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PEOPLE'S REPUBLIC OF CHINA

Western China: Enhancing Industrial Competitiveness and Employment

October 2005

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Integrated Programme for Shaanxi Province, Component 1:
Industrial Development Policies and Strategies
'Reduce Regional Disparities and Enhance Industrial Competitiveness'
US/CPR/03/051 & US/CPR/04/108

Western China: Enhancing Industrial Competitiveness and Employment

Technical Report

Prepared by UNIDO for the
National Development and Reform Commission (NDRC) and the
China International Centre for Economic and Technical Exchanges (CICETE)
Based on the work of a team
Of national and international experts

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The findings and policy implications of this study were presented at a National Workshop held in Guo Hong Hotel, Beijing on 22 July 2005. The UNIDO project team members wish to express their appreciation to the national and regional workshop participants for their valuable comments and direction.

Funding received for the preparation of this study from the Netherlands (Royal Netherlands Embassy, Beijing) and the People's Republic of China (China International Centre for Economic and Technical Exchanges, Beijing) is gratefully acknowledged.

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EXECUTIVE SUMMARY

1. At the request of the National Development and Reform Commission (NDRC), this UNIDO project undertook a comparative assessment of the industrial competitiveness of all Chinese regions, in order to learn from successful regions and to formulate policies and strategies (at the national, regional and local levels) to enhance the industrial competitiveness of Western China, and thus redress regional balance between the coast and the rest of the country. The study also provides policy suggestions as inputs in drafting parts of the eleventh Five-Year Plan (2006-2010) which address western region development and industrial competitiveness in general.

2. This policy study uses much new data and existing data presented in a novel way. The National Bureau of Statistics and the Customs Office of China provided special tabulations of regional statistics using international classification schemes to match international data, namely the UN Comtrade database. The study also commissioned two manufacturing surveys in Shaanxi (one for enterprises of varying size, and the other exclusively for 'below-scale' small and medium enterprises), as well as business cost surveys in selected coastal and western regions. The study's key findings are as follows.

Benchmarking regional manufacturing performance

3. The rapid stride made by China in the production and exports of manufacturing goods originated almost entirely in Eastern China. The UNIDO Competitive Industrial Performance Index (CIP), a composite of four indicators of manufacturing production and manufactured exports compiled for all 31 regions in China, confirms the overall dominance of eastern regions at the top half of the table, while central and western regions dominated the bottom half. The CIP also found that the overall competitiveness ranking changed little between 1995/98 and 2002/03, supporting world evidence that performance is the outcome of slow and incremental processes.

4. The coastal regions used a market and technology-oriented industrial strategy to great effect. By identifying and efficiently supplying large and dynamic exports markets, whether for resource-based, low technology or technology-intensive products, the eastern regions were able to accelerate their learning of best practices due to frequent interactions with international buyers and agents in the global supply chain. No less important, they increasingly targeted technology-intensive manufactures, but not at the expense of low-technology goods. Their gradual orientation towards more sophisticated goods allowed them to develop their design and development capabilities, and to develop extensive supplier and sub-contractor networks. The more advanced producers invested in R&D and forged close interactions with firms, universities and research institutions.

5. In contrast, the western and central regions appear to have focused on exporting more primary commodities and less processed manufactured products. Though they displayed some industrial and export dynamism, they had a relatively small impact in world markets, and added modest value to their manufactured goods. The share of technology-intensive products in the latter was negligible. As a result, the industrial divide between the coastal regions and the rest was substantial and widened over time.

6. The government's concern with the promotion of small and medium enterprises (SMEs) is relatively recent, and official agencies have only just begun to pay attention to their diversity and scope. The so-called 'below-scale' enterprises in fact accounted for over 40 percent of total manufacturing employment and 68 percent of employment in manufacturing TVEs in 2003 in the country. They respectively employed an average of just 30 and 8 workers per enterprise. The most important constraint faced by the surveyed SMEs was limited access to capital. SMEs have a great potential to generate broad-based income and employment, as well as to redress regional disparities.

7. China has vast environmental resources, which have contributed to its recent rapid economic development, but urbanization and industrialization have seriously damaged air, water, and soil quality over the last two decades. Since the 1980s, environmental protection has been one of China's core national policies and there is now a great deal of environmental legislation in place. Nevertheless, China's record of compliance is poor, especially in rural areas. As threats to environmental resources become more severe and obvious, businesses will increasingly face governmental regulation and pressure from stakeholders, including customers, investors, activist shareholders, and civil society. Moreover, competing businesses in other countries are seeking to build brand recognition and reputation by being the first to address the issues surrounding environmental degradation. As a result, exports in which China enjoys great competitive advantages are likely to encounter environmentally motivated consumer challenges in international markets.

8. More market tools should be applied to environmental issues as China continues to move toward a market-based economy. As part of this movement, industries and governments should ascertain the full price of ecosystem services upon which they depend, as these services are currently often under-priced or not priced at all. Moreover, the price of ecosystem services should be taken into account when formulating strategies for improving and sustaining industrial competitiveness. In developing such strategies, businesses and governments should be explicitly aware that although new environmental regulations may sometimes hinder short-term industrial development, the early adopters of such policies are likely to enjoy a head start in the emerging industries of the environmental economy.

Determinants of Manufacturing Performance

9. Manufacturing performance is influenced by a range of factors, including the macroeconomic environment, the overall investment climate and business environment, government policies and regulations, foreign direct investment, political and social stability, supporting institutions, skills, technologies, infrastructure, and many other factors. This study focuses on the key structural influences which are directly relevant to building manufacturing and technological capabilities.

10. This policy study confirms findings from around the world that the regions which performed best in the manufacturing competitiveness index were also those which upgraded their technological capabilities the most: they spent the most on research and development by manufacturing enterprises and royalties. They also possessed the best modern physical infrastructure, attracted the most FDI, and had the most educated labour force. The differences in manufacturing performance between eastern regions on the one hand and western and central regions on the other hand are matched by similar

differences in these determinants of manufacturing performance. In all four cases, the gap was not only substantial but widening.

11. *Education.* Educational disparities are large and widening. The student enrolment rate at the higher education level in the west was only half that of the east, while educational expenditure per capita in the west and centre were also half of the level in the east. Since the primary responsibility for the public school budget rests with the local governments, the human resource gap between the richer east and the poorer west will continue to widen in the future, unless the regional governments left behind in education attainment can fund their education system more aggressively, and unless the central government also allocates supplementary funds to them.

12. *Technological effort*. Eastern regions not only dominated technological development in China, but also increased their lead over the rest of the country. By 2002, they accounted for 70 percent of total R&D expenditures in large and medium enterprises, 53-55 percent of science and technology personnel and graduates, 70 percent of all contractual inflows to domestic markets, and 95 percent of imported technical contracts for technology and equipment. The Shaanxi manufacturing surveys confirmed that the large majority of firms did not rate their interaction with potential technology providers as important, whether research institutes and university departments, equipment suppliers, licensing firms, clients, other similar firms, industry associations, technical consultants or technical literature. Their technology acquisition channels were limited to in-house development, equipment purchase or hiring technical personnel.

13. *Foreign direct investment*. Eastern regions were far more successful in attracting FDI, some $45 billion versus US$2 and 5 billion for western and central regions in 2002. FDI increased by 5.5 percent per year between 1995 and 2002 in the east compared with just one percent per year in the west and east. As a result, the east's overall share in FDI amounted to nearly 90 percent of the total. This suggests that foreign investors lacked knowledge of investment opportunities in western and central regions, due perhaps to lack or information or misconceptions related to transport costs, skills availability, infrastructure availability and reliability, quality of life, labour costs, and other factors.

14. *Physical infrastructure*. In traditional infrastructure such as railways and highways, the western and central regions were not left behind the eastern regions and, in many cases, were even ahead on a per capita basis, especially in highway density. In terms of modern infrastructure however, the density of land telephone lines, internet and mobile phones, was significantly lower than in the east.

15. *Overall investment climate and business environment*. A preliminary comparison of business costs between selected western and eastern regions indicates that western regions offered a solid cost advantage in labour costs, facility costs, utility costs and living costs, and were only at a slight disadvantage in transport costs. These and other aspects of the overall business environment are summarized below.

16. *Labour costs*. The official minimum wage rate in western regions was less than 60 percent of eastern regions, while the market wage rate for unskilled workers, assemblers, operators and tradesmen ranged from 70 to 75 percent of their eastern counterparts. At supervisory, professional and managerial levels, the wage rates were about the same.

17. *Transport and utility costs*. Western regions were only marginally more expensive in transport costs for exporters, because sea freight accounted for most of the transport costs to the USA and Europe. However, their higher road transport costs put them at a disadvantage for inter-regional trade, especially in the lucrative costal markets. Utility rates in western regions were either equal or lower than in eastern regions.

18. *Facility costs, borrowing rate, tax rates and other costs.* Factory land cost less than half of that in the east, and construction costs, office lease and warehouse space ranged from a third to three quarters of that in the east. Secured commercial borrowing rates were uniformly low throughout China at just over 5 percent per year. Living costs in Western China were substantially lower than in Eastern China, about half for international standard housing and international schools.

19. *Business registration, regulations and inspections*. There is evidence that firms in advanced regions face lower regulatory burdens than less advanced ones. This is likely to create divergence between rich and poor regions, because investment will flow to where it is less difficult to get things done.

Product Choice

20. Development experience around the world suggests that interventionist regional development policies have largely failed to accelerate growth, except in brief periods. Many of the big failures of regional development concerned large industrial investment projects. Consequently, non-discriminatory policies such as those outlined above have gained favour over those with a sub-sector or industry focus. They require less detailed information and less implementation capacity on the part of government agencies, while averting the risk that policymakers would pursue capacity creation in non-competitive industries.

21. Nevertheless, as soon as manufacturing performance is measured and ranked in terms of some types of industries or products against others, intentionally or unintentionally, it draws attention to particular industry or product choices. The indicators used to measure manufacturing performance themselves inevitably become the natural object of the policymakers' attention and promotion.

22. Western and central regions can learn from the experience of eastern regions. A gradual and timely diversification of the manufacturing sector towards the production of a selected number of higher technology goods and exports can help them prepare for the future, as well as accelerate innovation and learning, and generate externalities in the rest of the economy. For sustained industrial development, reliance on static endowments such as primary resources and inexpensive labour is a good way to start, but this should be accompanied by building and enhancing technological capabilities to produce technology-intensive manufactures.

23. The increasing production of more sophisticated goods can allow western and central regions to develop their design and development capabilities, and to develop extensive supplier and sub-contractor networks. For more advanced products, firms will need to increase R&D investment and forge close interactions with firms, universities and research institutions. In the meantime, they can continue to identify and efficiently supply dynamic exports for which the world market is growing above average, whether resource-

based, low technology, or medium and high-technology products. In this way, they will be able to accelerate their learning of best practices due to regular interactions with international buyers and other agents in the global supply chain. In sum, while increasingly targeting the production of technology-intensive manufactures, they should by no means ignore or discriminate against labour-intensive and low technology manufactures.

24. Central and Western China's rich natural resources and abundant and inexpensive labour give these two regions great industrial potential. They may maintain a static comparative advantage in resource-based and labour-intensive manufactures over the east in the years to come. However, this study shows that these regions have not exploited the full potential of their agro-industries. They both need to move up the value chain, and increase processing activities of their agro-industrial products.

25. There is a danger that, in their haste to promote higher technology industries, the regions opt to invest in the same sub-sectors. For instance, in the tenth five-year plan (2001-2005), some twenty regions targeted motor vehicle manufacturing as their industry of choice. To avoid costly excess capacity of this type, at the outset, the government and the business sector (including state-owned enterprises) should produce a joint long-term vision of where the region wants to be in terms of industrialization (what types of products it would like to produce and export, and what other types of goods it should continue to import), to provide broad signals to investors, and to develop guidelines for government-business sector resource mobilization. This collaborative process is by itself very important to reach a common vision, which can be articulated in a joint government-business strategy on industrial competitiveness.

Implications for central government

26. *Education*. To reduce educational disparities between the east and the rest of the country, the central government can allocate additional funds to assist the regions left behind.

27. *SME promotion*. The central government can consider taking the following measures to promote small and medium enterprises in the manufacturing sector:
    - Target government funds, preferential measures and other promotional efforts at small enterprises only, not small and medium
    - Ensure balanced regional development, by allocating more funding to lagging areas
    - Increase the flexibility of interest rate ceilings so that banks can charge commercial rates to smaller enterprises
    - Channel SME development funds through commercial banks
    - Encourage the banks to increase the competency of their staff to effectively deal with SMEs, including re-aligning the internal incentive system to remove SME bias
    - Remove the high-technology bias in SME promotion
    - Unify the government administration for urban and rural SMEs
    - Improve the SME Promotion Law
    - Improve data and information on SMEs
    - Monitor and evaluate SME promotion programmes
    - Employ SME promotion to address global concerns in environmental protection and energy conservation.

28. *Internationally comparable manufacturing statistics.* In order to support benchmarking exercises such as the ones contained in this study, and to enable regions to assess and monitor their industrial development performance relative to other regions and even other countries with similar resources and industrial structure, the National Bureau of Statistics and the Customs of China should make available manufacturing production and export statistics using:
    - International classification schemes (ISIC and ISTC)
    - Technology categories (resource-based, low-technology, medium-technology and high-technology)
    - Data on trade flows between regions.

Implications for regional governments

29. *Focus on key determinants of manufacturing competitiveness*. The regional governments have the more important direct role to play to enhance industrial competitiveness. They need to focus on the key structural determinants of industrial performance, namely technological effort, foreign direct investment, and modern infrastructure, and educated labour force. Perhaps the most important measure is to encourage the widespread development of technological efforts in all types of industries, not just high technology firms, and firms of all sizes. Other important areas are effective investment promotion and SME development. In all three areas, the western and central regions must learn from their eastern counterparts and from successful examples abroad.

30. *Develop manufacturing and technological capabilities of all firms.* Technological effort takes many forms, not just R&D, and includes activities such as purchase of machinery and turn-key plants, reverse-engineering and continuous improvements in process, product and logistics. Specific measures the regions can initiate include:
    - Reform or establish technology extension services oriented towards all firms, not just high technology firms.
    - Re-invigorate official technology and manufacturing service providers, including government and university research institutes, metrology, standardization, testing and quality control (MSTQ) services, and productivity centres; consider their provision through government-business partnerships, or by private firms and industry or business associations.
    - Encourage industry associations to increase their direct involvement in industrial technology development strategies, priorities and programmes.

31. *ISO certification*. There is evidence that ISO certification is granted too readily in some regions. The whole ISO certification system needs to be reviewed, with the view to adopting more stringent guidelines, and to tightening up the process so as not to dilute the value of such certification.

32. *Investment promotion services*. Many western and central regions possess adequate and reliable infrastructure and skills for the manufacturing sector, and offer substantial labour cost advantage to attract more FDI. However, foreign direct investment will not automatically flow in unless the regions devote sufficient resources to publicize business opportunities to prospective investors. Western and central regions need to step up their investment promotion services by learning from their eastern counterparts and by learning from successful examples abroad. The following measures can be taken:

- Labour cost is perhaps the most important factor in the location of manufacturing plants, so their labour cost advantage should be well publicized
- Attract the right kind of foreign and domestic investment
- Establish an authoritative promotion agency
- Produce and disseminate effectively up-to-date and accurate business cost surveys
- Attract domestic investments, since they are of a much larger magnitude than FDI

33. *SME promotion*. Since the vast majority of SMEs do not regard the existing technological support institutions as important for raising their manufacturing capabilities and competitiveness, the regional governments can take the following measures:
    - Focus technology extension services on SMEs and revamp them to become proactive
    - Encourage universities and private and public training institutions to become more proactive in selling their services to the SMEs
    - Encourage business and industry associations to promote technological development
    - Facilitate access to business development services (the functions of facilitating organizations should not be confused with providers of BDS)
    - Publicize and facilitate tax deduction for R&D and training
    - Match central government funds for SME development with own resources.

