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Chinese Industry After 25 Years of Reform¹

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Beginning with the start of reform in the late 1970s, China's industry has recorded impressive growth of output, labor productivity, and exports as well as dramatic upgrading of the quality and variety of output. These gains have occurred in spite of difficulties arising from lethargic state enterprises, weak corporate governance, excessive official intervention, corruption, and weak financial institutions.

We see globalization and intensified domestic competition as the driving forces behind this steady accumulation of manufacturing capabilities. The impact of China's growing interaction with global markets is widely understood. China has gradually opened its economy to trade and investment. Unlike Japan and Korea during their rapid growth phases, few sectors of Chinese industry escape the direct impact of international market pressures.

Exports provide the clearest evidence of progress. At the start of reform, most Chinese manufactures could not fulfill customer requirements in middle- or high-income nations. Today, the competitive strength of Chinese manufactures is a topic of worldwide discussion. While foreign investment has contributed to the growing quality and range of China's manufactures, recent industrial development reflects a broad and deep expansion of Chinese production and management capabilities.

Domestic competition is more controversial. Information from provincial input-output tables and other sources leads some authors to describe China's economy as deeply segmented, with local protectionism imposing stringent limits on domestic trade.² However, recent surveys show trade barriers in decline.³ Along with official policy efforts, national advertising and massive improvements in transport and communication have undermined barriers to commerce.

The consequences of increasing market liberalization and competition from both domestic rivals and imports act through multiple channels.⁴ These forces typically result in falling prices and increasing concentration as weak firms exit and stronger enterprises expand their market share. Where the returns to investment in product quality and productivity are high, and "economies of scope" permit capable firms to capture market share, we expect higher R&D spending to add to the upward momentum of market concentration. As competition intensifies, market turbulence is likely to produce considerable turnover in industry leadership and in the ranking of firms.

These elements figure prominently in the evolution of individual Chinese industries during the last twenty-five years. In old industries like beer, for example, local breweries have crumbled before the onslaught of large firms (See Table 1), while in new industries

like television, there has been a combination of increasing concentration and massive leadership shifts during the past decade, as newly dominant firms eclipsed first Nanjing Panda and now Sichuan's Changhong.

Television manufacture also illustrates how Chinese experience replicates classic market-economy development patterns for new industries.⁵ (see, for example, Klepper and Graddy, 1990). An initial rush to enter this new sector--by 1990 there were over 100 TV manufacturers in China--led to a painful interlude of high costs, excess capacity, and financial distress. Figure 1 shows that 1990 output of color TV sets lagged far behind the capacity of production lines installed during 1978-1985 in every province.

During the ensuing decade, we observe considerable shakeout. The number of manufacturers declines considerably, while several of the sickly start-ups portrayed in Figure 1 metamorphose into global export leaders amidst sweeping industry-wide consolidation. This is evident in Figure 2, which shows output of color TVs in 2000 in provinces with the leading firms in industry, i.e. Guangdong (TCL and Konka) and Sichuan (Changhong), well in excess of earlier capacity.

Figure 3 shows a classic "product cycle" pattern – initial imports followed by both a steep rise in exports that rocketed Chinese producers into a prominent position among global exporters of televisions. The equally abrupt decline in the ratio of imported components to export sales reflects new domestic capacity to manufacture key components formerly procured from abroad.

Top firms in some leading sectors already approach world-class performance, while others lag far behind. Auto parts illustrates both outcomes. When the new wave of international carmakers established factories in China during the 1990s, official regulations required local sourcing of 70% of all components. With international suppliers to the global auto majors following their big clients into the People's Republic, the top tier of component suppliers quickly evolved into a mix of international and domestic firms. The combination of extensive foreign penetration and explicit, widely publicized standards led to a steep rise in product quality and productivity among first-tier suppliers who sell directly to First Auto Works, Shanghai-GM and other leading auto assemblers. In 2004, local sourcing exceeds ninety percent.

