.

<sup>22</sup> This and following information are derived from a June, 2000 transcript of an e-mail interview with Professor Lee Branstetter, University of California at Davis, economics department.

domestic production, or try to use the new trade rules to increase exports? According to a Toyota official, in 2003, the company could expect to produce some 30,000 cars in China, and perhaps also export 30,000 vehicles the same year. The official could not predict how a future mix would be constituted, though, noting that this would depend on market conditions as the Chinese economy grew. However, Toyota did plan to set up a consumer finance plan for potential purchasers to stimulate demand.

In short, Toyota seemed to be hedging its bets: if it could make cars at a competitive price in Japan, and WTO rules actually lowered import barriers, it would continue to seek a market for exports. It was also willing, however, to test domestic production facilities and see how well it could compete with cars made within China's borders. As a late entrant to domestic production, Toyota stood to benefit from other WTO concessions. Though it was not clear as of this writing how local content rules for parts suppliers would change under the new agreement, companies would presumably not face strong pressure to use Chinese parts for their vehicles. In essence, the companies could source from their home factories, or even from facilities in Southeast Asia or Latin America.

All of the vehicle ventures interviewed in summer, 2000, however, maintained they would continue to build parts supply networks in China. Toyota noted the advantage of low cost was a main factor, but that they would have to pay careful attention to quality. Even after WTO entry, according to one company, foreign parts would still carry an import duty of some 10 percent in 2006, though this was significantly below the highest rate of 50 percent in 2000 and a new top rate of 40 percent announced in January, 2001.<sup>23</sup> Shipping costs and other duties would add to the price. Shanghai GM officials noted that they had no plans to "de-localize."

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<sup>23</sup> *South China Morning Post*, January 4, 2001, Business section of website <http://china.scmp.com/business/ZZZRVLMPGC.html>.

All of the proceeding discussion assumes the Chinese government will take steps to implement the promised liberalization of its automobile market. However, actual liberalization may fall well short of what the WTO accession agreement seems to promise. Our interviews strongly suggested that various trade barriers outside of WTO rules could remain. A Chinese auto official interviewed in summer, 2000, for example, was quick to point out that countries such as Japan and South Korea, both WTO members, were quite skilled at protecting their vehicle markets. Though she did not make the assertion explicit, the implication is that the Chinese government could use non-tariff barriers to prevent a surge of foreign-made cars and trucks across the country's borders.<sup>24</sup>

In fact, it was not only the Chinese side that expressed the possibility of continued trade barriers after WTO entry. Officials at General Motors, Volkswagen, and Beijing Jeep all strongly agreed that various forms of protectionism would probably develop in the wake of WTO entry. Naturally, this would provide an additional advantage to domestic producers. Protectionism is likely to persist not only at the national level but also at the regional level. We have already noted the various ways the city of Shanghai tried, and largely succeeded, to have its citizens purchase mainly SVW (and now General Motors) products. A glance at the city streets, choked with almost nothing besides Santanas and occasional Buicks, indicates the strong municipal will to encourage local purchasing. Another example comes from Hubei, where the city of Wuhan, in late 1999, gave special tax relief to purchasers of the provincially-made Citroën-Fukang cars. Moreover, those who bought non-Fukang cars, in some parts of the city, had to pay a special fee of up to Renminbi 70,000 (about \$8400).<sup>25</sup>

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<sup>24</sup> These ideas were also reflected in parts of the earlier cited essay by Hu Yazhuang.

<sup>25</sup> *China Daily*, December 13, 1999.

### ***Recent Developments***

The primary move on the regulatory front in recent months has been the formal deregulation of prices in the passenger automobile market. On May 21, the State Planning Commission (SPC) announced the elimination of price regulation for domestic cars. Since 1995, the SPC has set base prices for domestic cars, but allowed enterprises to adjust these prices by 10% in either direction. Some Chinese industry observers allege that this policy has created a “price floor” for domestic producers, maintaining high prices even in the face of domestic overcapacity.<sup>26</sup>

Within weeks of the price deregulation announcement, prices of some key domestically manufactured models were cut 7-15%.<sup>27</sup> The industry conventional wisdom suggests that further price cuts will take place only gradually. A “price war” that speeds up the consolidation of the automobile industry is not seen as a likely outcome in the near future, though some market-oriented Chinese industry observers are calling for precisely that kind of aggressive, market-driven consolidation.

Internationally, another important recent development has been a delay in China’s expected formal accession to the WTO. As of early summer 2001, diplomatic sources suggested that China’s formal entry might not come until the end of the year or even 2002. Part of the delay has come from foot-dragging by other WTO member states, such as Mexico, who believe their own ability to export manufactured goods to the United States could be undercut by a reallocation of production to China. Tensions between China and the United States have not helped matters, and rumors suggest that many Chinese government officials, fearful of the

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<sup>26</sup> See “It’s Time for a Car Price War,” posted at <http://www.chinacars.com/info/html/home/200105/21655.htm>.

<sup>27</sup> See “Ten Predictions for Car Price Cuts: By How Much Could Prices Be Cut?” posted at <http://auto.sina.com.cn/news/10239.shtml>.

effects of liberalization, are quite content to delay accession. For these reasons, the full tariff reductions and liberalizations outlined in Tables 4 and 5 may be delayed by 1-2 years.

A final important recent development on the domestic front has been a spate of announcements from the newly established and incumbent joint venture firms concerning the introduction of new products into the Chinese market. Ford Motor Company, having finally secured the right to manufacture cars in Chongqing, announced in April that it would plan to manufacture a version of its popular small car, the “Focus” in China. This was followed shortly thereafter by official announcements from Shanghai Volkswagen and Shanghai GM regarding their own small car product introductions. Volkswagen will begin making the Polo in Shanghai, while GM plans to manufacture a small Opel model under the brand name “Sail.” As has already been discussed, Toyota will also begin making small cars in Tianjin, and other manufacturers, including FAW-VW, Dongfeng Citroen, are all beefing up their product portfolios.<sup>28</sup>

### *Scenarios for the Future*

We can postulate a few possible scenarios for the auto industry in China under WTO membership:

- Scenario 1: Negative Impact: China’s domestic industry (including joint ventures) is swamped by imports, and becomes a minor player even in the domestic auto market
  
- Scenario 2: Positive Impact: China’s domestic industry rises to the challenge of WTO membership, and eventually becomes an important world center of automobile production.

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<sup>28</sup> Information in this paragraph was obtained from a list of new product introductions given at <http://www.chinacars.com/info/html/home/>

- Scenario 3: Middle ground: The auto industry muddles along with characteristics similar to the status quo, with some substantial improvement in the efficiency of the domestic industry, but not enough to make China an important automobile exporter.