34. *Sub-sectoral development strategies.* The practice of policy implementation around the world shows that many policies need to address sub-sector issues in trade and commercial policies, export promotion programmes, industrial restructuring programmes and cluster support policies. Moreover many government-business sector networks are organized around sub-sectors. Nevertheless, the following should be kept in mind.
    - *Selectivity*. The regions should identify a narrow group of industries, without however prejudicing other industries, and set out transparent policies to promote them, as well as clear-cut guidelines against which their success can be evaluated. Also, since government resources for industrial promotion are limited, the promotional strategy should remain focused on priority areas. Intervening in a large number of unrelated activities will risk diffusion and failure.
    - *Government-business vision and partnership*. The starting point would appear to be a thorough process of government-business consultations and deliberations, culminating in the joint formulation of a long-term vision for the selected industries. A broad coalition of public, private and academic players is needed to give direction to industrial strategy. Business and industry associations which effectively represent their members must play a key role of dialogue partners of the government departments in charge of industrial development. The vision should contain a realistic assessment of the competitive potential of various sectors.
    - *SWOT analysis*. Once industry-specific visions have been formulated, a stocktaking exercise can analyze the strengths and weaknesses of the selected industries, in order to reach government-business consensus on medium-term objectives for sub-sector development. This can also happen the other way round, i.e., the result of sectoral analyses and competitiveness profiles can serve as input for strategy formulation. Export competitiveness profiles, such as the ones shown in this report, are a useful starting point in describing their current competitiveness situation and recent trends, as well as point out opportunities and challenges in the world market. Data permitting, export competitiveness profiles need to be supplemented by domestic market competitiveness profiles. This descriptive analysis then needs to be followed by more

detailed and deeper analysis of the factors responsible for the observed trends and patterns, and the underlying causes behind these factors identified.

- *Joint government-business formulation of operational programmes*. The SWOT analysis can be followed by the formulation of operational programmes, where industry associations and other government-business sector representatives define initiatives to enhance the competitiveness of all the firms in the selected sectors. Sources of funding for industry-specific operational programmes can be identified, and agreement reached on cost-sharing arrangements between the private and public sectors.
- *Implementation mechanisms, monitoring and evaluation*. Finally, procedures and mechanisms can be formulated for implementing the industry-specific operational programmes, and for monitoring and evaluating the programmes.

35. *Monitoring of manufacturing performance.* Regional governments can use the regional industrial performance index introduced in this report to assess and monitor their industrial development performance relative to other regions and even other countries with similar resources and industrial structure. The four benchmark indicators, used to produce the composite index, can in turn be used individually to analyze why their overall performance has outpaced or lagged behind that of other regions, as the case may be. In order for them to continue monitoring their industrial performance, the statistical authorities at the regional level must begin to classify industrial activities and exports by technology level and world market share using international classification schemes, with the assistance of the National Bureau of Statistics and the Customs Office of China.

Implications for local governments

36. Local governments have a distinct role to play, complementary to the central government and regional authorities, to enhance the competitiveness of manufacturing firms located in their areas. The main areas of intervention include the local business environment and investment climate, the pro-active role of business associations, SME and cluster promotion, education and training and government services.

37. *Business registration, regulations and inspections*. Local governments can speed up business registration and keep regulations and inspections to a strict minimum to reduce the regulatory burden on entrepreneurs.

38. *Contract enforcement*. To improve the overall business climate, local business and industry associations can work closely with the local government to achieve an efficient and speedy local court system.

39. *Business and industry associations as technology promoters*. Local governments should promote and encourage the formation of local industry associations run by their own members. The associations should then be encouraged to promote manufacturing and technological upgrading of their members, and to invest in common facilities such as quality certification, information services, trade fairs and joint marketing.

40. *SME promotion*. Many changes have already been legislated for, and many biases against SMEs have been formally removed. Now the initiative is with local governments to become the focus for improving the enabling environment for SMEs. Local governments need to systematically reduce the cost of doing business in the areas under their

jurisdiction, improve the attitude of staff regarding SMEs, and eliminate remaining extortionary practices. They should facilitate the provision of BDS for small businesses, and provide guidance to SMEs on how to operate within the law, and maintain social and environmental standards. In addition they can do the following:

41. *Government agencies and public service units* (*shiye danwei*) should withdraw from business development services, such as accounting, legal, consulting, brokerage and other business intermediation activities, since private sector establishments are better able to provide relevant services at competitive costs. This may necessitate selling off public units.

42. *Information provision*. While local industry associations can take the lead in providing information services, particularly on business opportunities, local governments, as already initiated in some counties, can complement this effort by providing information not yet available, or difficult to provide by industry associations, using documentation centres as well as the internet.

43. *Bridge the gap between universities and SMEs*. While universities and research institutes have generated many spin-offs in the area of technology-based SMEs, their interaction with other local SMEs is virtually non-existent. Thus a major opportunity for improving SME industrial performance on a permanent basis is being ignored. Local governments can actively foster contacts between universities and research institutes and the local SMEs through seminars, workshops, meetings and study tours.

44. *Education and skills* are the most important resource sought by SME after finance. Local governments are in effect responsible for providing most of the educated and skilled labour needed by SMEs. While government supervision remains a necessary ingredient, local providers of education and training must develop an intimate relationship with the SMEs so that the qualified labour is produced in line with SME needs. Local governments can also effectively take the lead in encouraging SMEs to retrain their staff in line with market developments and new technologies to enhance competitiveness.

45. *Encourage natural SME clusters*. Traditionally, local governments, and even regional governments, see themselves in rivalry with their neighbouring local or regional economies. Cluster management seeks to overcome administrative boundaries and encourage the development of natural clusters which cross county, district, city and regional boundaries. Cluster management also need a coherent overall administration for regional marketing, strengthening of institutional linkages, attracting qualified human resources, technology, and other inputs, and furthering the tacit knowledge available to the members of the cluster on product and process development. Cluster management seeks to organize a coordinated system of support to the cluster's enterprises to avoid the pitfalls of administrative fragmentation.

CHAPTER 1. INTRODUCTION

1.1 East-West Disparities and Regional Development

The Chinese per capita income grew ten-fold in the past twenty years. In such a large and diverse country as China, differences in economic growth rates and socio-economic development between regions are therefore expected. Nevertheless, differences between Eastern, Central and Western China are substantial even by the standards of other large countries[1]. For decades, the resource-rich west has been lagging behind China's coast in market-oriented reforms and openness to trade and investment. Moreover, income disparities have widened between regions, mainly due to the spectacular progress of the coastal regions.

China's economic take-off has been largely confined to coastal areas. Central and Western China, which account for around 62 percent of the country's population, registered a relatively sluggish economic growth and high levels of rural poverty. The west's manufactured exports per capita reached US$24 in 2002, or less than Bhutan (US$27) or Vietnam (US$25). Overall poverty incidence in China, which fell drastically between 1980 and 2000, though not evenly during this period, has stagnated since the mid-1990s, and may have worsened in the 2000s. Massive retrenchments in state-owned enterprises, and rural-urban migration allowed since 2000, have exacerbated urban unemployment. While large numbers of workers have moved to the richer east, regional imbalances remain substantial.

How long can China sustain an economic model with such acute interregional disparities? This has been indeed a major concern of the central government since the late 1990s. It is fully aware that increasing income gaps already evident between leading and lagging regions will eventually undermine social cohesion and stability. The government is equally aware that lagging regions will drag down the overall growth rate of the national economy, as well as limit the expansion of the domestic market. Moreover, China wants to avoid undue reliance on exports, so balanced growth requires an increased role of the domestic market to match that of exports. Finally, many lagging regions contain large numbers of poor people, including Gansu, Guangxi, Inner Mongolia, Sichuan, Shaanxi and Yunnan. Since poverty incidence is also more severe in these regions, the higher the economic progress of the west, the faster the progress in reducing overall poverty.

The government has therefore launched several large-scale initiatives to address regional development inequalities. In the mid-1980s, poverty alleviation efforts were given fresh impetus by targeting poverty programmes in 592 selected counties across the country. In early 2000, the State Council adopted the 'Great Western Development Strategy', and launched the Western Regional Development Programme (WRDP) to accelerate physical investment in twelve regions in Western China, many economically backward parts of the country. Also in 2000, the government adopted a poverty alleviation strategy called the 'Outline for Poverty Alleviation and Development of China's Rural Areas 2001-2010'. In a reversal of past policy, this policy supported out-migration and voluntary resettlement from disadvantaged areas, in addition to putting emphasis on agriculture, education and training for the poor, and harnessing science and technology to help reduce poverty.

China has made great efforts to reactivate the region's economy by offering fiscal initiatives, strengthening regional institutions, and accelerating infrastructure development.

[1] Eastern China comprises the following 11 regions: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan. Central China comprises the following 8 regions: Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei and Hunan. Western China comprises the remaining 20 regions: Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang.

Yet there is little doubt that the development of Western China is linked to the development of its industries. The huge industrial potential of the west is now becoming essential to the central government's policy agenda for at least four main reasons. First, China is undergoing a transition from a predominantly export-oriented country to one with more balanced growth and stronger domestic demand. Western China is called to playing a major role as supplier of parts and components to manufacturing-based companies in the coast.

Second, China became a net importer of farm products. Chinese imports reached US$14 billion in the first half of 2004 according to the Financial Times (22 August 2004), raising fears over food security. The development of the west's agro-industries to meet increased domestic demand, and thus reduce the dependency on foreign food imports, has become an important policy agenda. Third, China's energy consumption poses a big constraint to the national industry. Power outages have hit the country over the last years, as the country has increased its dependency on oil and natural gas imports. China's new long-term energy strategy considers top priority the development of the West's rich mining and gas resources to meet domestic demand. And fourth, Coastal China may lose its comparative advantage in labour-intensive sectors as wages rise. The west needs to stand ready to attract national and international investors seeking relocation.

While the rapid industrialization of western regions is necessary, it is less clear how the manufacturing sector of such diverse and remote regions can be developed beyond the general prescriptions of additional infrastructural facilities, and creating an enabling policy and business environment. This report provides additional suggestions to policy makers from a different and complementary perspective, that of building manufacturing capabilities and strengthening technological capabilities. But first, the overall patterns and trends in regional disparities, as well as the success of past regional development programmes, are briefly reviewed below.

Per capita income

Per capita GDP levels in Western and Central China reached only 40 and 50 percent of that of Eastern China in 2004 respectively. Differences were even more striking at the regional level, where the per capita income of municipalities such as Shanghai, Beijing and Tianjin were four to six times higher than in the poorest regions of Guizhou, Gansu and Tibet. Moreover income disparities widened across regions. The ratio of average per capita income between the leading and the lagging regions widened from 1.20 to 1.46 between 1980 and 1990, and further to 2.05 in 2000. This is one of the fastest increases in regional income inequality in the world measured in the state or regional level, namely, states in India and Brazil (World Bank, 2001a:1).

While regional socio-economic statistics are often only presented at the regional level, the available data at the sub-regional level show that rural-urban and intra-regional differences in income, growth and many social indicators were even more significant than broad inter-regional differences. For instance, Shanghai and Guizhou represented two extremes of per capita income levels in China. Yet, Guiyang prefecture in Guizhou region had a higher income per capita than several prefectures of Fujian and Zhejiang regions. Furthermore, retrenchment in state-owned enterprises since the mid-1990s has generated massive unemployment in many towns and cities, as well as eroding their tax base. In regions such as Liaoning, Jilin and Heilongjiang – all above average per capita income – there are many severely distressed towns and cities (World Bank, 2001a:1).

To be fair, development has by no means bypassed the poorest regions of China. Even poorer regions, such as Tibet, Heilongjiang and Qinghai, managed to grow at above 7 percent per year between 1980 and 2000. This would be the envy of even the fastest economies of Asia, not to speak of the rest of the world. Rather, many regions, led by

Guangdong, Fujian and other mainly Eastern regions, grew even faster at double-digit rates of 11-13 percent per year, some of them now earning per capita incomes ten to fifteen times higher than some twenty years ago. Some poorer regions such as Inner Mongolia, Anhui and Henan grew faster than average, thus improving their positions relative to others. Others, such as Fujian and Shandong, have gone from being at the bottom half of the table in 1980, to the top half in just twenty years. This suggests that with the right policy environment regions can improve their relative performance.

Poverty

Rural poverty. Most observers agree that the incidence of poverty in China's countryside fell sharply between around 1980 and the late 1990s. According to the National Bureau of Statistics, which uses a very low poverty threshold, the poverty rate fell from around one-third of the rural population to only about 3 percent between 1978 and 2000. World Bank estimates, based on the higher international poverty line of one dollar per day (purchasing power parity), show the rural poverty rate falling from 42 to 25 percent during the 1990s. The UNDP human poverty index fell from 18 to 15 percent between 1995 and 2000 (UNDP 2003:2-18).

Poverty reduction was concentrated in two relatively short periods, the first five years of the reform period 1979-1984, and the middle three years of the 1990s, both driven by agricultural development. The first period saw the dismantling of the rural commune system, and a land reform which parcelled out land to households on an essentially egalitarian basis. Farmers were freed from growing grain first, and allowed to diversify production. Farm prices were allowed to rise by 30 percent. Fertilizer supplies also increased rapidly. As for the second period, farm prices doubled in the middle of the 1990s, raising farm incomes by a fifth, leading to a decline in rural poverty of 40 percent in this short period.

Rural poverty incidence stagnated between these two periods, as well as after the mid-1990s, and may have even increased in the first half of the 2000s. The agricultural sector was again the main factor, with farm prices stagnating and the agricultural terms of trade deteriorating relative to industry. This underlines the importance of general economic policies for overall poverty reduction. In contrast, public anti-poverty efforts correlate poorly with actual poverty reduction. Such programmes accelerated since the mid-1990s just when rural poverty increased overall, helpful as they may have been in specific localities that implemented them.

Urban poverty. According to the official poverty line, which was substantially higher than the rural line, urban poverty incidence was about 4 percent for the 'full-status' population in 2002, i.e., excluding the floating population of migrants living in towns and cities. According to a recent ADB study, which carefully constructed poverty lines region by region, urban expenditure poverty was put at 11 percent in 2002, substantially higher than the official figure. Poverty among migrants was found to be around 15 percent in a special ADB survey of 1999, or fifty percent higher than for the full-status urban residents.

Urban poverty incidence has remained below that of rural areas for a number of reasons. Since the early days of PRC, China's urban cities and towns have been privileged places of residence. Their population size was controlled by a system of household registration (*hukou*) that barred rural-urban migration. Until recently, the state provided employment to nearly all city residents, and implemented a food procurement system which guaranteed urban supplies during periods of hardship and famine. Urban residents were also entitled to free health care, schooling and pensions, none of which were available to the rural majority.

The urban poor population was concentrated in the east, central, north and northeast regions. However, the northwest and the northeast, the regions with the smaller absolute

numbers of poor, were those with a relatively small urban population but a high relative incidence of urban poverty. Thus, for instance, urban *income* poverty incidence ranged from 3.7 percent in Yunnan to 4.8 percent in Sichuan and 12.0 percent in Shaanxi (ADB, 2002 in UNDP 2003:15). The corresponding figures for urban *expenditure* poverty were 9.7, 7.3 and 20.1 percent respectively (ADB, 2002 in UNDP 2003:15). In terms of numbers, both Sichuan and Shaanxi contained half of the total poor in their respective regions of the southeast and northwest (table 1.1).

Table 1. 1 Regional Distribution of Urban Poor Population, 1998

		Distribution (%)	Poverty Incidence (%)
	National	100.0	4.8
1	North	14.7	5.2
2	Northeast	21.4	6.7
3	East	18.2	3.0
4	Central	22.7	4.3
5	Southwest	10.1	4.5
6	Northwest	12.9	8.8
		12.6	n.a.
	Selected western regions		
a	Sichuan	4.8	4.7
b	Yunnan	1.5	3.7
c	Shaanxi	6.3	12.0

Source: ADB (2002) *Urban Poverty in PRC*, Final Report, TAR: PRC 33448.

Urban poverty is closely related with unemployment and inability to work, though half of the urban poor were working poor (China Daily, July 20-21, 2002 quoted in UNDP 2003:5). Urban unemployment has increased as the state has withdrawn financial support for ailing state enterprises. Official unemployment figures include only registered unemployed, around 6 out of a labour force of 213 million in 2000 (2.8 percent). Many laid-off workers retain a formal link to their enterprises, and are not eligible to register as unemployed. Official figures also exclude unemployed migrant workers in urban areas. If these are added, urban unemployment may rise to 13 percent of the labour force. A national safety net was not established before SOEs were reformed, leading to increased unemployment and urban poverty. China is trying to set up unemployment insurance and a guaranteed minimum living standard for urban residents, but both schemes are incomplete and under-funded (UNDP 2003:6).