Field research carried out in 2003/2004 documents some of the improvement in product quality and productivity. Domestic firms already match global norms for labor productivity in the assembly of auto seats. In the case of exhaust systems, a considerable gap in labor productivity remains; however the productivity gap is substantially smaller than the wage differential between China and high-income countries.

Figures 4 and 5 show both the achievements and the shortcomings of quality control in China's auto parts sector. Figure 4, which tabulates defect rates for 100 first-tier component suppliers to a major carmaker's Chinese operations, shows that over half of these component makers had achieved defect rates below 100 parts per million (ppm), the international best practice standard for the global auto industry. This impressive

outcome, however, pertains only to the top-tier of suppliers. Moving one rung down the ladder of component makers, Figure 5 shows very high defect rates for components delivered to a typical first tier supplier: here the defect rate is measured as a percentage, rather than ‘parts per million’. First tier suppliers, typically mid-size firms, are reluctant to invest in training their own suppliers. They are more willing than the carmakers to tolerate a higher level of product defects in return for a lower price from their own (‘second tier’) suppliers. The result is a much slower rate of capability building – a pattern seen also in the U.S., Japan and Europe, though in the Chinese case the gap between first and second tier suppliers is particularly wide.

Generalized expertise in supply chain management is a key determinant of performance across the general run of manufacturing industries. The development of tightly organized and well-managed supply chains in some segments of the automotive industry stands in stark contrast with the extreme vertical integration observed under China’s pre-reform plan system and with continuing weak supply chain management in many domestic industries.

Reform has raised both capabilities and wages. Interconnected upward shifts in capabilities and wages generate a continuing transformation of China’s export mix from “unskilled labor-intensive” to “skilled labor-intensive” and capital- and technology-intensive sectors. It is easy to exaggerate the contribution of low-cost labor to Chinese growth. To be sure, the initial wave of incoming foreign investment, much of it from Hong Kong, and to a lesser extent, Taiwan, reflected foreign producers’ efforts to replicate low-wage environments previously available in Taiwan and Hong Kong. While makers of garments, toys and many other products continue to employ millions of migrant workers in plants built around labor-intensive processes, foreign investment is now well into a second stage, in which it is no longer low wages alone, but rather China’s unique combination of rising capabilities and moderate labor costs that motivates FDI decisions.

In Figure 6, we use information on the R&D content of United States manufacturing industries from a unique 1977 survey to calculate the annual “R&D intensity” of China’s manufactured exports during the period 1987-2003. The procedure is far from perfect. Some exports fall outside the available R&D categories. Imported components often enhance the technology component of Chinese exports, as when Chinese workers install hard disks from Singapore or microchips from Taiwan or Korea in electronic goods destined for overseas markets. Nonetheless, both the summary figures compiled in Figure 6 and more detailed breakdowns (not shown) reveal a distinct shift toward export sectors with increasing degrees of capital- and knowledge intensity as well as a gradual erosion of the large but declining export share of labor-intensive products.

The extreme diversity among China’s disparate regions adds a geographic dimension to the process of capability building. Foreign investment, industrial exports, and expansion of manufacturing capability all cluster in China’s dynamic coastal areas. As these regions expand their manufacturing capabilities, rising wages and land costs compel earlier cohorts of labor-intensive manufacturers to depart from these leading areas,⁶ as

occurred previously in Taiwan and Hong Kong. If China's interior provinces can provide a hospitable investment climate to complement massive new investments in airports, roads, and telecommunications, firms and industries forced to depart from coastal locations may find new homes in central and western China rather than moving overseas.