Scenario 1 is possible if foreign companies with relatively little production presence in China, such as Daimler Chrysler, Hyundai, and others become very aggressive about exporting passenger cars and other vehicles to the PRC. The attractiveness of world-standard cars selling at competitive prices could prove to be overwhelmingly attractive to Chinese citizens accustomed to the often-dated technology offered by the joint venture and domestic vehicle manufacturers. Even major producers such as Toyota (with its plan to produce cars in Tianjin) and Honda (with a relatively small plant in Guangzhou) may forego major domestic production to ship cars from Japan.

In fact, early signs from consumer reaction to the WTO announcement in late November, 1999, indicated the eagerness for foreign cars. Domestic vehicle sales temporarily fell, as some potential customers were apparently delaying a purchase in anticipation of buying an imported car in the years ahead. Tables 1 and 3 suggest that, given a strong economy and the favorable circumstances that existed in the early 1990s, imports could find a warm welcome in the Chinese market. With imports crowding out the domestic products, economies of scale could be lost, and China's own vehicle industry could see many or most of the major producers disappear.

However, as we have already noted, not a *single* expatriate manager in the Chinese automobile industry believes Scenario 1 will happen. First, every interviewed source believes that the Chinese government will continue to constrain imports and favor domestic production even as markets liberalize and formal tariff barriers come down. They see no reason why the

Chinese government would not be able to find a means to limit imports that is either consistent with WTO rules or outside the purview of those rules. In Section 4, we argue that this perception of managers on the ground is almost certainly right. Second, most expatriate managers pointed out that they have been successful at upgrading the technical quality of the product they are manufacturing in their China plants. Many expressed considerable confidence that they would be able to close the “quality” gap with imported models. While they did not all necessarily believe that they could match both the price and the quality of imports, they felt that the combination of post-WTO tariffs (25%) and, perhaps, additional informal import restrictions would provide them with enough of a price cushion to be competitive. Based primarily on strong feedback from managers on the ground, we give scenario 1 only a 20% probability.

Scenario 2 could come about if companies such as GM continue to assure product quality and update their vehicles to world standards. In December, 1999, GM announced it was adding a minivan to its product mix. In Spring 2001, it announced the introduction of a compact car based on a popular Opel model. Should companies like Honda, Toyota, Volkswagen, and some of the other major producers expand plans for the low-wage domestic vehicle production, the foreign challenge could fail to materialize. Gradually, China could absorb more advanced technology, and emerge as a legitimate world-class producer, as South Korea did in the 1980s and 1990s with its Hyundai and Kia brand vehicles. A sense of nationalism might also convince Chinese consumers to support the domestic producers.

This scenario is clearly the desire of the government agencies that have long branded the automobile industry a “pillar” industry in Chinese industrial development. However, the same expatriate managers that expressed skepticism about scenario 1 also expressed skepticism about scenario 2. In one sense, WTO is already having a positive effect on the domestic industry. Domestic joint venture firms are lowering prices, upgrading product quality, and rationalizing

their supply chains in order to be more competitive with imports. With the specter of import liberalization at hand, they have been able to ask for and receive a “freer hand” from the government in terms of running their firms in accord with economic objectives rather than political ones.

However, it is one thing to manage to defend ones position in a semi-protected home market and another thing entirely to be a competitive exporter of finished automobiles to the rest of the region. Despite the enthusiasm for the potential of the Chinese market signaled by some of our interviewees, there was very little belief that China would become an important exporter in the region or worldwide. Given the size of China’s potential internal market, there was little reason to focus on exports. It is also worth noting that, unlike South Korea, most of China’s most successful “domestic” firms market cars under the brand name of the foreign partner. Given the strong skepticism voiced by managers on the ground regarding the ability of China to become an important automobile export center in the near-to-medium term future, we give Scenario 2 only a 30% likelihood of taking place.

Finally, Scenario 3 could come about if the WTO rules fail to have much real impact. For example, even if import tariffs fall, China, as noted above, might try to use national and local non-tariff barriers to continue subtle protection of the domestic industry. Domestic distribution of vehicles is particularly susceptible to manipulation by local and national officials. And disguised subsidies to other, smaller domestic producers could keep workers from facing the unemployment lines in several coastal and inland provinces. Both established domestic firms, as well as old and new joint venture producers, would probably have some sympathy to this course of action. In fact, as we note in section 4, the Chinese government has shaped the evolution of the domestic industry in such a way as to maximize this “sympathy.”

The threat of limited import competition is already forcing domestic manufacturers to upgrade quality, lower price, and increase productive efficiency. This will have a beneficial impact on consumers relative to the status quo. However, it is our view that the role of imports will be limited in the post-WTO automobile market, domestic production will still be favored and protected, and the price and quality of domestically produced cars will move toward but not necessarily match world standards. We give this scenario a 50% probability.

### **3. Statistical Analysis of Import Demand in China**

As section 2 demonstrates, the impact of WTO accession on the Chinese automobile industry will depend in a critical way on post-WTO developments in automobile imports. To date, the primary focus of quantitative statistical analysis in this project has been on modeling import demand. This analysis has been complicated by a number of data difficulties. The Chinese government publishes an annual industry yearbook, the *Zhongguo Qiche Gongye Nianjian*, which presents data on auto production by product class and province.<sup>29</sup> It presents national production levels for the auto industry at the production model level. It also contains technical specifications on new vehicles introduced in that year. However, this yearbook fails to provide disaggregated data on automobile prices. As the Chinese automobile industry has become steadily more market driven, private firms have begun to compile and publish price data. Unfortunately, this privately supplied data tends to only be available for recent years. We are currently working to collect as much of these data as possible from private sources.<sup>30</sup>

Another significant omission is a lack of disaggregated data on automobile consumption as opposed to sales. While we can track automobile production, we do not observe where automobiles are purchased. At the national level, the discrepancy between production and

consumption is inconsequential, since nearly all vehicles produced in China are consumed in that country. However, at the provincial level, there may not be a close correspondence between production and consumption. Shanghai Volkswagen, with a nearly 50% national market share, clearly exports a substantial fraction of its production to other provinces. For a variety of reasons, it would be useful to have data on automobile sales by production model, province, and year. These data do not seem to exist in the public domain. The official sources track a more aggregated measure of automobile consumption that includes buses as well as passenger cars.