Poverty reduction strategy. In the mid-1980s, the central government stepped up funding to fight poverty, spending some $3 billion by 2000. Most of the funds were targeted at improving economic conditions in poor areas, yet much of it never reached the poor for several reasons. First, some 592 poor counties were selected, often by means which were not totally objective, to be the beneficiaries of all the funds, at the expense of poor households in 'non-poor' counties. Second, the largest programme consisted of providing subsidized loans, initially directly at poor households, but later on shifted to farmers and enterprises. In return, the enterprises were required to recruit half of their new employees from among the poor. In fact few poorer workers were recruited, and loan repayment reached 50 percent at most (UNDP 2003:30). Third, the second largest programme was labour-intensive food-for-work programme to build rural infrastructure, but again ignoring non-poor counties.

A UNDP study estimated that the share of the poor population excluded from poverty reduction programmes increased from 25 to 46 percent of the rural poor between 1986 and 2000 (UNDP 2003:35). Moreover, the benefits of the subsidized loans and food-for-work

programmes, by their nature, were temporary. Households lifted out of poverty were likely to fall back into poverty once the programmes ended. As for the urban poor, the benefits provided to most registered unemployed were very small relative to their salaries during their employment. Most city and town governments lacked fiscal resources to provide counterpart funds for funding the new unemployment, pension and medical insurance systems. So they defined lower minimum living protection standards, and excluded many poor from the relief scheme. An example is Nanchong city, Sichuan region, where fewer than 9,000 of the 39,000 urban residents with incomes below the minimum living protection line received relief (Gao, 2001 cited in UNDP 2003:37). About 10 million out of around 14 million poor urban residents who were officially below minimum living protection lines were not yet included in the minimum living protection for various reasons (Gao, 2002 in UNDP 2003:22), mainly due to weak local budgetary capacity and large numbers of poor.

The poverty patterns and trends briefly reviewed can be summarized as follows. First, poverty incidence is increasing in the Western region of China. Second, the current poverty strategy is not working or is not sufficient to reducing poverty further. And third, the current poverty strategy must be accompanied by substantial efforts to create jobs in Western regions, attract investment which will have large multiplier effects in the local economy, and link the fast-growing economies of the coastal areas to the economies of the hinterland.

Lessons of regional development experience

What explains the low income and poor performance of different localities? Geography, endowments and public policy go some way towards explaining regional disparities. Geography refers to the spatial relationship between economic units, while endowments refer to institutions, physical infrastructure, natural resources, attributes and human capital. Public policies, which favour some regions against others, can also contribute to regional disparities. Regional development thus consists of overcoming the adverse effects of geography, endowments and public policy.

In general, Western regions do suffer from unfavourable natural endowments, including geographical location, topography, soil fertility and climate in comparison with Eastern regions. Nevertheless, past regional development policies have accentuated the East-West divide. Between the early 1980s and late 1990s, China's regional development strategy gave priority to coastal development. A series of favourable policies and incentives were provided by the central government to attract investment and other development resources to coastal regions, which were already more advanced than the rest of China. As a result, the coastal economy grew much faster than the hinterland, which was already disadvantaged in terms of harsh physical conditions, weather and larger concentration of poor population. While the faster growth of coastal cities and areas has created employment opportunities for workers from other regions (10 million workers from Sichuan alone, according to one estimate), East-West inequalities have nevertheless worsened. Unfortunately, many of the incentives provided to investment in Eastern areas remain in place, prolonging the discrimination against the West.

While policy measures can be implemented relatively easily, overcoming the handicaps of poor geography and endowments has proven to be difficult and costly. The development of coastal areas of China was possible largely because supportive policies built on relatively favourable endowments and proximity to markets. Even so, the cost of developing the coastal regions has been immense, with several localized and nationwide negative consequences, which new policies are beginning to address. It is unlikely that the lagging regions of China could easily adopt the coastal model of regional development.

Development experience from around the world suggests that interventionist regional development policies have largely failed to accelerate growth, except in brief periods. The

benefits of such policies have seldom justified the costs. Instead, accelerated growth has resulted largely from the removal of major distortions in the local economy, improving the investment climate, easing rigidities in transferring land, labour and capital to alternative uses, and addressing the fragmentation of the internal market for goods and services.

Regional development is indeed a drawn-out and arduous process, fraught with failures of otherwise well-intentioned interventions. Nevertheless, some degree of pro-activity is necessary to accelerate the development of lagging regions and localities for reasons already discussed above, namely maintaining social stability, expanding domestic demand and making the country less reliant on exports, and reducing poverty. To ensure that regional development initiatives have some chance of success, international experience suggests a number of guiding principles for accelerating the development of Western Chinese regions.

First of all the quality of investment is as important as the quantity of investment. If lagging regions are less efficient at making use of investment, then policy should emphasize as much raising the quality of investment as its quantity. The return on investment depends crucially on the investment climate. Its principal components are basic infrastructure (transport, power and water), human development, social protection, and rules and regulations concerning the setting-up and operations of businesses. The most crucial common characteristic of these components is that their effects are not limited to specific sectors, but diffused throughout the economy. Transport and human resources merit special attention.

Without a substantial reduction in transport and logistical costs, regional development faces an uncertain future. Overland access to the port from China's interior typically accounts for two-thirds of total transport costs. Whereas transport accounts for just 10 percent of the final products produced in Shanghai and sold on the West cost of the United States, this rises to 30 percent in the case of a producer located in Lanzhou (World Bank 2001a:3). Offsetting such effects is costly and takes time. They also require closer coordination between agencies and institutions to ensure efficient flows of goods from ports, airports, and railway and road terminals. In addition the implementation of supply chain management can reduce costs by lower inventories and more reliable delivery of inputs and products to final consumers.

An appropriate human development strategy is especially important in lagging areas to provide people with the ability to take advantage of opportunities as they arise. Unfortunately, the characteristics of many lagging regions – higher rural populations and poverty, minority groups, younger and rapid population growth, mountainous terrain and scattered populations, higher incidence of endemic disease, shortage of water and a higher proportion of distressed state-owned enterprises – make their human development and social protection challenges even more daunting than in other parts of China.

Second, since the outcome of an investment project is never certain, particularly in China where the scale of investment projects is so large and therefore potentially so costly, it is safer to select multi-purpose investments to deal with uncertainty and risk. Many of the big failures of regional development concerned large industrial investment projects. By contrast, infrastructural investments are location-specific but their returns are not specific to a particular activity. The same is true of environmental projects and human capital investments. The most successful examples of regional development, for instance in Ireland and the United States, resulted from an exceptional emphasis on human capital development.

Third, another important way of spreading risk is to invite broader participation from the non-state sector and individuals. In many regions of China, there is a large gulf between official pronouncements regarding the promotion of private enterprise and actual practice. Recent surveys in several regions have shown that barriers to private investment and bureaucratic oversight of non-state sectors remain high (World Bank, 2001a:5).

Fourth, many regions and localities produce development plans and investment lists based on perceived comparative advantages. Many stress the availability of natural resources including mineral and agricultural resources. While these are important potential sources of comparative advantages for lagging regions, they require substantial complementary inputs for their potential to be realized. Moreover, the identification of comparative advantage and 'winning' industries is an imperfect science in the best of circumstances. It is important to stress that comparative advantage is increasingly seen as created, rather than given by natural and other endowments. The challenge is to create networks of suppliers, processors, logistics providers, marketers and efficient intermediary services of all kinds. Since the government and state-owned enterprises are unlikely to rise to this task, the governments of lagging regions can focus on creating and maintaining the right investment climate, and let the dynamic business enterprises respond to the improved business environment.

1.2 How can Enhancing Industrial Competitiveness Help Western China?

Development experience from around the world shows that a thriving manufacturing sector offers an ideal opportunity for broad-based growth and poverty reduction. There are several well-founded reasons for the special place of this sector in economic development. First, unlike the agricultural sector, the income elasticity of manufactured goods is high. As incomes grow, households spend proportionally more on industrial products, ensuring a plentiful demand for manufacturing goods. However, the demand for some industrial products grows faster than others. When incomes rise, textiles and other basic goods begin to exhibit some of the low income elasticities characteristic of agricultural commodities. In contrast, the demand for technologically more sophisticated products, such as electronics and medicines, rises with income. So manufacturing production directed at these highly income-elastic products has better market prospects in the long run.

Second, among economic sectors, manufacturing perhaps displays the highest backward and forward linkages. This is because it is highly dependent on raw materials from the agricultural, mining and energy sectors, and on intermediate products from other manufacturing sub-sectors (backward linkages). It also makes heavy demands on products from most service sectors, including transport, logistics, trade, finance, insurance and banking, as well as being itself a primary user of products from other manufacturing sub-sectors (forward linkages). In the process, it creates and sustains not only direct employment in the manufacturing sector itself, but also generates substantial indirect employment opportunities in most other economic sectors.

Third, some manufacturing sub-sectors such as garments and leather goods are particularly labour-intensive. However, even when capital-intensive manufacturing sub-sectors generate little direct employment in their production process, such as motor vehicles or pharmaceuticals, they nevertheless exhibit substantial backward and forward linkages. The increased demand from all manufacturing sub-sectors for raw materials and services raises incomes and living standards even in sectors such as agriculture and trade where employment is already high but at low wages, thus indirectly alleviating poverty.

Fourth, related to its high backward and forward linkages, the manufacturing sector brings local producers in close and regular contact with suppliers of raw materials, equipment and machinery, and suppliers and buyers of other intermediate manufactured products located locally, in other localities and regions, and overseas. This continuous and intensive interaction broadens horizons, facilitates technology transfer and management know-how, and allows local producers to adopt best practices implemented abroad. The process of industrialization is associated with an acceleration of the rate of change of technology in manufacturing and in other sectors of the economy.

Fifth, rapid manufacturing growth in Eastern China and in many other countries was the engine of growth for their entire economies. This is due in part to the above average increases in labour productivity in this sector compared with other sectors. If, in addition, foreign direct investment can be harnessed in developing the local manufacturing sector, several benefits can potentially significantly contribute to economic development. Foreign firms can raise the level of capital formation, penetrate foreign markets, promote exports and generate foreign exchange. They can provide a much needed market for domestic supplier and support industries and, in the process, transfer technology, increase industrial linkages and stimulate industry as a whole, while providing direct and indirect employment. They can disseminate best practices through the demonstration of higher production efficiencies, labour standards, wages and environmental protection. Moreover, competition between foreign and domestic firms in a market dominated by a few large local firms can improve the competitiveness and efficiency of domestic firms.

The above benefits of industrialization, which can readily be seen as quite substantial and broad-based, will only materialize if the manufacturing firms in Western China can compete against products from Eastern China and other countries. Only their increased competitiveness can generate additional and direct employment in the factories, indirect employment in the service sectors such as transport, trade, communications, logistics, finance and banking and, more importantly, higher and steadier income for the rural population which supplies raw materials to industry.

However, raising the cost competitiveness of manufacturing firms in Western China presents formidable challenges. Their land-locked geography and rugged terrain naturally translate into higher transport costs, which can only be partially be offset by lower wages. In any case, labour costs only account for less than ten percent of production costs on average in the generally capital-intensive manufacturing process. Other economic factors such as inadequate physical infrastructure, bureaucratic red tape and a poorer investment climate, sparsely populated areas in many parts and the generally lower purchasing power of their populations also mean higher costs. Western regions also have to compete against some of the most ruthlessly efficient manufacturing producers in the world right at their doorsteps in Eastern China.

The challenge for manufacturing firms in Western China is therefore to produce goods encompassing increasingly higher value-added activities to offset their cost disadvantages, to identify new market niches for their products based on their natural comparative advantage, and to specialize in new products where they have created competitive advantage, as well as to develop marketing and distribution channels to reap the relatively higher value-added content of these activities. In the meantime, the government and the manufacturing firms can start by working together to improve the business climate in areas over which they have control.

1.3 A Guide to the Methodology and Structure of this Policy Study

The preceding sections have attempted to set the overall context of the policy study by describing briefly the extent of the East-West divide, the potential role and pitfalls of regional development interventions to remedy some of these disparities, exacerbated in part by the stunning success of manufacturing firms in the coastal regions of China, and the benefits of accelerated industrialization for the overall economic development of the Western regions.

Mere industrialization without due attention paid to raising the competitiveness of the manufacturing firms, will not succeed in generating substantial employment and raising the incomes in this large and yet impoverished region of China. The first step on the road to more rapid and broad-based economic growth is for western regions to find out where their

manufacturing performance stands in relation to eastern regions and central regions, as well as how they compare with other countries in Asia and the rest of the world. Chapter two therefore benchmarks their manufacturing and trade performance against all other Chinese regions and, where relevant and feasible, against other countries. A total of four performance indicators are used to benchmark both manufacturing value-added and manufacturing exports, including overall levels, growth rates, structural changes and technological upgrading. Finally, to facilitate presentation, an overall competitiveness index, first developed in the UNIDO Industrial Report 2002/03 (UNIDO 2002) ranks the manufacturing and trade performance of all the Chinese regions against one another.

Chapter three then attempts to explain the differences in manufacturing and trade performance described in chapter two by comparing and benchmarking relevant indicators of industrial capability. These include indicators of human capital (education levels, specialized science and technology manpower), technology development (research and development expenditure), domestic and foreign direct investment, and infrastructure (traditional and modern such as information communication technology). For this purpose, this study commissioned a special survey of 90 manufacturing enterprises in Shaanxi to systematically collect information on their human resources and their technological efforts. Conclusions and policy implications are drawn for strengthening technological efforts at the enterprise level, including the crucial role of support institutions, as well as the regional governments' efforts to step up investment promotion and educational attainment.

In addition to investment in physical and human capital, the business environment, government policies and government regulations play a crucial role in fostering or retarding manufacturing development and competitiveness. These issues are taken up in chapter four, by first comparing the cost of doing business in three western regions (Shaanxi, Sichuan and Yunnan) with that of three eastern regions (Shanghai, Jiangsu and Zhejiang) in terms of labour of different types, start-up facilities, transport, utilities and other facilities. Next, the chapter assesses the business environment and investment climate facing manufacturing enterprises, including the regulatory environment, and the role of industry associations as promoter of manufacturing capability. The above-mentioned manufacturing enterprises survey thus also collected systematic information on the constraints facing enterprises in their operations and growth.

Considering the overwhelming bias of government agencies at the central, regional and city or prefecture levels towards the promotion of large and very large industries in the past, chapter five turns to the assessment and challenges faced by small and medium-scale industries. Since information and data collection for SMEs is still in its infancy in China, the chapter starts out by mapping manufacturing SMEs, and assesses their importance in value-added and employment relative to large firms. Policies regarding their manufacturing and technological capabilities, as well as those addressing the major constraints facing them are developed based on the findings of a separate manufacturing SME survey in one selected prefecture in the food, machinery and pharmaceutical industries.

A number of conclusions and policy implications can be drawn from the assessment of manufacturing capabilities, the prevailing business climate and the existing framework of government oversight and policies affecting the manufacturing sector as a whole and for SMEs. In order to address challenges and opportunities at the sub-sectoral level, chapter six presents sub-sectoral competitiveness profiles of three western regions. Similar profiles can be prepared for more detailed assessments of other manufacturing sub-sectors. These assessments intend to convey the crucial message that public policy can go a long way towards influencing the nature, pace and direction of industrialization, without resorting to distortive pricing policies or firm-specific incentives.

The final chapter seven summarizes the main conclusions of this study, and discusses policy implications for the central, regional and local governments to help manufacturing firms raise their competitiveness and to promote regional development.

CHAPTER 2. BENCHMARKING REGIONAL MANUFACTURING AND TRADE PERFORMANCE

2.1 Introducing a Technology and Market Orientation to Manufacturing Performance

At present, industrial policy makers and analysts in China, at both national and regional levels, monitor developments in the manufacturing sector in terms of light and heavy industries. Manufacturing statistics are presented accordingly, and do not readily distinguish between industries which are technologically simpler and those which are more demanding and complex to establish. They also do not distinguish between products for which demand is stagnant on the world market, and those for which world demand is rising.