Foreign technology, imported capital goods, and cooperation with multinational enterprises occupy prominent roles in the product innovation and capability expansion described in this essay. But China has rich entrepreneurial resources – Tim Wright's characterization of pre-World War II China as having “an abundance of small-time entrepreneurs” remains valid today,⁷ when we also observe an ample supply of big-time entrepreneurs, many with advanced overseas training and international experience. This talent pool will enable domestic firms to seize opportunities to combine new capabilities, including skills initially monopolized by foreign firms, to achieve economic gain. Recent developments in telecommunications, semiconductors, biotechnology and many other industries underline the implausibility of claims that Chinese firms will not challenge “the continued industrial and technological preeminence of the United States and other advanced industrial democracies.”⁸

Looking forward, we anticipate continued expansion and deepening of manufacturing capabilities in the foreign-linked coastal regions that have dominated China's initial achievements, now joined by new streams of upgrading and innovation, already visible in sectors like silk and steel manufacture, arising from the spread of capabilities across sectors and regions, and also by fresh impetus originating in domestic R&D operations.⁹ Signs of domestic innovative potential include qualification of nearly 100,000 Chinese firms for ISO 9001 certification by the end of 2003 and advances in biotechnology, shipbuilding and other sectors with limited foreign participation. Mutual interaction among these streams of innovation, reinforced by continuing official efforts to promote institutional reform, points to continued rapid development of Chinese manufacturing capabilities, with market-induced upgrading and enlarged international competitiveness spreading to a growing array of industries and geographic regions.

China's manufacturing achieved remarkable gains during the first quarter-century of reform. These advances, although costly, uneven, and often foreign-led, are noteworthy both for their large scale and for the strong momentum that overwhelmed seemingly powerful obstacles, including intrusive and capricious regulation, extensive corruption, and weak systems of law, management, finance, and corporate governance.

Our expectation of continuing advance for Chinese manufacturing does not rule out cyclical fluctuations, including substantial and painful downdrafts. However we see the emergence of the competitive mechanisms driving recent advances in manufacturing capabilities as a permanent structural change that will survive any cyclical fluctuations.

Endnotes

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² For example: Genevieve Boyreau-Debray and Shang-jin Wei, "Can China Grow Faster? Diagnosis on the Fragmentation of the Domestic Capital Market" (ms., 2003); Sandra Poncet, "Measuring Chinese Domestic and International Integration," *China Economic Review* 14.1 (2003):1-21; Alwyn Young, "The Razor's Edge: Distortions and Incremental Reform in the People's Republic of China," *Quarterly Journal of Economics* 115 (2000):1091-1136.

³ Li Shantong et al, "Survey and Analysis of Chinese Domestic Regional Protection Problem," *Jingji yanjiu* [Economic research] #11 (2004): 78-84, 95. See also Chong-En Bai et al, "Local Protectionism and Regional Specialization: Evidence from China's Industries," *Journal of International Economics* 63 (2004): 297-317.

⁴ These issues are spelled out more fully in John Sutton, *Rich Trades, Scarce Capabilities: Industrial Development Revisited* (Keynes Lecture, British Academy; London, 2000) and in Loren Brandt, Thomas G. Rawski, John Sutton, "Industrial Organization" (unpublished 2004).

⁵ Steven Klepper & Elizabeth Graddy, "The Evolution of New Industries and the Determinants of Market Structure," *RAND Journal of Economics* 21.1 (1990): 27-44.

⁶ Widely reported "labor shortages" in Guangdong factories may reflect this phenomenon. If market pressures prevent old-line industries from raising wages, workers may depart in search of better opportunities, leaving their former employers with the choice of relocating or closing their businesses.

⁷ Tim Wright, "Growth of the Modern Chinese Coal Industry: An Analysis of Supply and Demand," *Modern China* 7.3 (1981): 325.

⁸ George J. Gilboy, "The Myth Behind China's Miracle," *Foreign Affairs* July/August 2004.

⁹ See Albert Hu and Gary Jefferson, "Science and Technology in China (unpublished, 2004); Emily Hannum, Jere Behrman and Meiyan Wang, "Human Capital in China" (unpublished, 2004); and Jiang Xiaojuan, "China's Economic Development Enters a New Stage: Challenges and Strategy," *Jingji yanjiu* [Economic research] #10 (2004): 4-13.