Related data do exist for earlier years – data on auto registrations at the provincial level. We were able to purchase these data for the years 1988, 1990, and 1992. These data provide quite detailed data on registration by production model. While registration data is a stock measure, rather than a flow measure of automobile consumption, flows could, in principle, be inferred by examining changes in stocks from year to year. Unfortunately, aggregation and open publication of these data ceased in 1993.

Relative to data on domestic production, our data on Chinese imports of automobiles are comparatively rich. This is due to the possession by the authors of comprehensive records of Chinese imports and exports taken from the Chinese General Customs Administration.<sup>31</sup> These data record imports and exports at the five-digit SITC level. For each category of goods, we observe the source country and the destination province – that is, we can track the flow of goods from outside China into a specific regional market. We also observe both the economic value of imports and the number of physical units, allowing us to construct a proxy for average price – the “unit value” of imports of a given class of automobiles. These annual data are recorded on a consistent basis from 1988 through 1998, providing us with 10 years of usable data. One major

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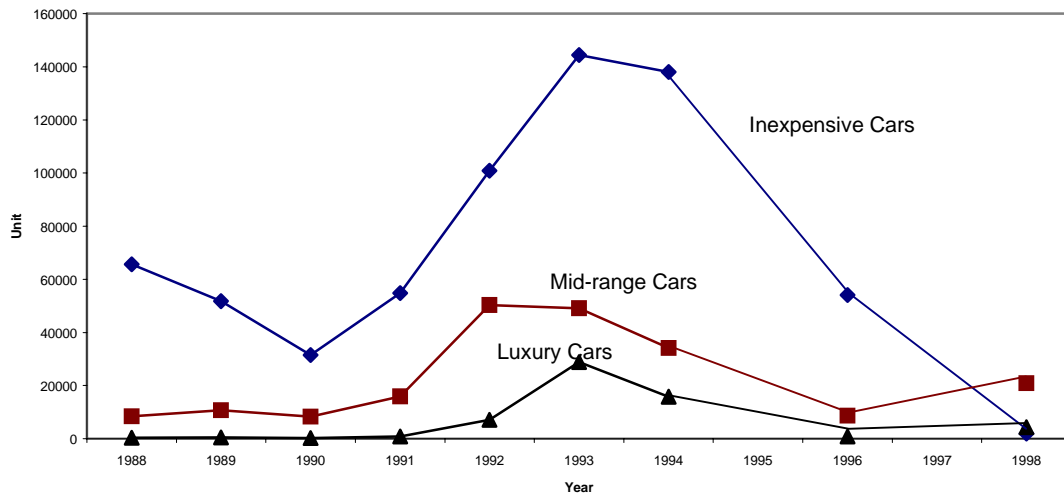
<sup>29</sup> This was the source of the data used in Table 1.

<sup>30</sup> We wish to thank Mr. Wayne Xing of China Business Update for his help in this.

caveat to the quality of our import data is that, of course, we only record legal imports. As was stressed in section 1, there is a substantial flow of imported “gray market” vehicles into China that does not enter the official trade statistics. In provinces where smuggling is rampant, illegal imports may displace demand for legal imports.

For purposes of initial data exploration, we divide automobile imports into three classes, based on unit values – inexpensive cars, midrange cars, and luxury cars. The total physical units of imports of these three classes are given in the figure below.

Figure 1 Car Imports of China, 1988-1998



Based on these raw data, we construct an index of quantity of automobile imports by province (destination market), value class, and year, denoted  $Q_{ijt}$ , where  $i$  denotes province,  $j$  denotes class, and  $t$  denotes year. This quantity demanded is hypothesized to be a function of the average price (measured by unit value) of this class of imports, the average price of the other

<sup>31</sup> These data are described in greater detail in “Chinese and Hong Kong International Trade Data,” by Shunli Yao and Robert Feenstra, July 1999.

classes of imports (which are substitute goods), an index for the stock of vehicles in the province (*Stock*), and provincial variables which reflect the standard of living in the province as well as its level of economic development. These include measures of per capita GDP (*Pcgdp*) and its square ( $Pcgdp^2$ ), measures of urban and rural household income (*Urbaninc* and *Rurinc*, respectively), the ratio of rural to urban population (*Rururb*), the fraction of provincial population engaged in agriculture (*Nonag*), and per capita auto production (*Pcauto*). Finally, as measures of transportation infrastructure, we include measures of the length of railways (*Rail*), the length of highways (*Highway*), and the length of waterways (*Waterway*). Our index for the stock of vehicles is simply the sum of lagged past import levels and past levels of domestic (provincial) production. This aggregate includes buses as well as private automobiles, so this is certainly an imperfect proxy. However, there should be a broad correspondence between this variable and the actual stock of vehicles. Automobiles are durable goods, so a large stock of existing vehicles will, *ceteris paribus*, depress demand for new imports. We are unable to include a useful index of average quality for these imported cars – so there is an omitted variable that is correlated with price. Our estimating equation is thus:

$$\begin{aligned}
Q_{ijt} = & \beta_0 + \beta_1 P_{ijt} + \beta_2 P_{ij-t} + \beta_3 P_{ij+1t} + \beta_4 Stock_{it} + \beta_5 Pcgdp_{it} + \\
& \beta_6 Pcgdp_{it}^2 + \beta_7 Urbaninc_{it} + \beta_8 Rurinc_{it} + \beta_9 Rururb_{it} + \\
& \beta_{10} Nonag_{it} + \beta_{11} Pcauto_{it} + \beta_{12} Rail_{it} + \beta_{13} Highway_{it} + \beta_{14} Waterway_{it} + \\
& \sum_t \tau_t D_t + \varepsilon_{ijt}
\end{aligned} \tag{1}$$

In addition to the variables described above, we also include a set of dummy variables corresponding to the years of our data. Chinese trade policy with respect to automobiles and

other goods varied over the years of our sample period, and the relative enforcement of this trade policy varied even more, albeit in ways that the official policy record does not reflect. As demonstrated in section 1, the level of imports of finished automobiles in China rose rapidly in the early 1990s, then fell equally rapidly. This rise and fall was not principally driven by changes in import prices. Rather, stricter guidelines from the central government concerning automobile purchases sharply curbed import demand.

Initial estimates, reported in Table 6 below, give our results from equation (1). The table reports regression coefficients, with standard errors given below in parentheses. As can be seen from columns 2 and 3, the impact of price on demand for mid-range and luxury imports is strong, statistically significant, and of the expected sign. While changes in imports may not be primarily driven by price, it is clear that changes in price do affect demand. The regression coefficients imply that if the price of mid-range automobile imports declines by 10%, quantity demanded will expand by more than 40% -- a four for one change! The results in column 3 suggest that if the price of luxury cars declines by 10%, quantity demanded will increase by a more modest 8%. On the other hand, the results in column 1 suggest that imports of inexpensive cars are essentially insensitive to price. The point estimate is positive, but it is statistically insignificant.