In contrast, industrial policy makers and analysts around the world increasingly use a technology and market classification to assess manufacturing competitiveness. There is much evidence to suggest that technology-intensive manufacturing sectors have better growth and trade prospects, offer greater learning opportunities, and often produce more externalities in the rest of the economy. They also generate higher value added and impose higher entry barriers to newcomers. By contrast, simpler industries, including resource-based and low technology sectors, generate lower and less sustainable margins because competition in such industries is much tougher. These industries, often labour-intensive, do not need a strong human capital base, and thus provide the first entry points to most developing countries on the path to industrialization (UNIDO, 2002). Thus technology-intensive manufacturing sectors are more beneficial to sustained industrial competitiveness and economic growth.

The present comparative regional study adopts a technology and market classification to industrial structure as a guide to the relative manufacturing production and export performance of each of the 31 regions in China (see box 2.1). This was made possible by the provision of specially commissioned region-wise detailed statistical tables from the National Bureau of Statistics [1] and the Customs Office of China[2]. Both agencies provided the required data using international classification schemes instead of the Chinese classification schemes normally used in statistical publications[3] .

This chapter shows that the rapid stride made by China in the production and exports of manufacturing goods originated almost entirely in Eastern China. Moreover, the coastal regions increasingly targeted technology-intensive manufactures, without however ignoring less technologically sophisticated goods. Their orientation towards more sophisticated goods allowed them to develop their design and development capabilities, and to develop extensive supplier and sub-contractor networks. The more advanced producers invested in R&D and forged close interactions with firms, universities and research institutions. No less important, by identifying and efficiently supplying dynamic exports for which the world market was growing above average, whether resource-based, low technology or technology-intensive products, the eastern regions were able to accelerate their learning of best practices due to frequent interactions with international buyers and other agents in the global supply chain. These are important lessons for the western and central regions in their quest for rapid industrialization and increased living standards.

[1] The National Bureau of Statistics kindly provided manufacturing production and employment data by province at International Standard Industrial Classification (ISIC) Revision Three, three-digit level for 1998 and 2003.

[2] The Customs Office of China kindly provided export data by province of origin at the Standard International Trade Classification (SITC) Revision Three, three-digit classification level for 1995 and 2002 for this policy study. Detailed data at the same level of classification for trade flows between regions or regions are not available.

[3] Manuel Albaladejo, independent consultant, compiled and processed the data required for the regional ranking, and prepared the manufacturing and export performance assessment for the second part of this chapter.

Box 2. 1 Classification of manufactured products by technological intensity

The classification used in this report is taken from the UNIDO Industrial Development Report 2002/03, which itself is based on that of OECD countries, excluding unprocessed primary commodities.

Resource-based manufactures: mainly food and tobacco, simple wood products, refined petroleum products, leather (not leather products), precious stones and organic chemicals. The products can be simple and labour-intensive (simple food or leather processing) or intensive in capital, scale and skills (petroleum refining or modern processed foods). Competitive advantage in these products generally, but not always, arises from the local availability of natural resources.

Low technology manufactures: mainly textiles, garments, footwear, other leather products, toys, simple metal and plastic products, furniture and glassware. These products tend to have stable, well-diffused technologies largely embodied in capital equipment, with low R&D expenditures and skills requirements, and low economies of scale. Labour costs tend to be a major element of cost, and the products tend to be undifferentiated, at least at the mass-produced (non-fashion) end of the scale. Barriers to entry are relatively low; competitive advantages in these products, of interest to developing countries, come from price rather than quality or brand names.

Medium technology manufactures: heavy industry products such as automobiles, industrial chemicals, machinery and relatively standard electrical and electronic products. The products tend to have complex but not fast-changing technologies, with moderate levels of R&D expenditures but advanced engineering and design skills and large scales of production. In engineering products there is emphasis on product design and development capabilities, as well as extensive supplier and sub-contractor networks. Barriers to entry tend to be high because of the capital requirements and strong learning effects in operation, design and, for some products, product differentiation. Innovation and learning in the engineering segment increasingly involves cooperation in the value chain between manufacturers, suppliers and sometimes customers for large items of equipment.

High technology manufactures: complex electrical and electronic products including telecommunications, aerospace, precision instruments, fine chemicals and pharmaceuticals. These products, with advanced and fast-changing technologies and complex skill needs, have the highest entry barriers. The most innovative ones call for large R&D investment, advanced technology infrastructure and close interaction between firms, universities and research institutions. But many activities, particularly electronics, have final processes with simple technologies, where low wages can be an important competitive factor. The high value-to-weight ratio of these products allows segments of the value chain to be broken up and located across long distances.

A limitation of the MVA and export data is that they do not distinguish countries by their genuine domestic capabilities in technology-intensive activities, due mainly to the spread of low high technology assembly activity to low-wage countries. Countries with low technology capabilities can appear technologically advanced, giving a misleading picture of industrial performance. On the other hand, many low technology and resource-based industries can have high technology segments. Other evidence on the spread of global integrated production systems dominated by transnational corporations and on local technological effort must be used to arrive at a fairly realistic picture of national technological capabilities. This should be kept in mind when comparing regions and countries. Still the technological complexity measure offers insight into the abilities of countries to sustain growth.

Source: UNIDO Industrial Development Report 2002/2003 (2002:30).

2.2 Benchmarking Regional Manufacturing Performance

Benchmarking, or the systematic use of comparisons, allows a country or region to assess its performance relative to other comparable countries or regions. It allows a region to answer questions such as: Are manufacturing production, exports and employment growing fast enough, given its resources, industrial structure and level of technology? Are domestic enterprises sufficiently innovative and participating in international knowledge flows? If other regions are doing consistently better, something must be lacking at home. It also allows policymakers to keep close track of other regions' industrial performance.

Several tools have been developed in recent years to compare the competitive performance of countries against one another. Among the better known ones are the World Economic Forum's (WEF) *Current Competitiveness Index and Growth Competitiveness Index,* the International Institute for Management Development's (IMD) *World Competitiveness Scoreboard* and the UNIDO's *Competitive Industrial Performance Index*. The Organization for Economic Cooperation and Development (OECD) has also recently come up with alternative country rankings (Causa and Cohen, 2004).

The UNIDO scoreboard complements existing competitiveness indices. Because it focuses on the manufacturing sector and a small number of structural variables, it is chosen here for benchmarking the manufacturing performance of Chinese regions amongst one another. Since it is difficult to find a single indicator that can capture all the dimensions of competitive production, the Competitiveness Industrial Performance (CIP) index for Chinese regions is the simple average of four basic indicators of manufacturing production and export performance used by UNIDO to assess the industrial performance of some 80 countries (UNIDO 2002, see box 2.2): manufacturing value-added (MVA) per capita; manufactured exports per capita; share of medium and high-technology MVA in total MVA; and share of medium and high-technology manufactured exports in total exports These four benchmarks allow regions not only to be compared with one another but also with other countries.

Box 2. 2 The UNIDO Competitive Industrial Performance Index (CIP)

The competitive industrial performance (CIP) index focuses on the national or regional ability to produce manufactured goods competitively. Since it is difficult to find a single indicator which can capture all the dimensions of competitive production, the CIP index is constructed from four basic indicators of industrial performance:

1. *Manufacturing value added (MVA) per capita*. This indicator measures the overall capacity of a country or region to produce manufacturing goods, regardless of population size. If all production was equally exposed to international competition, this indicator would be enough. However, natural barriers to trade such as high transport costs, and trade, legal and other institutional barriers limit exposure of domestic industry to international competition.
2. *Manufacturing exports per capita*. This indicates the ability of a country or region to participate in the international trade for manufactured goods, again regardless of population size. Exports can be taken to demonstrate that producers are using competitive (modern) technologies, and thus reflect the ability to keep pace with technological change.
3. *Share of medium and high-technology industries in MVA.* Industrial development generally entails moving from resource-based and low technology to medium and higher technology activities (Chenery, Robinson and Syrquin 1986). Technology intensive structures promote growth and development. They offer greater learning potential, and lend themselves more to sustained productivity growth. Many have stronger spillover benefits.
4. *Share of medium and high-technology products in total exports*. This indicator is taken separately because it can differ significantly from the corresponding share in MVA. In economies with large domestic markets, for instance, the MVA structure can be more advanced than that of exports. The UNIDO CIP uses the share of these products in total manufactured exports; however data constraints at the regional level in China precluded using this. The share in total exports was used instead.

The values for each of the four variables are standardized for the 31 regions, ranging from zero (worst performer) to one (best performer)*. The composite index is simply the unweighed average of the four standardized basic indicators. No weights are assigned to any of the basic indicators.

Source: *Unido Industrial Development Report 2002/2003* (UNIDO, 2002:42)

*All the indicators are standardized according to the formula: $I_{i,j} = \frac{X_{i,j} - Min(X_{i,j})}{Max(X_{i,j}) - Min(X_{i,j})}$ where $X_{i,j}$ is the value *i* of the region *j*, Min is the smallest value in the sample and Max the largest.

The CIP ranking of regions distinguishes five groups of regions (table 2.1): Group A consisted of Shanghai, Tianjin and Guangdong, with a CIP index of around 0.7 and above, well above all other regions. Group B comprised three regions, Beijing, Jiangsu, and Chongqing, with an index between 0.5 and 0.6. With the exception of Chongqing municipality, all regions in groups A and B were from Eastern China. Group C consisted of five regions with a CIP index of 0.34 to 0.40, including three from Eastern China (Liaoning, Zhejiang, Fujian) and two from Western China (Sichuan and Shaanxi). Group D, the largest, comprised eleven regions with a CIP index of 0.21 to 0.31, half from Central China and the other half from Western China. Finally, group E comprised the remaining six regions, and all except one, Hainan, in Western China. In sum, and as expected, the Eastern regions dominated the top half of the table, while central and western regions dominated the bottom half.

Two caveats are in order. The first one is that municipalities such as Shanghai, Beijing and Chongqing rank high in the CIP because their agricultural sector is confined to small areas in the outskirts of urban areas, and most of their production is of an urban nature, including manufacturing and services. Strictly speaking therefore, the CIP of municipalities is not directly comparable with that of regions with large rural populations.

Table 2.1 Ranking of Chinese Regions by UNIDO CIP Index 1995/98 and 2002/03

Ranking		Region	Index Value	
2002/03	1995/98		1995/98	2002/03
1	1	Shanghai	0.906	0.903
2	4	Tianjin	0.686	0.731
3	2	Guangdong	0.718	0.682
4	3	Beijing	0.705	0.585
5	5	Jiangsu	0.453	0.542
6	n.a.	Chongqing	n.a.	0.495
7	7	Liaoning	0.447	0.397
8	13	Zhejiang	0.362	0.391
9	10	Sichuan	0.407	0.366
10	18	Fujian	0.338	0.348
11	8	Shaanxi	0.442	0.341
12	9	Jilin	0.423	0.306
13	14	Hubei	0.355	0.299
14	6	Qinghai	0.448	0.282
15	21	Shandong	0.295	0.258
16	15	Guizhou	0.353	0.251
17	20	Hebei	0.297	0.244
18	22	Anhui	0.271	0.244
19	21	Guangxi	0.301	0.241
20	18	Ningxia	0.326	0.219
21	20	Jiangxi	0.318	0.217
22	17	Shanxi	0.336	0.214
23	12	Gansu	0.372	0.205
24	24	Hunan	0.248	0.198
25	19	Hainan	0.321	0.182
26	16	Inner Mongolia	0.350	0.158
27	25	Henan	0.230	0.146
28	23	Heilongjiang	0.264	0.128
29	27	Yunnan	0.198	0.094
30	28	Xinjiang	0.194	0.062
31	29	Tibet	0.000	0.056

Source: Calculated using special tabulations provided by National Bureau of Statistics and Customs Office of China using international classifications schemes

Note:

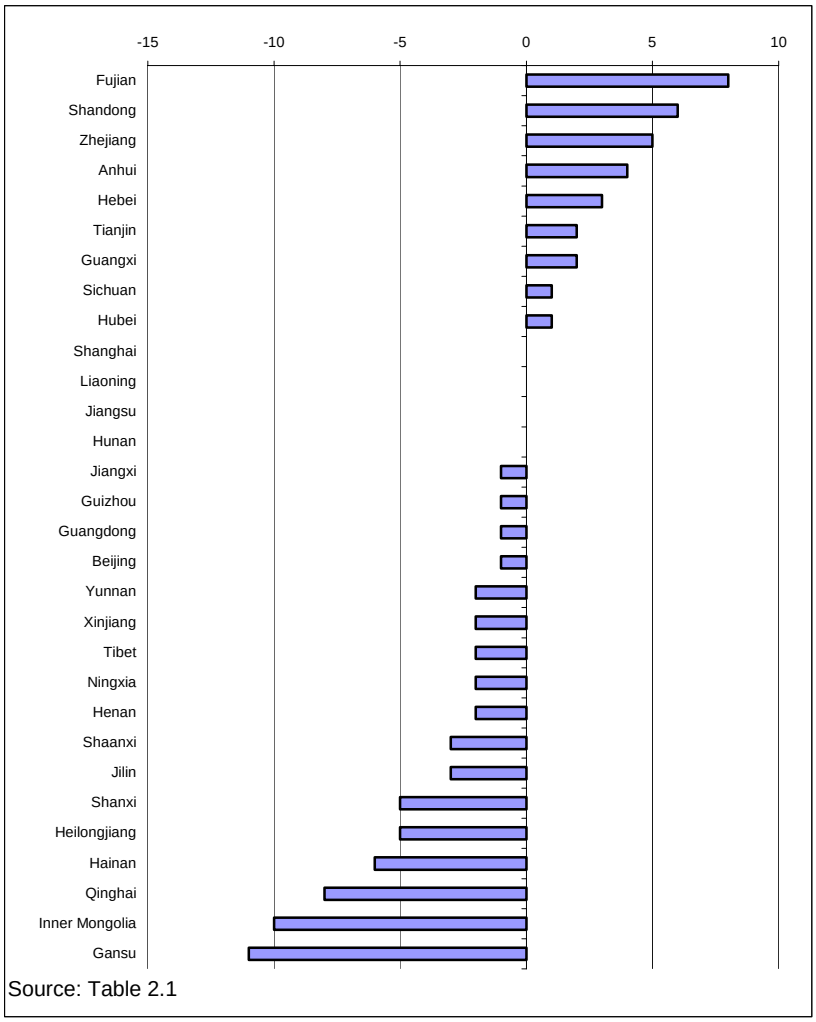
1. Comparable production data available for 1995 & 2003 (National Bureau of Statistics), while comparable export data available for 1998 and 2002 (Customs Office of China.

2. The CIP is the unweighed average of following four indices: 1. MVA per capita; 2. Manufactured exports per capita; 3. Share of medium and high-technology MVA in total MVA; 4. Share of medium and high-technology manufactured exports in total exports (see annex tables A.2.1 to A.2.4 for ranking of regions by individual basic indicators).

The second caveat relates to the large migrant workforce present in eastern regions, including municipalities. This workforce contributes to manufacturing production and export but remains unregistered in official population statistics used here to calculate per capita MVA and exports. This also inflates the CIP of eastern regions, while deflating the CIP of western and central regions which provide the migrant population.

Both these data limitations in effect exaggerate somewhat the competitiveness industrial performance gap between the eastern regions on the one hand, and the western and central regions on the other. Nevertheless, even after taking account of them, i.e., by ignoring the municipalities such as Shanghai and Beijing, and by adjusting for the migrant population, the eastern regions are still likely to outperform the western and central regions in the CIP index.

Figure 2. 1 Winners and Losers in CIP Ranking 1995/98–2002/03 (Places gained or lost)



Source: Table 2.1

In general the CIP ranking changed little at the top and bottom of the table from 1995/98 to 2002/03, but regions in the middle were more volatile (figure 2.1). Three regions improved rank by five or more places – Fujian, Shandong and Zhejiang –, for the main reason that they increased their share of medium and higher technology exports in total exports. In contrast, six regions lost ranks by five or more places – Gansu, Inner Mongolia, Qinghai, Hainan, Shanxi and Heilongjiang. In the case of losers, the reverse was true, namely, a decline in the share of higher technology exports in total exports. This was also accompanied by declining or stagnant total manufactured exports per capita. The losers lost rank even though MVA per capita, and medium and high technology value added per capita continued to grow as rapidly as in the case of winners, and even though the technological composition of MVA improved for most regions, with the exception of Gansu and Inner Mongolia. From a policy point of view, the winners improved their export competitiveness overall and in medium and high technology products in particular, while the losers failed to translate their increased capacity to produce manufactured goods and even technologically advanced products into increased exports relative to other regions.