Table 1 The Scale of Beer Producers in China (1994-2000)

		1994	1995	1996	1997	1998	1999	2000
Number of Firms		655	656	589	550	495	474	495
Average Size (1000 tons)		21.6	25.1	30.6	34.3	40.2	44.3	45.1
Above 200,000 tons	Number	3	7	8	13	18	19	20
	Share (%)	5.4	12.1	14.5	21.4	31.3	35.2	41.8
100,000 — 200,000 tons	Number	21	23	28	28	26	25	26
	Share (%)	19.9	18.6	21.8	20.9	17.1	17.1	16.7
50,000 — 100,000 tons	Number	36	44	47	57	60	62	60
	Share (%)	16.6	19.1	18.2	20.1	21.2	21.1	18.9
Below 50,000 tons	Number	595	552	206	452	391	368	389
	Share (%)	58.1	50.2	45.5	37.6	30.4	26.6	22.6

Source: *Zhongguo qingongye nianjian* [China Light Industry Yearbook], 1995-2001.

Figure 1.
China: Investment and Production of Color Televisions By Province 1: 1978-1990

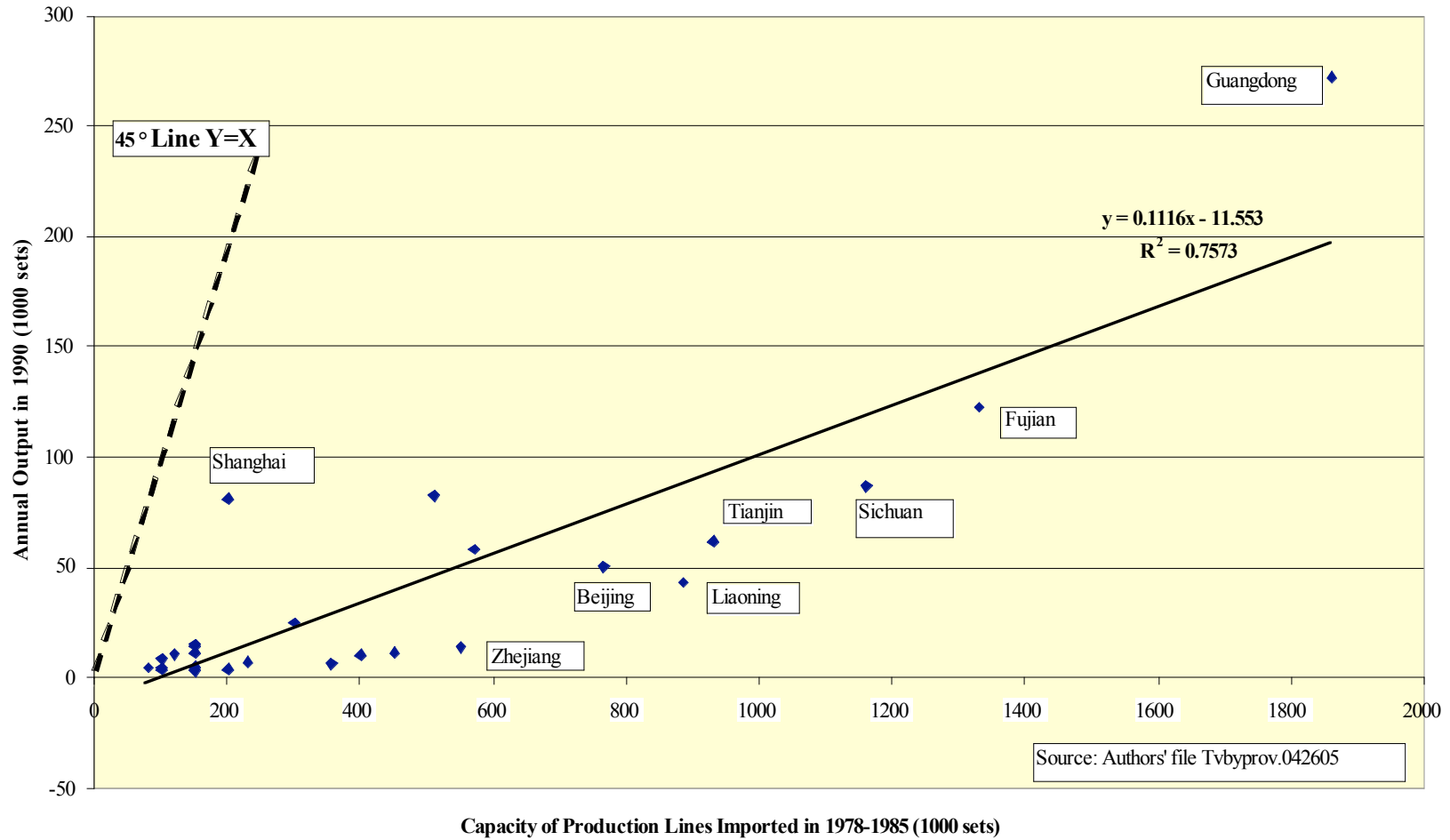


Figure 2
China: Investment and Production of Color Televisions by Province 2: 1978-2000
omitting Guangdong