**Table 6 Demand for Automobile Imports in China (with year dummy variables)**

Variable	Inexpensive Imports	Mid-range Imports	Luxury Imports
<b>Inexp_import_price</b>	<b>.346</b> (.411)	.629 (.270)	-.119 (.206)
<b>Midrange_price</b>	.934 (.180)	<b>-4.17</b> ( <b>1.05</b> )	-1.50 (.751)
<b>Luxury_price</b>	-.846 (.592)	-1.72 (.379)	<b>-.885</b> ( <b>.294</b> )
<b>Vehicle stock</b>	.461 (.524)	-.026 (.343)	.903 (.254)
<b>Per capita GDP</b>	37.7 (6.30)	7.52 (4.02)	3.35 (2.97)
<b>Square of natural log of per capita GDP</b>	-2.47 (.402)	-.496 (.252)	-.100 (.185)
<b>Urban household income</b>	9.81 (2.20)	3.15 (1.46)	2.52 (1.03)
<b>Rural household income</b>	-4.94 (2.20)	-.881 (1.45)	-2.19 (1.17)
<b>Ratio of rural to urban population</b>	.030 (.018)	.039 (.012)	.012 (.008)
<b>Ratio of nonagricultural to agricultural population</b>	4.12 (.915)	.859 (.593)	.073 (.430)
<b>Auto Production per capita</b>	.459 (.146)	.546 (.090)	.102 (.067)
<b>Length of railways</b>	.444 (.538)	.097 (.370)	-.357 (.245)
<b>Length of highways</b>	-.755 (.806)	.237 (.553)	-.021 (.383)
<b>Length of waterways</b>	.048 (.166)	-.072 (.108)	-.066 (.080)
<b>Year dummy variables</b>	Yes	Yes	Yes
<b>Provincial dummy variables</b>	No	No	No

**Source:** Author's calculations using log-linear regression with year fixed effects.

Do these results make sense? Broadly speaking, we think the answer is yes. While not always statistically significant, the impact of automobile stock and the provincial development and income variables tend to have the expected signs. The estimated price elasticities of demand for mid-range and expensive automobiles lie within plausible ranges. The real difficulty lies in interpreting the lack of price responsiveness of import demand for the lowest priced category of automobiles.

While it is too early to come to definitive conclusions about this, two possible explanations immediately suggest themselves. The first is that measurement error, which impacts all of our empirical work to some degree, is particularly problematic in the small car segment. In other words, our measures of price and quantity are particularly bad for this segment. This would be true if the majority of “gray market” cars were concentrated in the small car segment and the flow of such illegal imports was highly variable across provinces and time. Alternatively, it could be that demand in this segment is relatively price inelastic. Businesses and consumers may have a need for basic transportation equipment that must be met, partially with imports, regardless of fluctuations in price. Obviously, these two explanations are not mutually exclusive.

One important set of variables omitted from the regressions described in Table 6 is province fixed effects. Demand for automobiles is likely to differ across provinces due to variation in factors for which we have imperfect measures or no measures. In principle, the inclusion of provincial fixed effects would control for all omitted variables that vary across provinces but not within provinces over time. Table 7, given below, shows how our regression results change with the inclusion of these variables. The bottom line is that they do not change much. In particular, imports of mid-range and expensive cars are still relatively sensitive to price, whereas imports of inexpensive cars are not.

**Table 7:**  
**Demand for Automobile Imports in China (with year and province dummy variables).**

Variable	Inexpensive Imports	Mid-range Imports	Luxury Imports
<b>Inexp_import_price</b>	<b>.439</b> (.469)	.205 (.267)	.138 (.225)
<b>Midrange_price</b>	-.212 (1.649)	<b>-3.10</b> (.879)	-1.07 (.663)
<b>Luxury_price</b>	-.015 (.917)	-1.82 (.508)	<b>-.953</b> (.387)
<b>Vehicle stock</b>	-3.63 (2.36)	1.47 (1.35)	3.60 (1.02)
<b>Per capita GDP</b>	23.5 (8.36)	4.30 (4.67)	-2.17 (3.86)
<b>Square of natural log of per capita GDP</b>	-1.56 (.514)	-.372 (.286)	.100 (.219)
<b>Urban household income</b>	.914 (3.87)	1.37 (2.29)	-1.76 (1.80)
<b>Rural household income</b>	-6.62 (3.19)	-4.71 (1.84)	-.120 (1.45)
<b>Ratio of rural to urban population</b>	.0012 (.019)	.006 (.011)	.000 (.008)
<b>Ratio of nonagricultural to agricultural population</b>	4.34 (4.47)	4.32 (2.56)	.233 (2.02)
<b>Auto Production per capita</b>	-.854 (.412)	.090 (.232)	.371 (.179)
<b>Length of railways</b>	-.090 (.627)	.550 (.427)	-.027 (.258)
<b>Length of highways</b>	-5.17 (3.11)	-4.31 (1.66)	-3.22 (1.26)
<b>Length of waterways</b>	-12.1 (3.66)	-7.19 (2.02)	-1.45 (1.55)
<b>Year dummy variables</b>	Yes	Yes	Yes
<b>Provincial dummy variables</b>	Yes	Yes	Yes

**Source:** Author's calculations.

There is one final issue, unique to Chinese trade data, which remains to be explored. From the opening of the Chinese economy in the late 1970s through much of the 1990s, much Chinese foreign trade was mediated by a particular class of state-owned enterprise – the foreign trade company. Since these companies conducted imports on behalf of client enterprises scattered throughout the country, it would not be correct to assume that the imports received by such a company, based in say, Beijing, were actually used in Beijing. However, when a good is imported by a foreign trade company, we do not typically know the location of the final consumer. Tables 6 and 7 simply subtracted all such trade from the aggregate numbers and based econometric inference on what was left. Table 8 imputes all imports undertaken by such companies to the province of Beijing, and reruns our regressions with provincial and time fixed effects. Once again, the basic pattern of results stays the same.