Having described the overall CIP ranking of the regions, and changes between 1995/98 and 2002/03, the next sections turn to a more detailed investigation of the components of the overall index. Section 2.3 starts with a review of manufacturing performance, followed in section 2.4 by a review of manufacturing trade performance.

2.3 Manufacturing Production Performance

Manufacturing value added and employment

Manufacturing value-added. The manufacturing sector of China expanded by 18 percent per year between 1998 and 2003, and doubled its size in just five years in nominal terms (table 2.2). However, this growth was not even around the country. Eastern China expanded the fastest, by nearly 20 percent per year, compared with 14 percent per year for Central and Eastern China. As a result, Eastern China, which already accounted for 66 percent of manufacturing value-added in 1998, increased its share further to 72 percent of the total. Central and Western China's shares were respectively 17 and 11 percent of the total, both regions decreasing their share by 2-3 percent in this period. Since Eastern China accounted for 38 percent of the population, its per capita MVA was nearly four and five times larger than respectively Central and Western China.

Table 2. 2 Manufacturing Value Added by Region, 1998 and 2003

	Manufacturing Value-Added (Trillion yuan)		Share in total MVA (%)		MVA per capita (Yuan)		MVA growth rate 98-03 (%)	Popu-lation 2003 (m)	Share in total popu-lation (%)	Pop. growth rate 98-03 (%)
	1998	2003	1998	2003	1998	2003				
East	1,000	2,433	66.2	71.5	2,220	5,045	19.5	482.3	37.8	1.37
Central	305	583	20.2	17.1	749	1,369	13.8	425.9	33.4	0.91
West	205	388	13.6	11.4	593	1,057	13.6	366.9	28.8	1.23
China	1,510	3,404	100.0	100.0	1,255.3	2,669	17.7	1,275.1	100.0	1.18

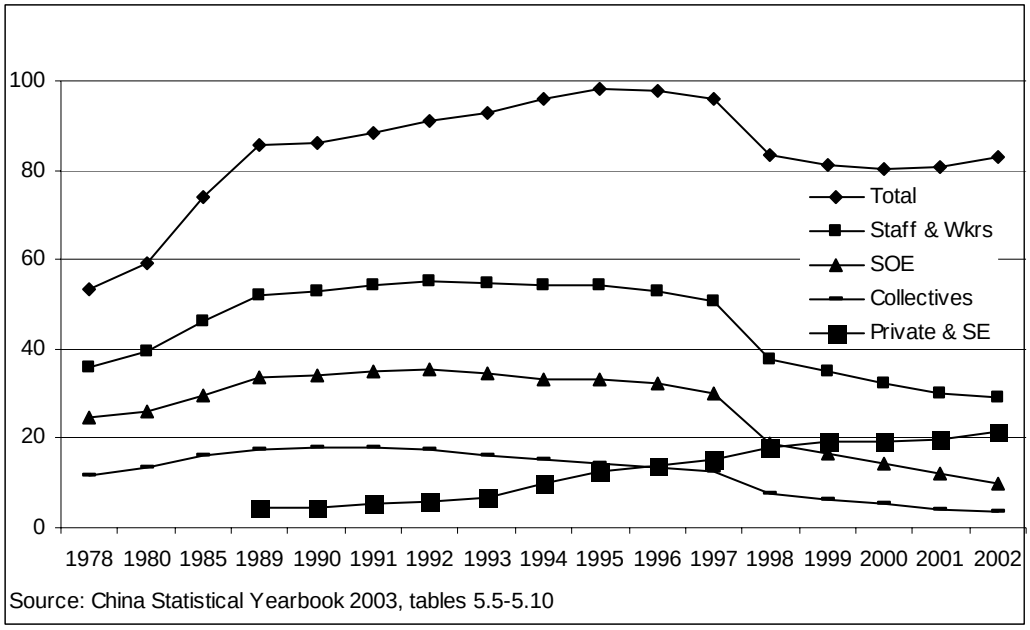
Source: Special tabulations, National Bureau of Statistics (see footnote 2).

As expected in such a large country, there were a number of exceptions to the overall trends by region. While the top ten per capita manufacturing producers were all in the Eastern region, with the exception of Jilin of Central China at number ten, and while most of these grew faster than the country average, the manufacturing sectors of Shanghai and Beijing grew slower at 12-14 percent per year, in favour of Guangdong, Zheijang, Jiangsu, Shandong and Fujian which raced ahead at 19-22 percent per year (annex table A.2.1).

There were also some success stories in Western China. Inner Mongolia and Sichuan, starting from a relatively low base, increased their per capita manufacturing production by over 20 percent per year. These two regions grew the third and fourth fastest in the country in the 1998-2003 period. However, Western China was also home to most regions which grew at less than ten percent per year, including Yunnan, Guangxi and Guizhou (6, 9 and 9 percent per year), with the exception of Hubei in Central China (8 percent per year).

Manufacturing employment. Total manufacturing employment doubled from around 53 to nearly 100 million between 1978 and 1995, but then remained around that level until 1998 (figure 2.2). Then came the large-scale privatization of state-owned enterprises, which slashed their manufacturing employment by some 26 million, most of this in the space of just three years, 1997-1999. While private sector employment rose steadily from less than 5 million to around 20 million in this period, it did not fully compensate for the total employment loss in SOEs, with the result that total manufacturing employment declined by 20 million to stabilize at around 80 million by 2000. Following stagnation between 1998 and 2001, manufacturing employment picked up again in 2002, with the addition of 2 million jobs in just one year, but total manufacturing employment was still some 15 million lower than twenty years earlier.

Figure 2. 2 Manufacturing Employment in China, 1978 to 2002 (million)



Technological upgrading of manufacturing production

China made relatively rapid progress in upgrading its production structure towards more technology intensive industries, with the share of medium and high-technology industries increasing from 52 to 58 percent of the total. The west, centre and east all upgraded their structure in this respect, by 5-7 percent in favour of medium and high technology industries. The eastern region remained ahead however, with technology-intensive sectors accounting for nearly 60 per cent of total MVA, compared with 52 and 56 percent for Western and Central China (table 2.3).

Table 2. 3 Technological Structure of MVA by Region, 1998 and 2003 (Percent)

	Medium & High Technology		Low Technology		Resource-based	
	1998	2003	1998	2003	1998	2003
East	54.1	59.1	20.4	18.3	24.0	21.4
Central	49.3	55.9	11.4	8.4	38.1	34.8
West	46.3	51.9	6.3	5.6	45.7	41.3
China	52.1	57.8	16.6	15.1	29.8	26.0

Source: Same as table 2.1
Note: Categories do not add up to 100% because of the omission of other manufacturing activities such as publishing, printing, and jewellery.

Interestingly, the regions with the highest proportion of technology-intensive industries were not in Eastern China, but Jilin in Central China, and Qinghai and Chongqing in Western China (74-78 percent of total MVA), ahead of the Eastern regions of Beijing, Tianjin, Shanghai, Guangdong, Liaoning and Jiangsu (62-73 percent of total MVA). The eastern regions of Fujian, Shandong and Zhejiang, which ranked high in per capita MVA and technology-intensive MVA, now ranked quite low in terms of share of technology-intensive MVA in total MVA, 26, 25 and 23 out of 31 regions (46-48 percent of MVA), lower than

many central and western regions. Shaanxi and Sichuan also did relatively well (62 and 57 percent of MVA).

Though Western China as a whole made rapid progress in raising the share of technology-intensive industries from 46 to 52 percent of total MVA in the period 1998-2003, resource-based industries still accounted for 41 per cent of its total MVA, while low technology products accounted for the remaining six percent of the total. With the exception of Chongqing and Inner Mongolia, all the western regions were in the bottom half of the table in per capita production of medium and high technology industries (table A.2.3). Central China was in a similar predicament, with only Jilin, Hubei and Shanxi in the upper half of the table. As a result, eastern regions dominated technology-intensive industries, with 10 eastern regions out of the top 15 regions with the highest per capita production of medium and high technology industries.

2.4 Manufactured Export Performance

Ideally, trade capability at the regional level should take into account both 'exports' to other regions and exports to other countries. Unfortunately interregional trade data, i.e., export and import flows between regions, are not readily available to capture the extent of domestic trade. So the assessment of manufactured trade performance is based here on export data only by region of origin to world markets for two years, 1995 and 2002.

Manufactured export capacity and technology upgrading

China's manufactured exports reached US$4,731 billion in 2002, increasing their world market share from 2 to 7 percent between 1990 and 2002. Manufactured exports accounted for most of the country's exports, rising from 88 to 93 percent of the total between 1995 and 2002. As in the case of manufacturing production, the eastern regions dominated manufacturing exports (93 per cent), and their share in fact increased over time. Only in primary exports did the western and central regions increase their share, though even here they accounted for just 29 per cent of the country's total primary exports.

On a per capita basis, the eastern regions exported twenty times more manufactures than central and western regions in 2002. In the medium and high-technology segment, the gap stretched to forty and twenty six times the exports of central and western regions respectively. Central China kept a slight competitive edge in resource-based and low technology exports, while the west did so in medium and high technology exports. However, sophisticated industries in the west were concentrated in just two provinces, Shaanxi and Sichuan, and one municipality, Chongqing.

Medium and high technology products were the driving force behind the export boom of coastal China, accounting for 51 per cent of total manufactured exports in 2001, and overtaking resource-based and low-technology exports (figure 2.3).

Central and Western China's exports grew above the world average between 1995 and 2002, though starting from a small base (figure 2.4). Yet their manufactured exports grew considerably less than their primary exports. In contrast, manufactured exports of eastern regions grew by 13 percent per year between 1995 and 2002, while primary exports grew below the average for the world.

While central and western regions displayed export dynamism, they continued to specialize in primary commodities. Also, because they started from a small base, the relatively high growth rate of their manufactured exports may be somewhat misleading. To bridge the manufactured export gap, central and western regions would need to grow faster than China's coastal regions, which is unlikely in the short run.

Figure 2. 3 Manufactured Exports per Capita by Region, 1995 and 2002 (US$)

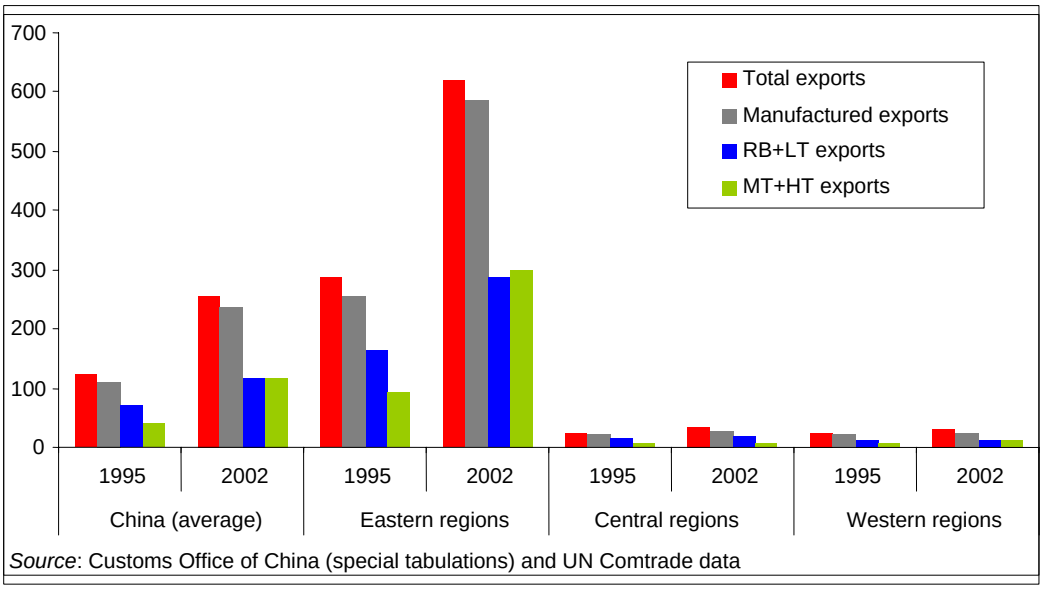


Figure 2. 4 Annual Growth Rates of Exports by Region, 1995-2002 (%)

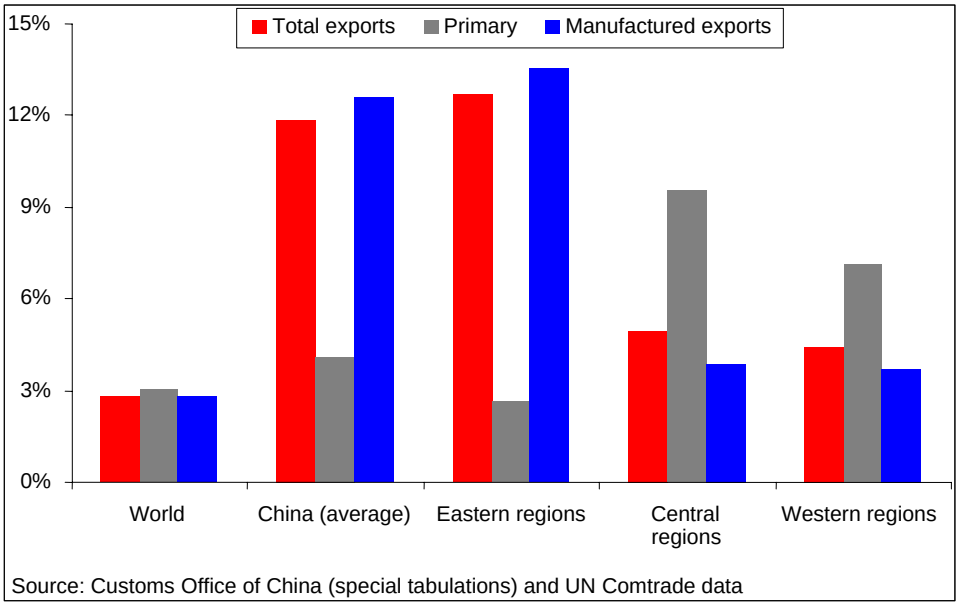
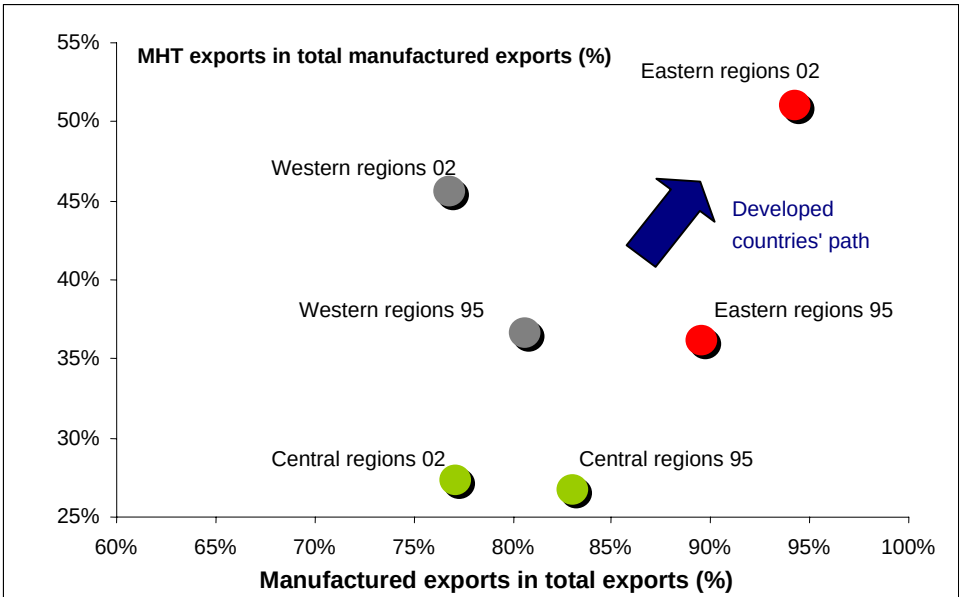


Figure 2. 5 Manufactured Exports and Technological Upgrading by Region 1995-2002 (%)



Source: Customs Office of China (special tabulations)

In international trade, the eastern regions followed in the footsteps of developed countries. Manufactured exports accounted for most of their exports, and the share of medium and high-technology exports represented more than 50 per cent of manufactured exports (figure 2.5). In contrast, central regions increased their dependency on primary exports, with little technological upgrading between 1995 and 2002. Similarly, Western China reduced its share of manufactured exports, though there was a significant technological upgrading within manufacturing. The latter was however concentrated in mainly Shaanxi, Sichuan and Chongqing.