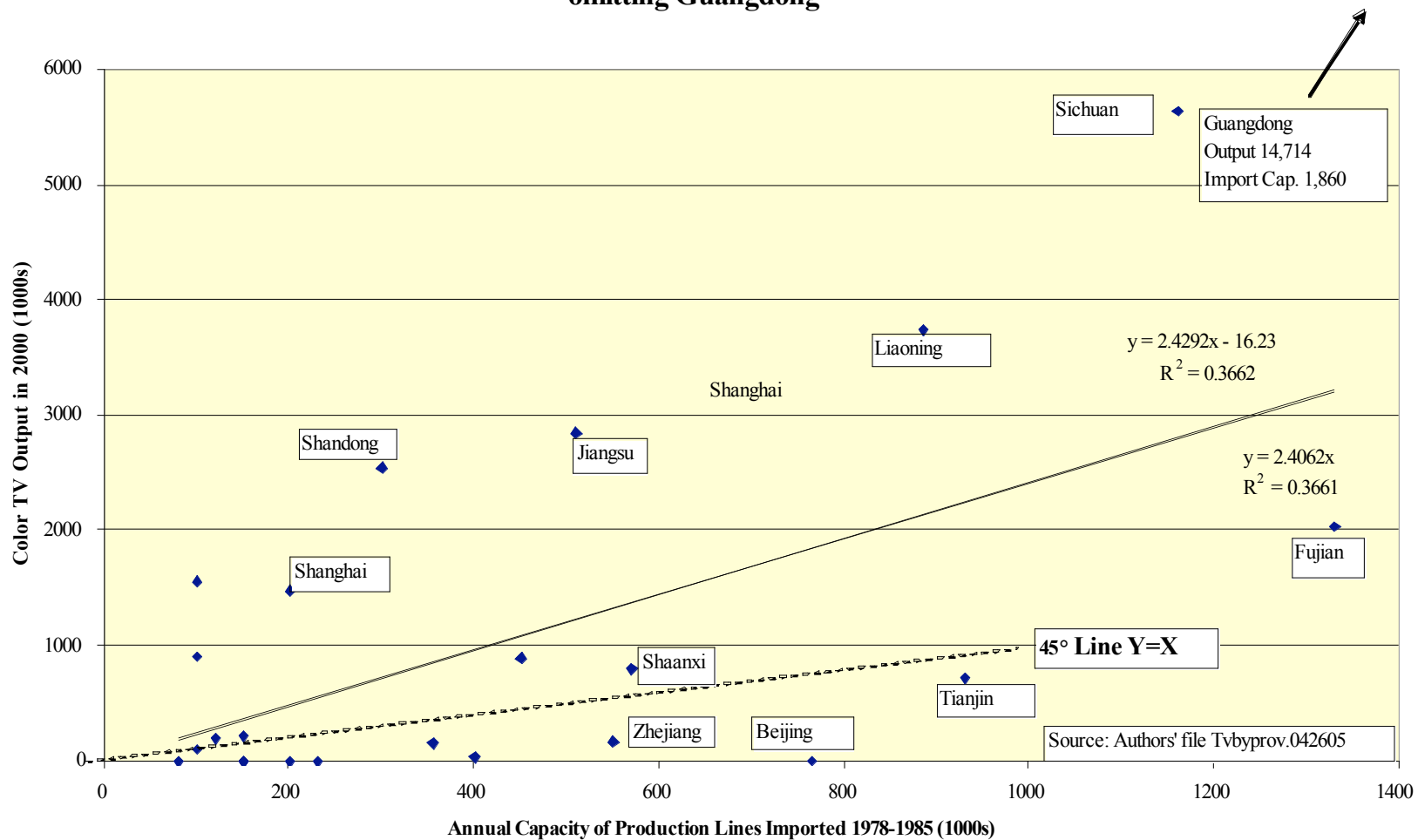


Figure 3: China's Trade in TVs and Components
 1992-2003 (US\$ million - left scale) and percent