Can these results inform any discussion of the impact of WTO accession on the Chinese automobile industry? Clearly, care must be taken in extrapolating from the 1988-1998 period through the next 10 years. Nevertheless, past history provides the only reasonable basis for predictions of future market development. The principal impact of WTO accession will be to lower tariffs on finished automobiles from 85% to about 25% -- a 60% reduction in tariffs, roughly equivalent to a 33% reduction in the total car price. If we were to take our regression estimates at face value from Table 8 and we assume that tariff reductions are fully passed through to consumers in terms of the final product price, then this would imply that, holding all else constant, import demand for mid-range cars would expand by roughly 100% and import demand for high-end cars would increase by nearly 30%! These are substantial changes, and that is without taking into account any likely growth in the total size of the market.

**Table 8:**  
**Demand for Automobile Imports in China (with year and province dummy variables)**

Variable	Inexpensive Imports	Mid-range Imports	Luxury Imports
<b>Inexp_import_price</b>	<b>.439</b> <b>(.469)</b>	.205 (.267)	.138 (.225)
<b>Midrange_price</b>	-.212 (1.649)	<b>-3.10</b> <b>(.879)</b>	-1.07 (.663)
<b>Luxury_price</b>	-.015 (.917)	-1.82 (.508)	<b>-.953</b> <b>(.387)</b>
<b>Vehicle stock</b>	-3.63 (2.36)	1.47 (1.35)	3.60 (1.02)
<b>Per capita GDP</b>	23.5 (8.36)	4.30 (4.67)	-2.17 (3.86)
<b>Square of natural log of per capita GDP</b>	-1.56 (.514)	-.372 (.286)	.100 (.219)
<b>Urban household income</b>	.914 (3.87)	1.37 (2.29)	-1.76 (1.80)
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<b>Ratio of rural to urban population</b>	.0012 (.019)	.006 (.011)	.000 (.008)
<b>Ratio of nonagricultural to agricultural population</b>	4.34 (4.47)	4.32 (2.56)	.233 (2.02)
<b>Auto Production per capita</b>	-.854 (.412)	.090 (.232)	.371 (.179)
<b>Length of railways</b>	-.090 (.627)	.550 (.427)	-.027 (.258)
<b>Length of highways</b>	-5.17 (3.11)	-4.31 (1.66)	-3.22 (1.26)
<b>Length of waterways</b>	-12.1 (3.66)	-7.19 (2.02)	-1.45 (1.55)
<b>Year dummy variables</b>	Yes	Yes	Yes
<b>Provincial dummy variables</b>	Yes	Yes	Yes

**Source:** Author's calculations.

### *Implications of these Results for WTO*

However, this rather simplistic projection needs to be taken with a large grain of salt. As noted in section 2, most expatriate managers on the ground in China believe that “administrative” trade barriers will be put in place even as formal border trade barriers are reduced. Alternatively, the tariffs could be offset by a depreciation of the Chinese currency with respect to the U.S. dollar and other major currencies such as the Euro and the Japanese yen. It is a historical fact that most successful trade liberalizations have been accompanied by exchange rate devaluations, and Chinese economists have already started suggesting that some “rethinking” of the current dollar peg is quite likely as the WTO provisions are put into place. We therefore can envision a scenario in which the tariff reductions are almost fully offset by a combination of exchange rate depreciation and administrative guidance to SOEs. In such a scenario, the prospects for substantial import growth would be much more restrained.

It is also true that the evolution of import demand will be heavily influenced by the fact that the dominant automobile producers in China are affiliates of the same multinational firms that would be the dominant exporters to China. Does Toyota want to increase exports at the expense of the costly production facility it is building in Tianjin? It is our view that a large number of automobile manufacturers were invited into China prior to liberalization with the explicit goal of creating this kind of “channel conflict” for the global automobile industry, thus providing the Chinese authorities with international allies in their effort to slow the pace of automobile liberalization. This strategic interaction is given more attention in the next section.

#### **4. Progress Report on Other Modeling Efforts**

There are two dimensions along which we hope to extend our modeling of the Chinese automobile industry. The first dimension is strictly empirical. The second is strictly theoretical. We briefly summarize these efforts here, and we plan to make a much more complete presentation of these efforts at the sponsor meeting at Asilomar in September, 2001.

##### ***Empirical Modeling Efforts:***

##### ***(1) Discrete Choice Analysis of Chinese Auto Demand***

Progress on the empirical front is contingent on our efforts to obtain more complete price data from the Chinese vehicle market in recent years. Here we describe our fundamental modeling approach in nontechnical language. We propose to model the national market share of individual production models in the Chinese automobile industry as a function of their price and of vehicle characteristics associated with vehicle “quality.” Market share can be calculated by summing up the sales figures for the leading sedan production models. A class of statistical models known as “discrete choice models” enables us to treat this market share data as the outcome of a process by which large numbers of “consumers” select a single automobile from a menu of options.<sup>32</sup>

This statistical approach will allow us to systematically relate observed market shares to prices and to product characteristics. The parameter estimates derived from this exercise may allow us to make some inference about the vehicle attributes that are most valued by automobile consumers. In principle, these parameter estimates may be useful in forecasting what sorts of new models might be most popular in a liberalized Chinese automobile market.

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<sup>32</sup> Daniel McFadden shared the 2000 Nobel Prize in Economics for his development of these statistical techniques.

## **(2) *Quantifying Regional Barriers in Chinese Automobile Distribution***

As we have already noted, we possess data on auto registration from three earlier years (1988, 1990, 1992), which allows us to track automobile consumption by province, period, and production model. Matching these consumption data with contemporaneous data on automobile production at the provincial level, UC-Davis Ph.D. student Haiyan Deng has quantified the existence of interprovincial trade barriers in the Chinese automobile industry. Using a model from the expanding “economic geography” model in China to predict the level of interprovincial auto trade that should exist in the absence of provincial protectionism, Ms. Deng finds clear quantitative evidence that provincial governments restricted this trade in the late 1980s/early 1990s.<sup>33</sup> While the extension of this work to more recent years would clearly be of interest, the absence of comparable data is proving to be a substantial impediment to our progress.

## **(3) *Theoretical Modeling Efforts: Selling Support for a Protected Market***

In recent years, the Chinese government has allowed a number of automobile manufacturers to establish production facilities in its protected market, including GM, Honda, Toyota, and Ford. At the same time, the government has pursued negotiations with its trading partners concerning WTO accession. We believe the Chinese government has deliberately encouraged a build-up of foreign direct investment into its auto industry in order to be able to proceed with liberalization on its own terms – and receive support from the international automobile industry as it does so.

At the briefing in Asilomar, we will illustrate the reasons for this belief with a formal theoretical model, drawing upon the work of Richard Harris (1984). However, the basic insight can be expressed in nontechnical language. Informal trade barriers that operate like quotas will

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<sup>33</sup> A full report of these empirical results and a more complete description of the underlying model will be provided at the Asilomar presentation.

maintain prices in the Chinese automobile market at artificially high levels. With these trade barriers in place, both domestic and foreign producers could achieve higher levels of profitability than they could achieve in a free market, albeit at the expense of Chinese consumers.