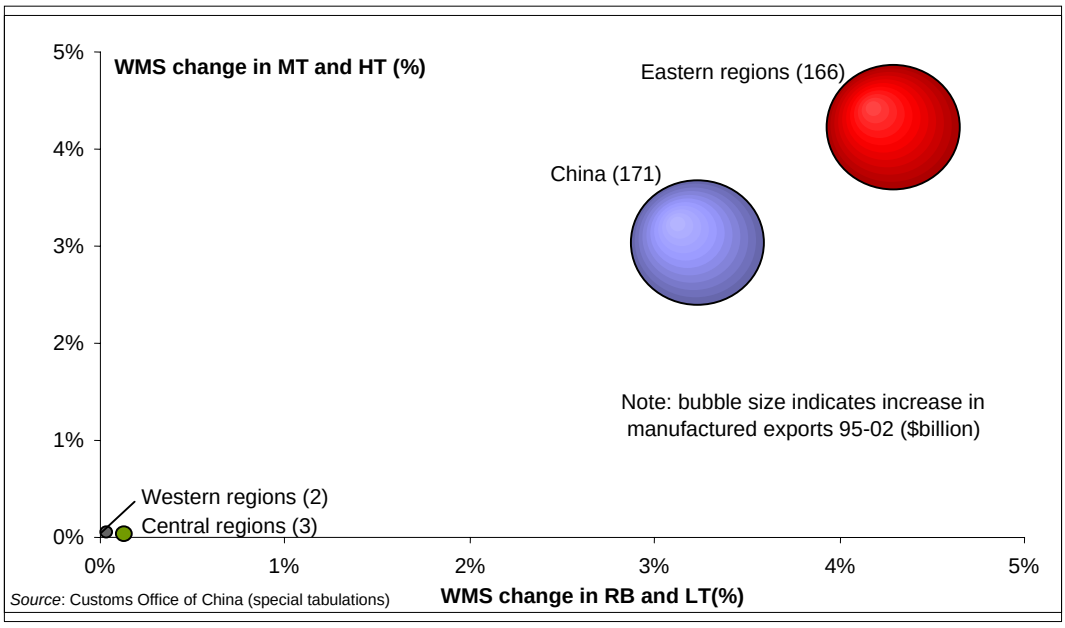
The above international and national comparisons do not capture the regions' factor endowments for competitive performance. Since Western and Central China have a stronger agricultural base and lower wages than coastal China, their strategy for economic and industrial growth may indeed follow a different path. Their factor endowments may offer them comparative advantage in resource-based and labour-intensive manufactures. They can complement this with selected sophisticated industries, which can bring about more rapid changes in technology, innovation and learning processes.

World market share

The share of a region's exports in the world market is a good indicator of trade performance. A rising share denotes increased competitiveness because its exports are growing faster than in other regions and countries. This is particularly the case when its world market share rises in export categories for which world demand is itself growing, the so-called 'champions' products.

China's share in world markets can be almost entirely attributed to coastal regions. These gained more market share than China as a whole, both in simple products (resource-based and low-technology) and complex products (medium and high-technology), while the shares of western and central regions in world markets were negligible (figure 2.6).

Figure 2. 6 World market share (WMS) change in RB, LT, MT and HT for Eastern, Central and Western Regions, 1995-2002 (%)

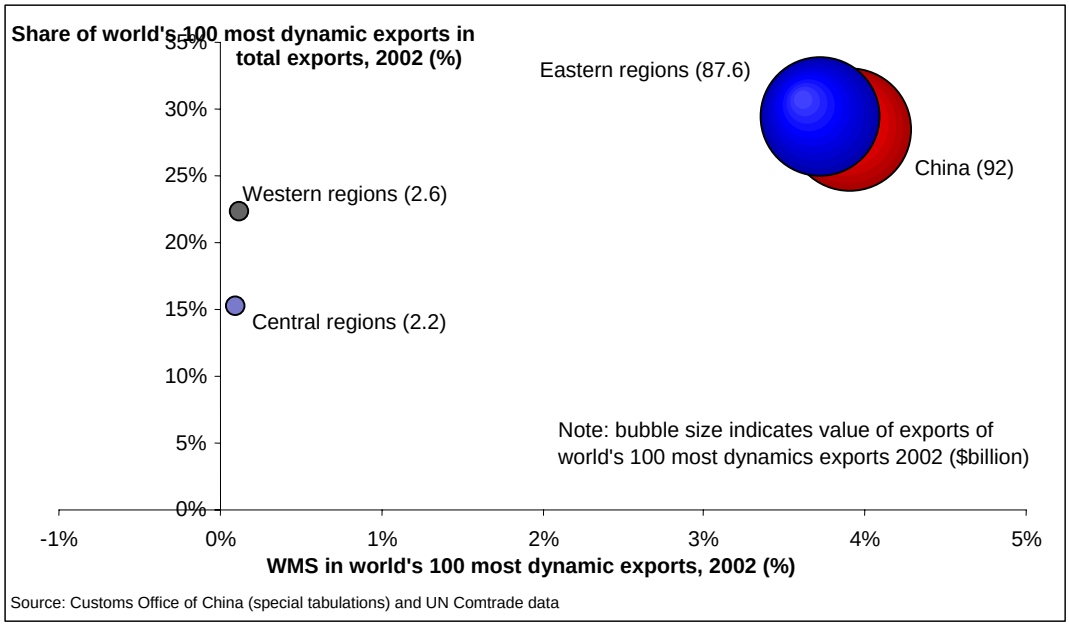


Eastern China accounted for 97 per cent of China's increase of manufactured exports between 1995 and 2002. Western and central China contributed little, only US$5 billion, to China's manufactured export boom for the period. Nevertheless, Central China made a slight indent in world markets for resource-based and low-technology products, with a 0.13 per cent gain between 1995 and 2002, while Western China accomplished this in technology-intensive products, with a modest gain of 0.06 per cent.

The success of the coastal regions can be partly attributed to their rapid response to international market signals, regardless of the technological intensity of the world's most demanded products. Eastern China, which produced 95 percent of China's total exports, also accounted for nearly four percent of the world's most dynamic products, i.e., those growing fastest between 1995 and 2002, and with a trade volume of at least US$5 billion (figure 2.7). In contrast, western and central regions did not perform well in the dynamic product category. Although more than 22 per cent of the west's total exports are considered dynamic products in world market, their impact was limited due to their small export volume, US$2.6 billion in 2002. Western and central regions only accounted for 0.11 per cent and 0.10 per cent of world market for the 100 most dynamic products respectively.

Learning from Eastern China, western China and Central China should be ready to tap into global exports regardless of their technology composition. Evidence shows that countries that have been able to participate in the world's most dynamic exports have also grown faster. This is because exporters who respond to market demand, and are flexible and quick enough to meet it, have a first-mover advantage over other exporters.

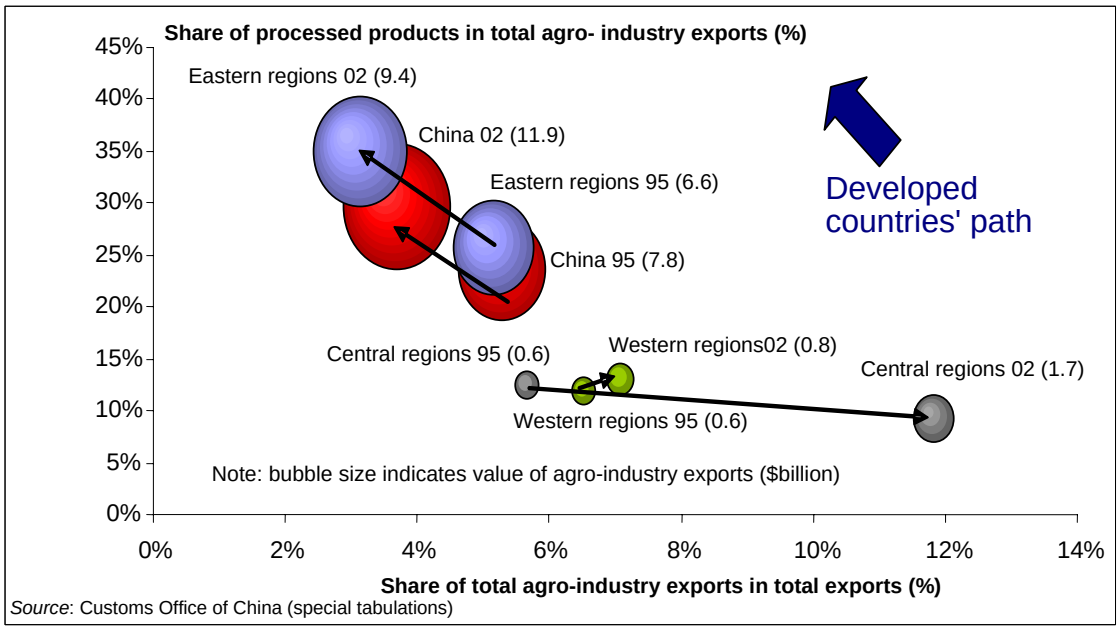
Figure 2. 7 Performance in the World's 100 most Dynamic Exports by Region



Trade performance of agro-industries

Eastern regions exported agro-industrial worth US$9.4 billion in 2002, and accounted for 78 per cent of China's total exports in this category. Central and west regions' agro-industrial exports only reached 18 and 6 percent respectively of the level of eastern regions. While the east reduced its dependency on agro-industry, western and central regions, particularly the latter, have moved in the opposite direction. The west experienced minor technological upgrading in the agro-value chain, due mainly to the surge of the fruit juice industry in Shaanxi (see later). In contrast, Central China exported less processed products than in 1995 even though agro-industrial exports accounted for almost 12 per cent of the regions' total exports in 2002.

Figure 2. 8 Agro-industry Value Chain by Region, 1995-2002



2.5 Determinants of Manufacturing Competitiveness and Product Choice

Determinants of Manufacturing Competitiveness

Manufacturing performance is influenced by a range of factors, including the macroeconomic environment, the overall investment climate and business environment, political and social stability, government policies and regulations, foreign direct investment, supporting institutions, skills, technologies, infrastructure, and many other factors. Different authors emphasize different key determinants of manufacturing competitiveness. For instance, Porter distinguishes four broad determinants of national competitive advantage: factor conditions, including skilled labour and infrastructure, home demand conditions, supplier and related industries that are internationally competitive, and firm strategy, structure and rivalry (Porter, 1990:71). A recent OECD paper highlighted the following five elements for raising manufacturing productivity: infrastructure, capital, trade integration, education and aggregate efficiency (Causa and Cohen, 2004:7).

UNIDO, for its part, focuses on structural influences which are directly relevant to building manufacturing capabilities, namely technological effort, foreign direct investment, infrastructure and education. It demonstrates that there is a strong and statistically significant relationship between manufacturing performance and the following factors in order of importance: research and development expenditure, royalties, infrastructure, foreign direct investment, and skills. When these five factors were regressed on the industrial competitiveness index for a sample of 75 and 85 countries for respectively 1995 and 1998 (in addition to a developing country dummy), the equation explained 93 and 88 percent of the variation in the competitive industrial performance index in respectively 1995 and 1998 (UNIDO, 2002:71).

Technological effort in general, including domestic R&D, foreign direct investment and royalties and licensing, had the most powerful influence on manufacturing performance. Of these, R&D was statistically the most important, highlighting the need for domestic technological effort even at low levels of development. While the causation may run in both directions – more industrialized countries invest more in R&D –, the causation is likely to run predominantly from R&D to manufacturing performance. Licensing foreign technologies through royalties was also statistically significant, but its role appeared to be diminishing. The role of foreign direct investment, in contrast, was increasing, and was evidence of the greater role of integrated production systems in the world economy, as well as the rising importance of transnational corporations, and their export activity for manufacturing performance. The significance of skills also increased. Infrastructure remained important in both years.

Chapter 3 therefore ranks the Chinese regions according to the UNIDO determinants of manufacturing performance using regional level statistics, and provides further evidence of the above relationship in the Chinese context. The regions which performed best in the manufacturing competitiveness index were also those which upgraded their technological capabilities the most: they spent the most on research and development by manufacturing enterprises and on royalties. They also possessed the best modern physical infrastructure, attracted the highest foreign direct investment, and had the most educated labour force.

The remaining chapters of this study elaborate upon specific and concrete measures that western and central regions can take to enhance their manufacturing performance, and thus redress the balance with eastern regions. Anticipating much of what is elaborated in later chapters, these measures are summarized below, starting with actions on the determinants of manufacturing performance, and followed by measures to improve the business environment and investment climate. The following sub-section then focuses on product choice and sub-sectoral promotion strategies.

Education. Chapter 3 shows that the education gap for the population as a whole was large and widening. The student enrolment rate at the higher education level in the west was only half that of the east, while educational expenditure per capita in the west and centre were also half of the level in the east. Since the primary responsibility for the public school budget rests with the local governments, the human resource gap between the richer east and the poorer west will continue to widen in the future, unless the regional governments left behind in education attainment can fund their education system more aggressively, and unless the central government also allocates supplementary central funds to them.

Technological effort. Comparative data on R&D in large and medium enterprises presented in chapter 3 indicate that eastern regions not only dominated technological development in China, but also increased their lead over Western and Central China. By 2002, they accounted for 70 percent of total R&D expenditures, 53-55 percent of science and technology personnel and graduates, 70 percent of all contractual inflows to domestic markets, and 95 percent of imported technical contracts for technology and equipment. If these four R&D indicators can be assumed to reflect industrial technology development in general, then they indicate that eastern regions stepped up their technological effort, while central and western regions increased their technological efforts in some areas, such as R&D expenditure and contractual inflows, but these were rather modest compared with the east. In other areas, such as technical personnel and imported technology contracts, they made little or no progress. The western and central regions clearly need to step up their efforts to acquire, adapt and develop industrial technology in practical ways elaborated in chapter 3.

Foreign direct investment. Chapter 3 indicates that eastern regions were far more successful in attracting FDI, some $45 billion versus US$2 and 5 billion for western and central regions in 2002, as shown in chapter 3. FDI in the east increased by 5.5 percent per year between 1995 and 2002 compared with just one percent per year in the west and east. As a result, the east's overall share in FDI amounted to nearly 90 percent of the total. This suggests that foreign investors lack knowledge of investment opportunities in western and central regions, due perhaps to misconceptions related to transport costs, skills availability, infrastructure availability and reliability, quality of life, labour cost advantages, and many other factors. Western and central regions need to step up their investment promotion services by learning from their eastern counterparts and by learning from successful examples abroad.

Infrastructure. Chapter 3 shows that in traditional infrastructure such as railways and highways, the western and central regions were not left behind the eastern regions and, in many cases, were even ahead on a per capita basis, especially in highway density. In terms of modern infrastructure however, the density of land telephone lines, internet and mobile phones, was significantly lower than in the east.

Overall investment climate and business environment. A preliminary comparison of business costs between selected western and eastern regions in chapter 4 indicates that western regions offered a solid cost advantage in labour costs, facility costs, utility costs and living costs. Western regions were only marginally more expensive in transport costs for exporters, because sea freight accounted for most of the transport costs. However, their higher road transport costs put them at a disadvantage for inter-regional trade, especially in the lucrative coastal markets. The western and central regions can take the following measures to publicize and improve their business environment and investment climate.

Labour costs. The official minimum wage rate in western regions was less than 60 percent of eastern regions, while the market wage rate for unskilled workers, assemblers, operators and tradesmen ranged from 70 to 75 percent of their eastern counterparts. At supervisory, professional and managerial levels, the wage rates were about the same. Since labour costs are so important in the selection of the location of manufacturing plants, western and central regions can certainly publicize more aggressively their solid wage advantage in

the unskilled and semi-skilled worker category, as well as the availability of skilled, professional and managerial personnel of comparable quality and cost to the east.