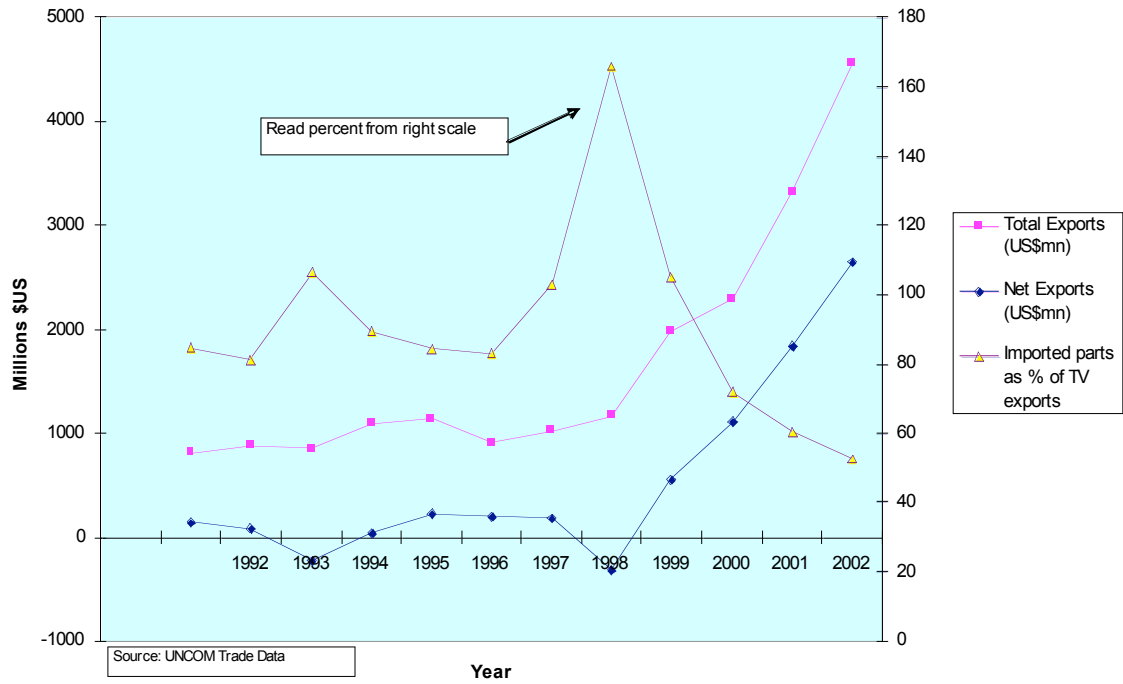