This anticompetitive effect of quota-like trade restrictions has been amply documented by international economists.<sup>34</sup> The United States provided ample evidence of this when it negotiated “voluntary” export restraints on Japanese automobiles with the Japanese government in the early 1980s.<sup>35</sup> Subsequent studies revealed that both the domestic automobile industry and Japanese producers realized substantial profit increases from this government intervention.<sup>36</sup> This is the reason why the restraints were, in fact, “voluntary.”

China’s case presents an interesting difference with the experience of the U.S., because the Chinese “domestic” industry is dominated by joint ventures that are, in turn, partially owned by the same multinational automobile manufacturers that would presumably export products to the Chinese market. For the multinationals, aggressive exports to China could “cannibalize” the sales of their joint ventures. At the encouragement of the Chinese government, many of the world’s largest automobile manufacturers have purchased an expensive stake in a protected market. Because of this, they are even more likely to voluntarily comply with informal export restraints than were the Japanese in the U.S. market.

In fact, the Chinese may never have to actually spell out what their “quotas” for exports are. Given the strategic configuration of the Chinese automobile industry, with the same companies on both sides of the existing trade barriers, it is unlikely that the global automobile

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<sup>34</sup> Import contributions to theoretical models of the impact of these restrictions include, “Why Voluntary Export Restraints are ‘Voluntary,’” by Richard Harris, in the *Canadian Journal of Economics*, Vol. 18 (4), 1985, pp. 799-809, and “Trade Restrictions as Facilitating Practices,” by Kala Krishna, in the *Journal of International Economics*, Vol. 26, 1989, pp. 251-270.

<sup>35</sup> Empirical studies of the impact of these restrictions include, “Quality Change Under Trade Restraints in Japanese Autos,” by Robert Feenstra, in the *Quarterly Journal of Economics*, Vol. 103 (1), February 1988, pp. 131-146.

industry will put pressure on China to comply fully with its aggressive import liberalization plan. Multinationals aware of policies discriminating against imports are unlikely to use their access to the Western business press to call attention to these barriers. This, in turn, increases the likelihood that liberalization of the Chinese automobile market will be both slower and less complete than the letter of the WTO accession agreement suggests.

This strategic dynamic would tend to push the evolution of the Chinese automobile industry in the direction of “scenario 3,” described in section 2. The losers in this equilibrium will be Chinese consumers, who will continue to have to pay higher prices in order to purchase a range of products that is likely to be much more limited than that they would have in a freer market. Higher prices and restrictions on consumer choice will tend to limit the growth of the automobile industry. Viewed purely in terms of economic efficiency, this is not a desirable outcome.

However, the social costs of rapidly expanding auto use in China’s coastal urban industrial centers is likely to be relatively high. Ambient air quality in major Chinese cities is quite low by global standards. Market interventions that restrict the growth of automobile consumption would also lessen the environmental impact such growth would have on both atmospheric pollutants and greenhouse gas emissions. These issues are explored more thoroughly in the next section.

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<sup>36</sup> See also John Ries, “Windfall Profits and Vertical Relationships: Who Gained in the Japanese Auto Industry from VERs?” *Journal of Industrial Economics*, Vol. 27 (1), 1993, pp. 259-276.

## **5. Environmental Implications of Automobile Industry Expansion:**

### **The Case of Shanghai**

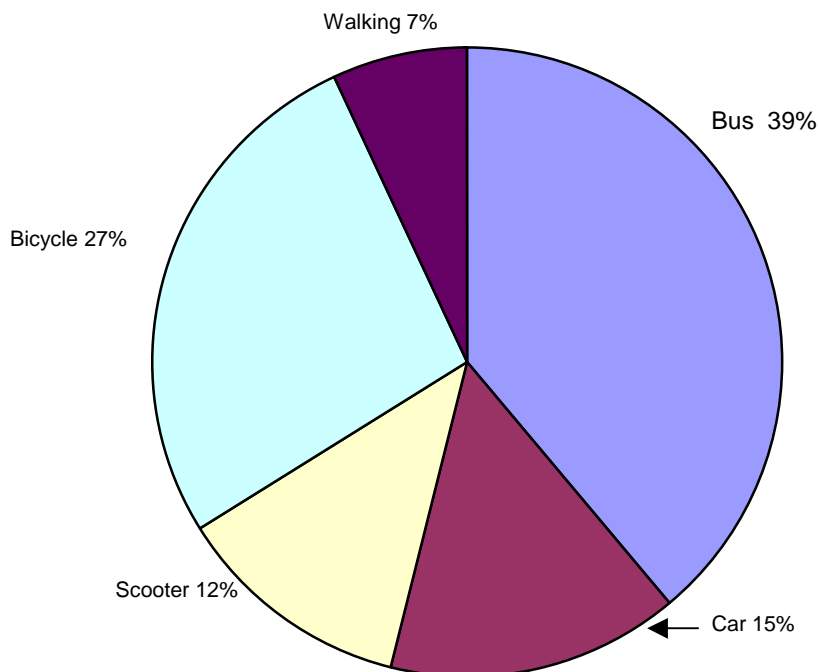
Given the early stage of our research, it would be premature to come to firm conclusions about the environmental impact of the development of the Chinese automobile industry. Nevertheless, the importance of this issue is great enough that it merits some discussion in this interim report. Our discussion draws heavily on a parallel report by ITS-Davis researchers -- a case study of Shanghai conducted by Hongchang Zhou, Deborah Salon, Daniel Sperling, and Mark Delucchi. It is an interesting case study, given that the Shanghai region is emerging as the most important domestic manufacturing center for the Chinese automobile industry. This other study is also useful for our purposes because, rather than tying itself to a single predicted outcome, the study illustrates a range of scenarios. Our remarks will focus on a scenario in which the automobile usage rapidly expands.

Despite Shanghai's status as China's leading industrial center prior to the defeat of the Nationalist government in 1949, the province grew relatively slowly in the early part of the post-1978 reform period. This situation changed abruptly in 1990, as the central government made the (re)development of Shanghai a national priority. This change in government policy coincided with the ascension to important national government offices of former Shanghai politicians Jiang Zemin (now China's President) and Zhu Ronji (China's Premier). Substantial funds were committed to develop industrial centers outside Shanghai's urban core, and foreign investment was aggressively courted. The 13 million people of Shanghai are now part of a metropolitan urban industrial economy whose growth is predicted to average roughly 7 percent per year through 2020.<sup>37</sup> As part and parcel of this economic growth, Shanghai city planners project a quadrupling of cars and trucks in the city by 2020. With this increase, cars would

account for 53 percent of total passenger travel in the city, displacing motorized two-wheeled vehicles, bicycling, and walking.