Transport and utility costs. The west was not as much at a disadvantage when it came to transport and utility costs. Sea freight costs incurred by exporters in western regions were some ten percent higher than in eastern regions only, because the road transport cost to get containers to the nearest international sea port, while double the cost incurred by eastern regions, was only a minor component of the total cost, whereas the most important cost, port-to-port freight costs, was the same. As for utilities, western regions charged either lower or equal rates than their eastern counterparts.

Facility costs, borrowing rate, tax rates and other costs. The west was very competitive in facility costs, with factory land costing less than half of that in the east, and construction costs, office lease and warehouse space ranging from a third to three quarters of that in the east. Secured commercial borrowing rates were uniformly low throughout China at just over 5 percent per year. Most regions provided tax incentives. Living costs in Western China were substantially lower than in Eastern China, about half for international standard housing and international schools.

Business registration, regulations and inspections. Though the two Shaanxi manufactured surveys commissioned by this study did not rate business licensing and permits as an obstacle, the findings of other sources differ as discussed in chapter 4. These found that many local governments undertake too many non-productive, intrusive inspections of businesses. These findings are too important to ignore, especially since firms in advanced regions appear to have lower regulatory burdens than less advanced ones. This is likely to create further divergence between rich and poor regions, and capital will flow to where it is less difficult to get things done.

Contract enforcement. According to a recent study, the length of time for the local court system to resolve the latest commercial dispute of a firm varied substantially from city to city, from six to 13 months, and averaged ten months. This waiting time was clearly too long, and a deterrence for business persons to take their dispute to court for settlement. Business and industry associations can work with the local government to achieve an efficient and speedy local court system.

Business and industry associations as technology promoter. The traditional role of business and industry associations has focused on lobbying government, and on providing their members with information about emerging government policies. However, associations can play a catalytic role in enabling the process of industrial upgrading and adopting global standards, in addition to sharpening their lobbying function. Thus, not only firms but also industry associations need upgrading. The regional authorities can encourage business and industry associations to be managed by their own members, and begin to provide technology services at the firm level.

Product Choice

As noted in chapter 1, development experience around the world suggests that interventionist regional development policies have largely failed to accelerate growth, except in brief periods. Many of the big failures of regional development concerned large industrial investment projects. Consequently, non-discriminatory policies such as those outlined above, such as technological effort, education, infrastructure, business environment and investment climate, have gained favour over those with a sub-sector or industry focus. They require less detailed information and less implementation capacity on the part of government agencies, while averting the risk that policymakers would pursue capacity creation in non-competitive industries.

Nevertheless, as soon as manufacturing performance is measured and ranked in terms of some types of industries or products against others, intentionally or unintentionally, it draws attention to particular industry or product choices. Though correlation exercises between manufacturing performance and a particular set of its determinants aim to direct the policymaker to take action to strengthen determinants such as the ones discussed above, the indicators used to measure manufacturing performance themselves inevitably become the natural object of the policymakers' attention and promotion.

When it comes to promoting specific sub-sectors or industries,

> '…there are two basic types of competitive advantage: lower cost and product differentiation. Lower cost is the ability of a firm to design, produce and market a comparable product more efficiently than its competitor. At prices at or near competitors, lower cost translates into superior returns… Differentiation is the ability to provide unique and superior value to the buyer in terms of product quality, special features, or after-sale service… Differentiation allows a firm to command a premium price, which leads to superior profitability provided costs are comparable to those of competitors… Competitive advantage of either type translates into higher productivity than that of competitors. The low-cost firm produces a given output using fewer inputs than competitors require. The differentiated firm achieves higher revenues per unit than competitors' (Porter, 1990:37).

The UNIDO measure of manufacturing performance, the competitive industrial performance index, gives prominence to higher technology industries because of their special role in generating greater learning opportunities, technological capabilities and externalities, and thus in generating productivity-enhancing growth. They also generate higher value added and impose higher entry barriers to newcomers. In these respects, they are akin to Porter's differentiated goods, commanding a premium price and offering higher revenues. The UNIDO measure of manufacturing performance also favours exports because they promote more interaction with foreign buyers, suppliers and agents and learning. Thus the CIP implicitly guides product choice in favour of higher technology products and exports, and preferably both at the same time.

Two major concerns in the product choice implied by the UNIDO CIP come to mind. The first one is the apparent bias against countries or regions that do not export manufactured goods, though they may produce sophisticated goods such as aircrafts, electronics and pharmaceuticals for the domestic market. The bias becomes more apparent in open economies, where merely holding on to the domestic market and competing against the flood of cheaper, higher quality and aggressively marketed imports is just as challenging a task as exporting. Moreover the need to export is also somewhat diminished in the case where firms have access to a large and thriving domestic market such as that offered by an increasingly affluent Chinese population.

Related to this, the CIP favours exports because they can lead domestic producers to develop their production, quality control, management and marketing capabilities as a result of interacting with foreign buyers, suppliers and agents in the global supply chain. The reality in many exporting countries such as Indonesia is that the role of domestic producers remains limited to making available exportable goods at a warehouse near the port. Foreign buyers and agents initiate and undertake all the interactions with foreign customers, including supplying designs, product and equipment specifications, procuring equipment, arranging and paying for insurance and freight, opening letters of credit, leveraging foreign exchange risks, and so on (Dhanani and Hasnain, 2001). In other words, domestic producers can often remain isolated at the far end of the supply chain.

The second concern, already alluded in box 2.1, is the bias against countries or regions that do not target the production of higher technology goods, either for home consumption or export, but which produce resource-based and low-technology goods, such as food products and textiles, or medium-technology goods such as steel products, using sophisticated, capital-intensive, state-of-the-art continuous process technology, for instance fruit juices in Shaanxi, cigarettes in Yunnan, and synthetic yarns and steel billets in many other regions. Such production is also likely to be accompanied by emerging technological capabilities.

Moreover, the continued success of Chinese exports in low-technology products such as textiles, garments and shoes in these apparently stagnant industries by fiercely competing on price and taking full advantage of economies of scale – greatly supported by the presence of a thriving and large domestic market – and thus raising their share in the world market share, would somewhat appear to diminish the wisdom of targeting higher technology industries and exports. In China's case in particular, even though the gains of competing on price may not be sustained forever, because of competitors offering lower labour costs and cheaper production, the time when these cost advantages may be overcome may still be very far, since labour costs, especially in western and central regions, are still much lower than in many countries in Southeast Asia and South Asia. Moreover, even when wages rise above its neighbours, the current massive economies of scale afforded by the large domestic demand and expanding export markets will continue to offset higher labour costs for some time to come. This is where Porter's observations need to be kept in mind, namely that competing on price also raises productivity, and the domestic market as a key determinant of national competitive advantage. Nevertheless,

> '…Pure cost advantages are frequently less sustainable than differentiation. One reason is that any new source of lower costs, even one less sophisticated, can nullify a firm's cost advantage. If labour is cheap enough, for example, even much higher efficiency can be nullified, unlike the case with differentiation advantages which normally must be matched to be exceeded. In addition, pure cost advantages are more vulnerable because new product designs or other forms of differentiation can eliminate a cost advantage in delivering the old ones.' (Porter, 1990:50)

So gradual and timely diversification of the manufacturing sector of a country or region towards the production of a selected number of higher technology goods and exports can help them prepare for the future, as well as accelerate innovation and learning, and generate externalities in the rest of the economy. Western and central regions can draw important lessons from the experience of eastern regions in this respect. For sustained industrial development, reliance on static endowments such as primary resources and inexpensive labour is a good way to start, but this should be accompanied by building and enhancing technological capabilities to produce technology-intensive manufactures. The increasing production of more sophisticated goods can allow them to develop their design and development capabilities, and to develop extensive supplier and sub-contractor networks. For more advanced products, firms will need to increase R&D investment and forge close interactions with firms, universities and research institutions.

In the meantime, they can continue to identify and efficiently supply dynamic products for which both the domestic and the world market are growing above average, whether resource-based, low technology, or medium and high-technology products. This way, they will be able to accelerate their learning of best practices due to regular interactions with international and national buyers and other agents in the global supply chain. In sum, while gradually targeting the production of technology-intensive manufactures and exports,

regions such as Yunnan should by no means ignore or discriminate against labour-intensive and low technology manufactures for the export and domestic markets.

Finally, there is a danger that, in their haste to promote higher technology industries, the regions opt to invest in the same sub-sectors. For instance, in the current tenth five-year plan, some twenty regions targeted motor vehicle manufacturing as their industry of choice. To avoid costly excess capacity of this type, at the outset, the government and the private sector should jointly produce a joint government-business sector long-term vision of where the region wants to be in terms of industrialization (what types of products it would like to produce and export, and what other types of goods it should continue to import), to provide broad signals to investors, and to develop guidelines for government-business resource mobilization. This collaborative process is by itself very important to reach a common vision, which can be articulated in a joint government-business strategy on industrial competitiveness.

The strategy should identify a number of priority industries and export products which the government and the private sector can jointly promote, without however prejudicing other industries. It should contain a realistic assessment of the competitive potential of various sectors and, since government resources for industrial promotion are limited, a promotional strategy focused on priority areas. Intervening in a large number of unrelated activities will risk diffusion and failure. A common strategic vision of industrialization will also assist in coordinating the efforts of the central government departments concerned with implementing various aspects of industrial policies, as well as all regional and district authorities, which will become increasingly involved in regional industrial development.

2.6 Conclusions and Policy Implications

By highlighting the technology and market orientation of manufacturing production and manufactured exports, this chapter has identified some of the key factors underlying China's impressive and well documented performance in manufacturing production and manufacturing exports. What is less well recognized is that most of the Chinese manufacturing success originated in the eastern regions. These not only took full advantage of their coastal location and preferential government treatment but, more importantly, succeeded in rapidly shifting their production structure towards technology-intensive manufactures, and finding an export market for them. They also gained an important foothold in dynamic products, for which world market was rising fast, and increased their world market share in low technology products, for which overall world market was growing slowly, but by essentially gaining world market share at the expense of other exporting countries.

In contrast, the western and central regions appear to have focused on exporting more primary commodities and less processed manufactured products. Moreover, the share of technology-intensive products in the latter was negligible. The upgrading of their production structure, which took place domestically, did not translate into technology-intensive exports. As a result, the industrial divide between the coastal regions and the rest was substantial and widened over time.

The regional competitive industrial performance index introduced in this study confirms the overall dominance of eastern regions. It also found that the overall competitiveness ranking changed little over time, supporting the argument that performance is the outcome of slow and incremental processes. Large changes did however take place in a few regions, the main cause of which appears to be an increase in the share of technology-intensive products in exports, an important observation from a policy point of view.

Also less well documented is that the substantial manufacturing expansion taking

place in the past ten years did not result in an overall increase in manufacturing employment. Employment rose in certain sectors and industries in the private sector, but was overshadowed by the large-scale redundancies accompanying the rationalization and privatization of state-owned manufacturing enterprises throughout the country. Retrenchment further exacerbated the divide between the coastal regions and the rest, due to the relative scarcity of alternative sources of formal employment and income.

Though the industrialized coast overshadowed the performance of the central and western regions, the latter nevertheless displayed some industrial and export dynamism. However, their specialization remained in primary commodities and resource-based manufactures. They had a relatively modest impact in world markets, and added little value to their manufactured goods. Central and Western China's rich natural resources and abundant and inexpensive labour give these two regions great industrial potential. They may maintain a static comparative advantage in resource-based and labour-intensive manufactures over the east for many years to come. These regions have not exploited the full potential of their agro-industries. They both need to move up the value chain, and increase processing activities of their agro-industrial products. To complement this and bring about rapid changes in technology, innovation and learning processes, they also need to develop selected technology-intensive industries.

How can the western and central regions enhance their manufacturing competitiveness and catch up with the eastern regions? First, by investing in the structural factors directly relevant to building manufacturing capabilities identified in this chapter, namely industrial technological development system, foreign direct investment, infrastructure and education. These are elaborated in turn in chapter 3. Second, by improving the overall business environment and investment climate, and strengthening selected support institutions, especially business and industry associations. These are taken up in turn in chapter 4.

And third, even in the context of liberalized investment and trade flows, public policy can go a long way towards influencing the nature and direction of industrialization, without resorting to distortive pricing policies or firm-specific incentives. Government-business partnerships in the formulation and implementation of industrial strategy can provide the necessary framework for the coordinated action of various government agencies involved in industrial development. For this to succeed however, policy makers and institutions must be insulated from lobbying for special favours from interest groups. To guard against bureaucratic authoritarianism, technocratic independence would need to be accompanied by public accountability.

Finally, the regional competitive industrial performance ranking introduced in this study suffers from two data limitations which should be kept in mind. One limitation concerns the use of official population statistics to construct per capita figures for manufacturing production and exports, when many eastern regions are known to contain large migrant and un-registered populations in these statistics. The second limitation concerns the non-comparability between municipalities such as Beijing and Shanghai, and provinces with large rural populations, with their sizeable rural and agricultural sectors. Both these are likely to introduce a bias in favour of eastern regions and against western regions, though the eastern regions are still likely to outperform the other regions even if corrected for these two limitations. These limitations notwithstanding, the emphasis on the key structural determinants of manufacturing competitiveness will remain valid.

Regional governments can use the regional industrial performance index introduced in this report to assess and monitor their industrial development performance relative to other regions and even other countries with similar resources and industrial structure. The four benchmark indicators, used to produce the composite index, can in turn be used individually to analyze why their overall performance has outpaced or lagged behind that of other regions,

as the case may be. In order for them to continue monitoring their industrial performance, the statistical authorities at the regional level must begin to classify industrial activities and exports by technology level and world market share using international classification schemes. Finally, in order to support the above initiatives, the National Bureau of Statistics and the Customs Office of China can make available respectively manufacturing production data and export data in terms of well-defined and internationally accepted categories used in this study, namely resource-based, low-technology, medium-technology and high-technology. This should be an urgent task for the central and regional statistical authorities.

CHAPTER 3. BENCHMARKING DETERMINANTS OF REGIONAL MANUFACTURING PERFORMANCE

Manufacturing performance is determined by a range of factors, including the macroeconomic environment, the overall investment climate, the business environment, the policy environment, foreign direct investment, political and social stability, supporting institutions, skills, technologies, infrastructure, and many other factors. Since several of these factors, including macroeconomic variables, the business environment and the investment climate are regularly analyzed by others, and in greater depth, this chapter focuses on the key structural influences which are directly relevant to building manufacturing capabilities[1]. The overall business and policy environment, and the role and availability of selected support institutions are taken up in the next chapter.

As discussed in the previous chapter, there is a strong relationship between manufacturing performance and the following factors in order of importance: research and development expenditure, royalties, infrastructure, foreign direct investment, and skills. Technological effort in general, including domestic R&D, foreign direct investment and royalties or licensing, had the most powerful influence on manufacturing performance. Of these, R&D is the most important, highlighting the need for domestic technological effort even at low levels of development. Licensing foreign technologies through royalties was also statistically significant, but its role appeared to be diminishing. The role of foreign direct investment, in contrast, was increasing, and was evidence of the greater role of integrated production systems in the world economy, as well as the rising importance of transnational corporations, and their export activity for manufacturing performance. The significance of skills also increased. Infrastructure remained important in both years. This chapter therefore benchmarks the Chinese regions according to the above determinants of manufacturing performance using regional level statistics.

To gain additional insight into manufacturing capability at the firm level, this study commissioned two enterprise surveys in Shaanxi province in October 2004. First, a survey of 90 manufacturing enterprises of all sizes was conducted across Shaanxi province, equally distributed between food, machinery and pharmaceutical industries, and comprising both state-owned and private firms, called the 'Shaanxi manufacturing enterprise survey'[2] here. This was followed by a more focused but smaller survey of 35 private small and medium manufacturing enterprises in the same sub-sectors but in one prefecture only in Shaanxi province, called the 'Baoji manufacturing SME survey'[3]. Accordingly, the contributing factors to manufacturing performance mentioned above are discussed below in relation to aggregate regional level data, complemented by related observations using the survey data.

[1] Jinkang Zhang compiled regional data on the determinants of manufacturing performance of this chapter.

[2] The Shaanxi manufacturing enterprise survey was conducted by the Business School of the *Renmin* (People's) University of China, Beijing, in the capital Xian and other prefecture-level cities in Shaanxi province. See annex tables to this chapter (pp. 154ff.) and chapter four for detailed survey findings.