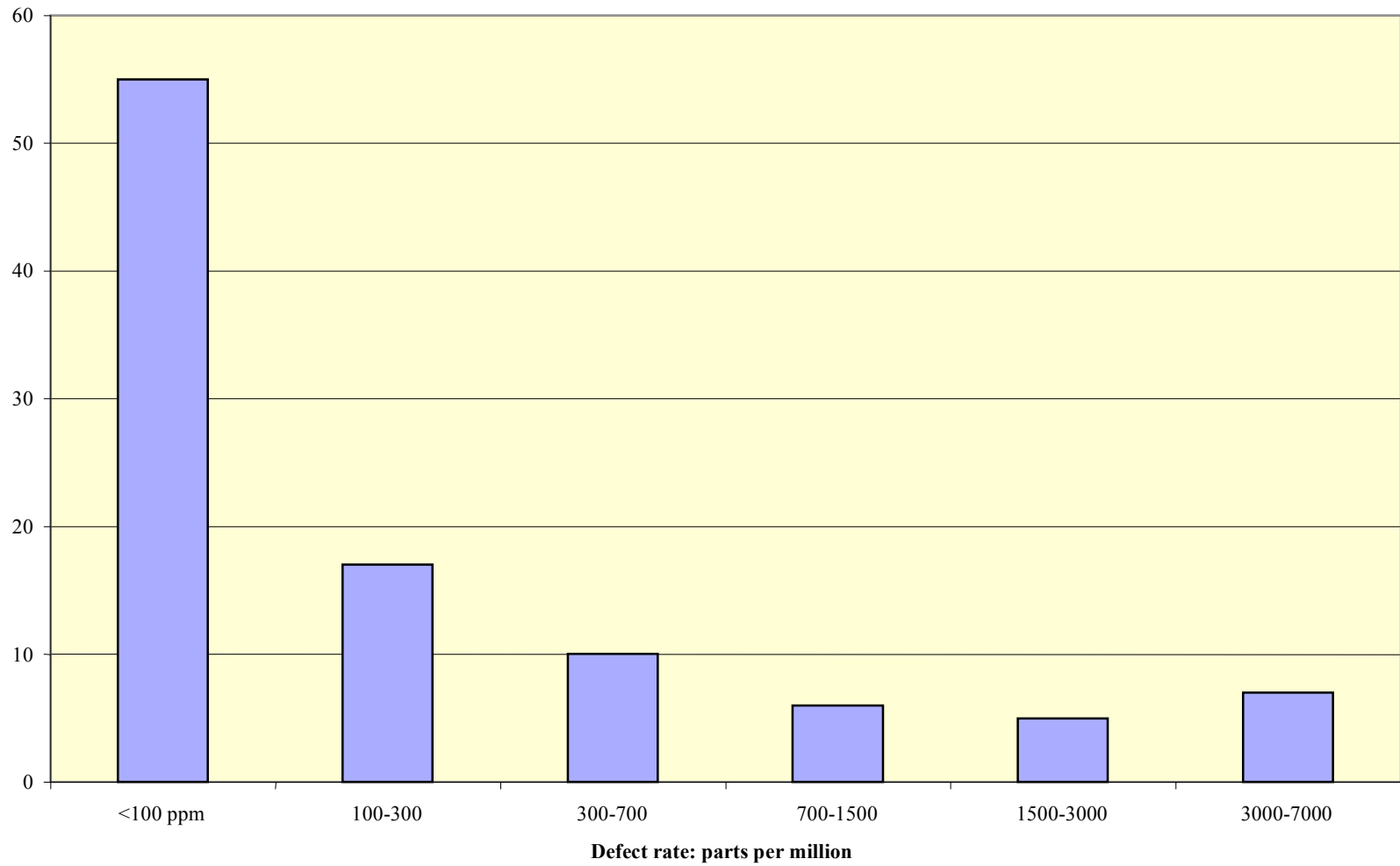