Already, Shanghai is China's richest province, with a GDP per capita of \$3,720.<sup>38</sup> However, the city's automobile population is well below the world average for cities of similar income. In 1998, Shanghai had about 600,000 registered motor vehicles – 85 vehicles per 1000 persons – and only about 15,000-50,000 of these were privately owned cars.<sup>39</sup> Delhi, India, had

Figure 2 Shanghai Travel Mode Share, Year 2000, Pass-Km



Sources: Lu, Ximing; Chen, Xiaoyan; and Xu, Xuncu; *Urban Passenger Transport Planning and Urban Development*, East China Polytechnic Publishing House, 1996, p. 194, and Shanghai City Comprehensive Transportation Planning Institute, Shanghai Report for UNCRD, 1997.

<sup>37</sup> At this rate of growth, per capita income in Shanghai would approach \$16,000.

<sup>38</sup> See *Statistical Yearbook of Shanghai*, various issues, China Statistical Publishing House (Beijing).

<sup>39</sup> Official sources from 1998 indicate 10,000 privately-owned vehicles. See *Shanghai City Transportation Study 1997*, Shanghai City Comprehensive Transportation Planning Institute, 1998, p.5; and Da Rao. 1999. "Analysis on private car purchasing in Beijing and Shanghai." *China Autos*. October. Informally, city officials indicate the number is closer to 20,000. But the car manufacturing companies in Shanghai indicate that their employees own about 10,000 vehicles by themselves. Executives at the Shanghai Automotive Industry Corporation, the Chinese holding company for joint ventures with VW, GM and others, indicate that an additional 30,000 or so employees of major Shanghai companies own their own vehicles but have registered their vehicles through their employers – and thus the City does not record those 30,000 or so as privately owned.

more than twice as many vehicles per 1000 persons, despite substantially lower levels of income. This low level of automobile usage partially reflects Shanghai's extraordinarily high population density – in the central city, this density averaged 22,700 people per square kilometer in 1996, with the densest part exceeding 60,000 per square kilometer. By contrast, the island of Manhattan is only about one-third as dense.<sup>40</sup> Combine this with large numbers of slow-moving pedestrians and bicycles on city streets and limited road infrastructure, and it is easy to understand why Shanghai's streets are quite congested, despite the relatively small vehicle population.

Shanghai city planners are undertaking substantial investments to “deconcentrate” the city's population by constructing seven satellite cities to which portions of the city's population and industrial activity will be moved. Already, much industrial activity has been relocated to these cities, and the city's transportation network is being expanded to handle increased movement of freight and people via roads and an expanded rail network.<sup>41</sup> This industrial relocation has changed commuting patterns, with increasingly large numbers of workers using motor vehicles to travel from their residences in the urban center to these industrial sites at the new urban periphery. While the changing patterns of urban development make motor vehicle use more attractive, the city has undertaken a set of policies expressly designed to limit motor vehicle use, in order to control traffic congestion, reduce air pollution, and extract revenue from automobile purchasers.

In order to obtain a driver's license in Shanghai, one must enroll in an official driving school at a cost of \$500 – more than 10% of per capita income! In addition to the monetary cost, this course reportedly involves three weeks of classroom instruction and more than a month of

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<sup>40</sup> The original source of this statistic is the Shanghai Municipal Statistical Bureau. Anecdotal evidence suggests that the urban core remains highly concentrated, in spite of the government's “deconcentration” efforts.

behind-the-wheel training. In addition to this cost, automobile purchases confront an array of taxes and fees. As of 2000, these fees nearly doubled the cost of a small domestically-produced sedan. In addition to these fees, operating costs of vehicles tend to be high in Shanghai, due to limited (and expensive) parking spaces, and fuel costs comparable to those in the U.S.<sup>42</sup> It is something of a paradox that Shanghai is so inhospitable to private vehicle ownership, given that auto-related production accounted for 20.4 percent of Gross City Product by 2000.<sup>43</sup>

Already, the advocates of the Chinese automobile industry have pointed out the fact that these fees constitute a barrier to further expansion. Herein lies a central policy conflict for urban planners in Shanghai and other major Chinese cities – not taking steps to restrict automobile demand will potentially increase air pollution and traffic congestion, at substantial social cost. The best way to restrict automobile use is to limit automobile ownership. However, restricting demand could curb the growth of a domestic industry, which the nation’s central government has singled out for development.

In addition to direct restraints on automobile ownership, Shanghai began eliminating leaded gasoline in 1998, and imposed the Euro I standards in July 1999 (equivalent to U.S. emissions standards in the early 1980s.) A fraction of the taxi fleet is being retrofitted to burn liquid petroleum gas, and the bus fleet is being retrofitted to burn compressed natural gas, a fuel for which China has relatively abundant domestic supplies. While the use of alternative fuels helps mitigate certain air pollutant emissions, the obtained reduction in greenhouse gas emissions is less dramatic.

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<sup>41</sup> See, for example, the *Shanghai Transportation Report* (in Chinese), Shanghai City Comprehensive Transportation Planning Institute, 1998.

<sup>42</sup> See Ching-Ching Ni, “Strict Rules Abound in Shanghai’s Driving Test, Licensing,” *LA Times*, January 21, 2001; William, Kenneth, “Theme Paper 10: Shaping the Future: Getting the Prices Right,” World Bank Discussion Paper No. 352, p. 391; and Stares, Stephen, and Liu Zhi, “Theme Paper 1: Motorization in Chinese Cities: Issues and Actions,” World Bank Discussion Paper No. 352, p. 79.

<sup>43</sup> *Statistical Yearbook of Shanghai*, 1998.