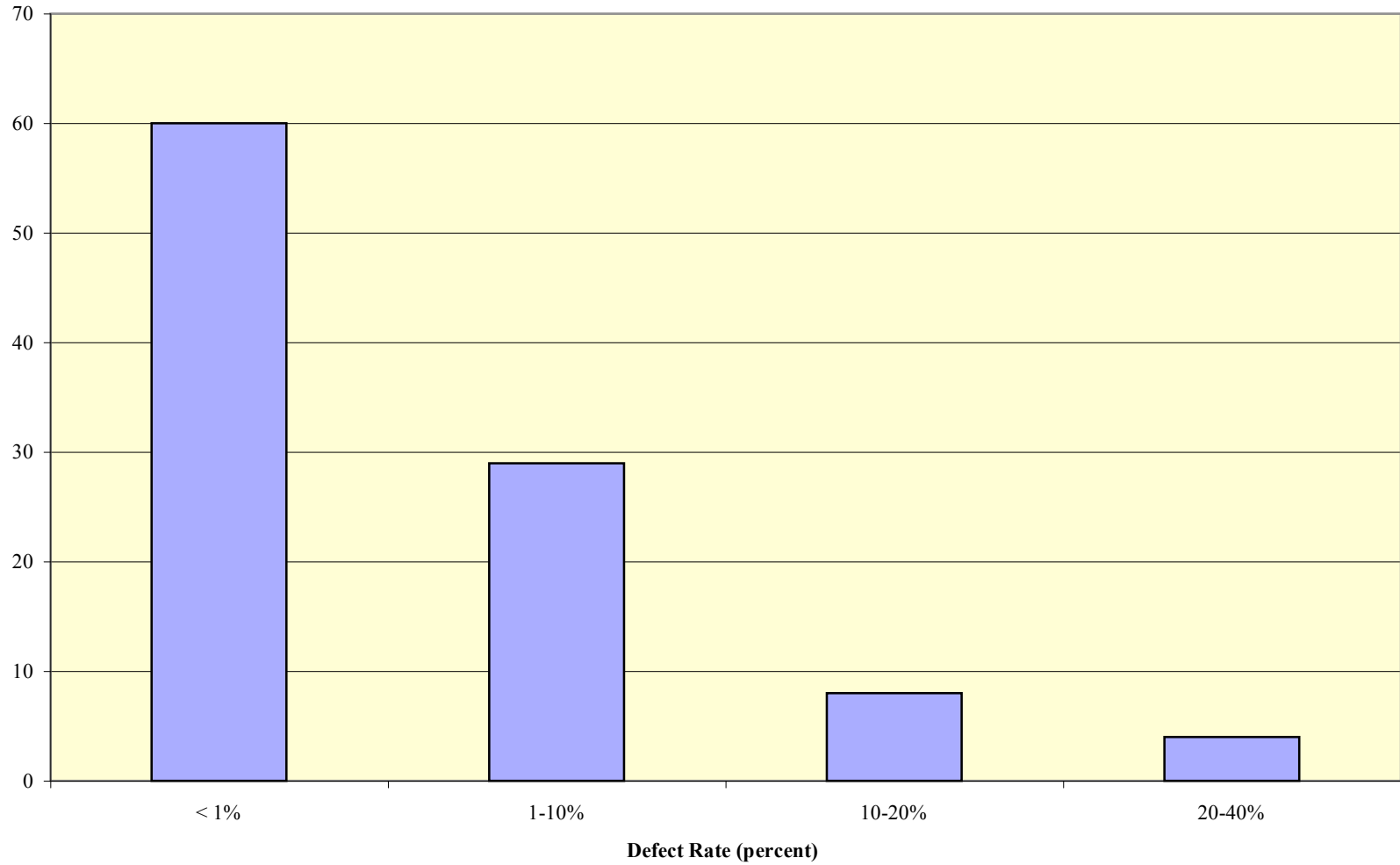
Figure 4: Defect Rate for 100 Component Suppliers to a Multi-national Car Maker



Source: John Sutton, *The Auto-component Supply Chain in China and India - A Benchmark Study* (London: STICERD, 2004), Table 2.1

Number of firms

Figure 5: Defect Rates for 101 Component Suppliers to a Chinese Maker of Steering Gear



Source: John Sutton, *The Auto-component Supply Chain in China and India - A Benchmark Study* (London: STICERD, 2004), Table 2.6

Figure 6
R&D Intensity of China's Exports, 1987-2003