However, the primary source of vehicular pollution in Shanghai today is neither the automobile fleet nor the buses, but rather the half million two-stroke two wheelers that currently fill the cities streets. Unlike the motorcycles and scooters common in the U.S. and Western Europe, these vehicles have extremely small, inefficient, highly polluting engines. The smallest (with engines under 50 cc) are essentially mopeds, whereas the largest are almost all under 150cc. For much of Shanghai's population, two-wheeled motorized vehicles are an attractive transportation option. They are much cheaper – both to purchase and to operate – than full-sized cars, they take up much less road space on crowded streets, they burn less fuel, and they are much easier to park.<sup>44</sup>

City planners have taken a much less positive view of these vehicles. This stems in part from the negative public image of these vehicles. They are driven mostly by young men, often aggressively, and they tend to mix with slower-moving bicycles, creating serious traffic hazards. They are also seen as being an intermediate step in the transition to a more fully motorized economy – and one with a limited future.<sup>45</sup> This view is heavily influenced by the rise then near disappearance of scooters and motorcycles in Western Europe. City planners have acted on their negative view by banning the use of all motorized two-wheelers in the city center in the late 1990s (except for the smallest models) and capping the total registration of scooters and motorcycles in 1999. Owners are allowed to transfer registrations to new vehicles, but not to purchase additional two-wheelers. Battery-powered two-wheelers are exempted from this restriction. While current models of electric mopeds are much more expensive than conventional models, further development of this technology might represent a transportation option attractive to both city officials and residents. A switch to electric scooters would have immediate positive implications for atmospheric pollutants. However, because most electricity

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<sup>44</sup> See the ITS report on Shanghai for more details. LAUREN: GET THE CORRECT CITATION

in China is generated using carbon-rich coal, the level of greenhouse gas emissions would not decline with a switch to this alternative technology.

A step up from two-wheelers would be vehicles known as “minicars” – automobiles substantially smaller than U.S. sedans that have long been popular in crowded Japanese cities. These vehicles are more fuel efficient and less consumptive of road space than are full-size sedans. They are also typically less expensive, and a number of automobile manufacturers in China see real commercial opportunities at this low-end of the product spectrum.

**Table 9: Greenhouse Gas Emissions for Vehicles and Fuels in Shanghai, CO<sub>2</sub>-equivalent Grams/Vehicle-kilometer**

	2000		2020	
	Fuel	GHG	Fuel	GHG
	<u>km/liter</u>	<u>g/vehicle-km</u>	<u>km/liter</u>	<u>g/vehicle-km</u>
Gasoline Motor Scooter (2-stroke)	32.1	130	35.5	99
Gasoline Motor Scooter (4-stroke)	44.9	77	49.7	67
Electric Motor Scooter	N/A	60*	N/A	59*
Gasoline Minicar	24.7	118	28.5	118
Gasoline Car	10.7	343	10.7	343
Diesel Car	15.8	213	15.8	213
CNG Car	N/A	277	N/A	248
Electric Car	N/A	N/A	N/A	244*
Diesel Bus	3.3	944	3.3	986
Gasoline Bus	2.2	1439	2.2	1462
CNG Bus	N/A	1040	N/A	967
Fuel Cell Bus (methanol)	N/A	N/A	N/A	684

\*The average generating mix for China used in calculating greenhouse gas emissions for battery electric vehicles (and rail transit) is as follows: 78 percent coal, 15 percent hydro, 4 percent oil, 2 percent nuclear, and 1 percent natural gas.

Source: Zhou, H, D. Salon, D. Sperling, and M. Delucchi (2001), *Transportation in Developing Countries: Greenhouse Gas Scenarios for Shanghai, China*. Pew Center for Global Climate Change, Washington, DC (forthcoming)

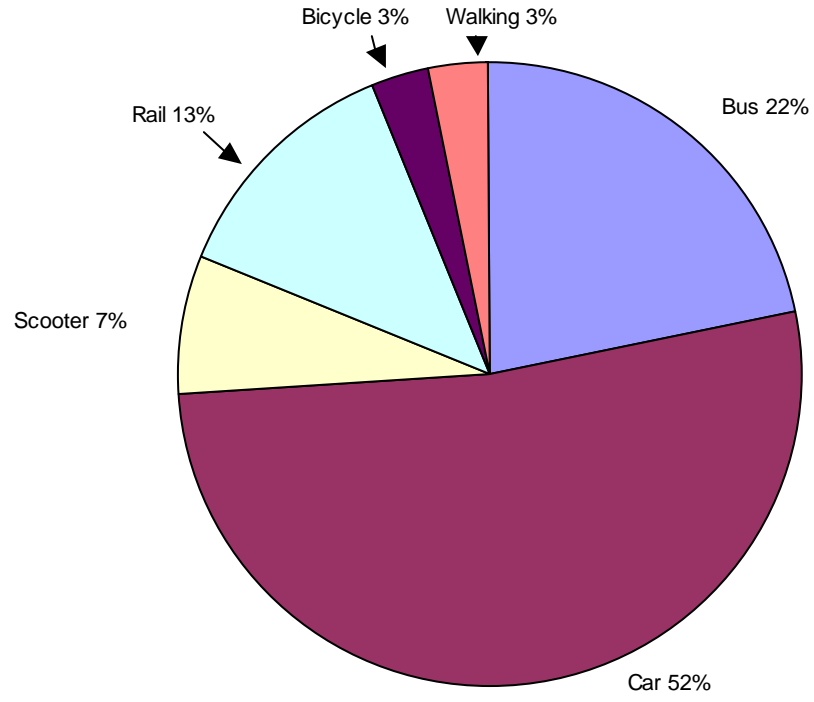
<sup>45</sup> The ITS-Davis study notes that these vehicles remain popular in Taiwan.

Even with some existing restraints on vehicle ownership and use in place, Shanghai city planners expect the car population to increase fourfold. Taking this prediction at face value, ITS-Davis researchers recently mapped out the implications of this growth for greenhouse gas emissions, making reasonable assumptions about city population growth, changes in the mix of vehicles used, the growth of mass transit alternatives, and use of alternative fuels in the vehicle fleet. Assumptions regarding the fuel efficiency and greenhouse gas emissions of different transportation alternatives are explicitly given in Table 9.

Figure 3 illustrates the modal share in passenger-kilometers in this high growth scenario for the year 2020. As one can see from this diagram, motor vehicle travel rises substantially in terms of its share of total travel, with cars becoming the most important mode of travel. This forecast, together with Table 9's assumptions about GHG emissions, suggests that Shanghai would see a sevenfold increase in greenhouse gas emissions by 2020.

Please keep in mind that these projections are made only for one city in China, albeit one that is rapidly (re)emerging as China's preeminent commercial center. However, the scenario mapped out for Shanghai is likely to be repeated in other cities, many of which do not possess the "natural" barriers to increased automobile ownership that Shanghai's population density creates. Furthermore, the policy dilemma we have emphasized in the Shanghai context between development of an automobile industry and the control of its negative environmental consequences will be a dilemma the entire nation will have to confront.

**Figure 3 Mode Share in Passenger-Km, High Growth Scenario, Year 2020**



Source: ITS Davis projections