[3] The Baoji manufacturing SME survey was conducted by the Institute of Industrial Development, National Development and Reform Commission, Beijing, in close collaboration with the Baoji Municipal Development and Reform Committee. See annex tables of chapter five (pp. 186ff.) for detailed survey findings.

3.1 Industrial Technology Development System

Industrial technology acquisition and development

Industrial technological development can take place in all types of enterprises, and is not limited to high technology firms. It also occurs in almost all parts of an enterprise, and much of this arises informally (UNIDO 2002:35). Research and development (R&D) is part of this effort, but industrial technology development is not just concerned with R&D. In fact, formal R&D activities are a relatively minor component of technological development activities, often accounting for just 20 percent of total expenditure even in industrialized countries. The remaining 80 percent are spent on non-R&D activities such as incremental improvements in the production process and product specification, design, engineering and reverse engineering (see box 3.1).

Box 3. 1 Ten types of industrial technology acquisition and development

One can distinguish ten types of technological activity falling into three groups: (i) technology acquisition; (ii) technology development based on incremental design and engineering activities; and (iii) research and development at the international frontier. These three groups consist of the following:

Technology acquisition:
1. New units of equipment or machinery in existing plants
2. New materials and components for existing designs and specifications
3. Turn-key plants
4. New product technology embodied in existing designs and specifications

Design and engineering activities:
5. Engineering-based incremental improvement in process technology
6. Incremental improvement in product specifications and designs
7. Continuous improvements in logistics and supply chain with existing suppliers
8. Design and reverse-engineering, and linkages with new suppliers of equipment and materials

Research and development:
9. Technology search and research close to the international frontier
10. Technological research and development, plus design and engineering for new products and processes

Source: Arnold E., Bessant, J. & Brimble, P. (2000), *Enhancing Policy and Institutional Support for Industrial Technology Development in Thailand: Overall Policy Framework and Development of Industrial Innovation System*. Bangkok: National Science and Technology Development Agency (NSTDA) and World Bank; and Lall S. (1986), *Building Technological Capabilities in Developing Countries*, Development Research Centre, OECD.

The first four types of technology acquisition share the common characteristic that they involve the introduction of standard designs, specifications and machinery already used elsewhere. Industrializing countries acquire rather than develop their technology, while the sources of capital equipment and product technology are usually located in industrialized countries. However, studies suggest that industrial growth relying on technology acquisition only, without some of the other six types of technology development, which typically have to be located in the domestic country, misses out on a very large source of enhanced productivity growth and other forms of competitiveness.

A technologically shallow growth path of industrial growth is one of limited investment by industry in the capabilities required to undertake activities in categories five to eight. Those in categories nine and ten are less important for the majority of industrial firms in industrializing countries. It is important to stress that the first two groups of activities, technology acquisition and design and engineering development, are rarely substitute for each other, but complementary. R&D becomes significant when a country's industrial structure develops and firms use more advanced technologies. Even when firms are not developing

new technology, R&D is needed to understand, adapt, imitate and improve imported technology. It is also needed to monitor technological progress around the world, a major function even in industrialized countries.

In industrialized countries, industrial firms not only generate the demand for technology, but also account for a very large part of the supply as well. In other words, the vast majority of technology development takes place in industrial firms. They supply much of the new technology they use themselves, especially of types five to ten, and they also supply a very large proportion of the technology used by other firms. Many large and medium-scale enterprises in China also undertake in-house technology development. Technology is a crucial determinant of manufacturing development, as underlined above, yet much of it cannot be quantified. The statistical yearbooks of science and technology provide information on R&D expenditure by medium and large enterprises, as well as R&D personnel, payments for royalties and licenses. These measures are considered proxy here for overall technological development, and are discussed below.

R&D expenditure and personnel. R&D expenditure by large and medium-sized enterprises for China as a whole increased by 30 percent per year in nominal terms, or by nearly ten times in size between 1995 and 2002 (table 3.1). This compares favourably with the ten percent annual growth rate around the world between 1985 and 1995-98, though China started from a low base, 0.5 compared with 3-4 percent of GDP in industrialized countries (UNIDO 2002:36).

Table 3. 1 R&D Expenditure and S&T Personnel (L/M Enterprises) by Region, 1995-02

	Expenditure or Persons		Share in country's total		a. Share in GDP % b. % Workforce c. Share in S&T %		R&D Expenditure per capita/ Personnel /10,000 population		Growth rate % p.a.
	1995	2002	1995	2002	1995	2002	1995	2002	1995-02
R&D expenditure (10,000 yuan)									
China	906,743	5,601,718	100.0	100.0	0.16	0.48	7	44	29.7
East	458,836	4,063,591	50.6	72.5	0.14	0.60	10	84	36.6
Central	201,108	892,273	22.2	15.9	0.13	0.30	5	21	23.7
West	246,800	645,854	27.2	11.5	0.23	0.32	7	18	14.7
R&D Personnel (man-years)									
China		424,259		100.0		1.6			
East		234,932		53.4		1.7			
Central	n.a.	98,180	n.a.	23.1	n.a.	1.2	n.a.	n.a.	n.a.
West		91,147		21.5		1.8			
S&T Personnel									
China	1,234,144	1,366,682	100.0	100.0	3.2	5.0	10	11	1.5
East	591,226	727,955	47.9	53.3	3.2	5.2	13	15	3.0
Central	328,540	360,901	26.6	26.4	2.6	4.6	8	8	1.4
West	314,378	277,826	25.5	20.3	4.0	5.4	9	8	-1.8
Scientists & Engineers									
China	451,911	813,274	100.0	100.0	36.6	59.5	4	6	8.8
East	221,274	443,795	49.0	54.6	37.4	60.9	5	9	10.5
Central	123,270	214,241	27.3	26.3	37.5	59.4	3	5	8.2
West	107,367	155,238	23.8	19.1	34.1	55.9	3	4	5.4

Source:
1. R&D expenditure: China Statistical Yearbook of Science and Technology 1996 (table 3-14) and 2003 (table 1-16); China Statistical Yearbook 1996 (table 3-3) and 2003 (table 4-3)
2. S&T personnel: China Statistical Yearbook of Science and Technology 1996 (3-5, 3-10) and 2003 (table 1-5)

The eastern region increased its R&D expenditure by 37 percent per year, or respectively two and half times and one and half times the annual growth rates of the west and centre. As a result, the east's share in total R&D spending rose from 51 to 72 percent in this period, reaching 0.6 percent of GDP in the east compared with 0.3 percent in the centre and west in 2002. The disparity was more pronounced on a per capita basis, with expenditure in the east about five times as high as in the other two areas.

R&D personnel formed 1.6 percent of the workforce of medium and large enterprises in China in 2002. The east and the west employed more R&D personnel than the centre (1.7-1.8 vs. 1.2 percent). Science and technology personnel increased by 1.5 percent per year in China, and at double that rate in the east. While this rate was about average for the centre, the number of personnel in the west decreased by nearly 2 percent per year between 1995 and 2002. The east's share of the total increased by 48 to 58 percent of the total in this period, while its proportion of personnel per 10,000 heads of population was twice as large (15 vs. 8). Since overall manufacturing employment stagnated in this period, the proportion of science and technology personnel in the total workforce improved from 3 to 5 percent for China as a whole, with no significant differences between regions.

The number of scientists and engineers in large and medium sized enterprises increased for all the three regions, but more rapidly in the east, about average for the centre and the least for the west (10.5, 8.2 and 5.4 percent respectively). The east's share rose from 49 to 55 percent of the total consequently, while this proportion of technical graduates per 10,000 heads of population was again twice as large (9 vs. 4 or 5). As a proportion of total science and technology personnel, the ratio of scientists and engineers rose from 37 to 60 percent for China, once again with little difference between regions. In sum, while the employment of science and technology, and of scientists and engineers in particular, continued to grow relative to the total manufacturing workforce in all regions, the east outperformed the centre and the west in R&D expenditure.

Royalties and technical payments abroad. Royalties and technical payments abroad include purchases of know-how, patents, licenses and blueprints. These are all imports of embodied technology which do not take the form of equity. Capital goods are also a form of embodied technology import, but they include equipment for investment outside of the manufacturing sector (UNIDO, 2002:37). Also, not all royalties and technical fees are for industrial technology; some are used to purchase brand names, franchises and know-how. While arms-length transactions account for most of royalties and technical fees, some go for payments between the affiliates and the parents of transnational corporations.

Chinese technology statistics distinguish two major forms of technical payments, contractual inflows to technical markets, and imported technology contracts. The value of contractual inflows to domestic technical markets in China tripled from 27 to 81 billion between 1995 and 2002 (table 3.2). They grew at the same rate as manufacturing value added, but at a much faster rate than FDI (17 vs. 5 percent per year). The east accounted for 68 percent of the country's total. Moreover, by raising spending at the rate of 18 percent per year, compared with 13-15 percent for the centre and the west, the east managed to increase its share from 61 to 68 per cent in 1995-2002. The value of these flows was only a third of the east's level on a per capita basis.

Imported technology contracts consisted of technology and equipment (87 and 13 percent respectively, table 3.3). The east accounted for almost all of these contracts worth $ 1.5 billion in 2002, 95 percent of the country's total (96 and 87 percent for technology and equipment respectively). The centre and the west accounted for only 3 and 2 percent of total imported contracts made by large and medium-scale enterprises. On a per capita basis, the value of these flows in the west and centre was only one thirtieth of the level in the east.

Table 3. 2 Contractual Inflows to Domestic Technical Markets by Region, 1995-2002

	Value (10 000 yuan)		Share in country's total		Per capita value (yuan)		Annual growth
	1995	2002	1995	2002	1995	2002	1995-2002
China	2,707,470	8,106,455	100.0	100.0	22	63	17.0
East	1,648,740	5,497,169	60.9	67.8	37	114	18.8
Central	573,661	1,318,959	21.2	16.3	14	31	12.6
West	485,069	1,290,327	17.9	15.9	14	35	15.0

Source: China Statistical Yearbook of Science and Technology 2003

Table 3. 3 Imported Technology Contracts by Region, 2002

	Total		For technology		For equipment		Per capita total (yuan)
	USD' 10 000	Share	USD' 10 000	Share	USD' 10 000	Share	
China	1,552,804	100.0	1,347,950	100.0	204,850	100.0	12.1
East	1,470,281	94.7	1,293,024	95.9	177,254	86.5	30.5
Central	52,487	3.4	36,165	2.7	16,321	8.0	1.2
West	30,036	1.9	18,761	1.4	11,275	5.5	0.8

Source: China Statistical Yearbook of Science and Technology 2003

The above comparative data on R&D in large and medium enterprises indicate that eastern regions not only dominated technological development in China, but also increased their lead over Western and Central China. By 2002, they accounted for 70 percent of total R&D expenditures, 53-55 percent of science and technology personnel and graduates, 70 percent of all contractual inflows to domestic markets, and 95 percent of imported technical contracts for technology and equipment. These four indicators indicate that the east stepped up its technological effort, while the centre and west increased their technological efforts in some areas such as R&D expenditure and contractual inflows, but by far less than the east. In other areas, such as technical personnel and imported technology contracts, they made little or no progress. These aggregate figures can be compared with data collected at the firm level.

Technology acquisition at the firm level[1]

The Shaanxi enterprise survey 2004 revealed that R&D workers accounted for 9 percent of their total work force on average, though 13 out of 90 enterprises did not employ R&D personnel. Of these, 70 percent had a science or engineering qualification. The firms spent an average of 1,200 yuan on research or development, or 3 percent of their sales in 2003, compared with just 1.5 percent in regional data (annex tables A.3.1-A.3.5). R&D expenditure varied between industries, with food industries spending the least, pharmaceutical companies the average, machinery the most on R&D as a share of sales (1, 4 and 5 percent).

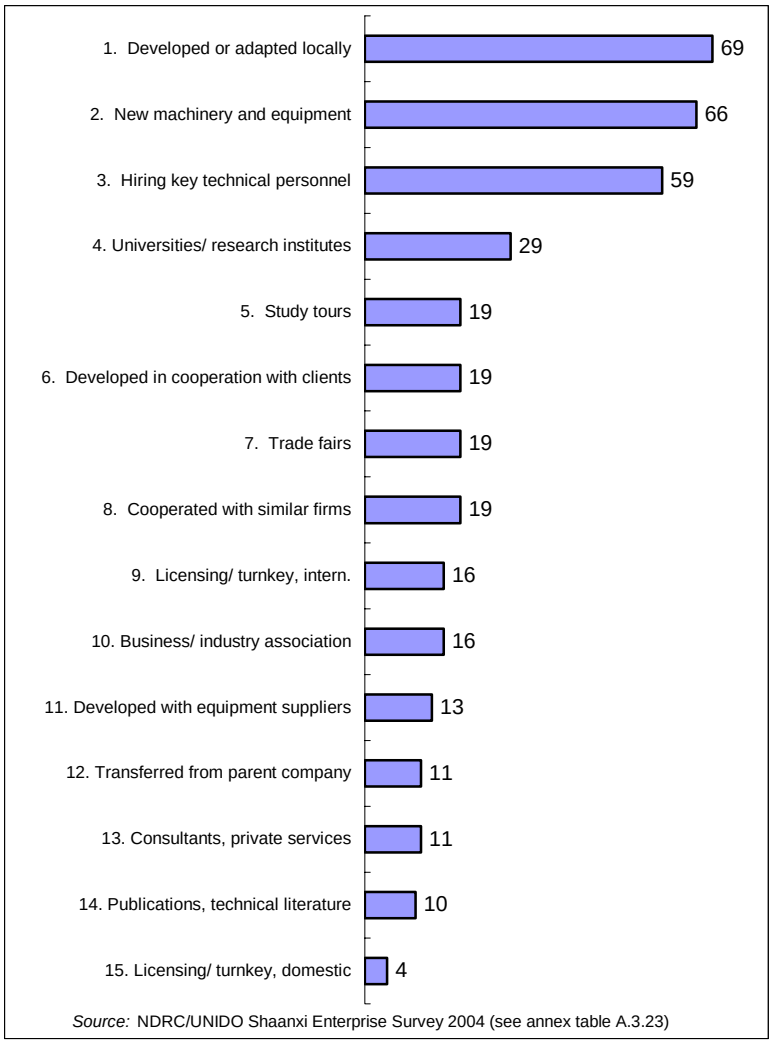
The three most important channels for acquiring technological innovation were developing or adapting technology locally, purchasing new machinery and equipment, and hiring key technical personnel, (69, 66 and 59 percent of firms, figure 3.1). Less than 30 percent of the surveyed firms made use of universities and research institutes. Some 20 percent acquired technology through study tours, in cooperation with clients, attending trade fairs, or cooperating with similar firms.

About a sixth of the firms used licensing or turnkey projects from international sources, or through business and industry associations. Only around 10 percent used other channels, including cooperating with equipment suppliers, transfer from parent company,

[1] Detailed results of the NDRC/UNIDO Shaanxi manufacturing survey 2004 appear in annex tables A.3.19-27.

using consultants or private technical services, or using technical literature. Hardly anybody used licensing from domestic sources. The finding that a significant proportion of firms made use of university departments and research institutes is encouraging, nevertheless it is a reminder that the remaining 70 percent of the firms did not interact with research institutes, a big challenge in Shaanxi province.

Figure 3. 1 Channels of Technology Acquisition (Order of Importance, Scale 0 to 100)



Source: NDRC/UNIDO Shaanxi Enterprise Survey 2004 (see annex table A.3.23)

Nearly half of the surveyed firms introduced new products in the last three years. However, product innovation or modification was relatively skewed, with the top 3 percent of enterprises accounting for 25 percent of all new products or processes (table A.3.19). Nine firms, or ten percent of the total, had a licensing agreement with a foreign company. Twenty percent of enterprise reported holding patents, this proportion being double the average for machinery firms. Enterprises with more than 500 workers were twice as likely as smaller ones to hold patents.

Nearly 80 percent of the firms used email in their business contacts, this share rising to 93 percent in pharmaceutical industries, which also did more business outside the province and even abroad. Two thirds of the firms had a Chinese language website, while 24 percent had an English language website. Machinery and pharmaceutical companies were more likely to maintain a website in both languages.

Nearly 75 percent of the surveyed firms possessed the ISO 9000 quality standards (87 percent in pharmaceutical companies), while 23 firms, or 24 percent, had the ISO 14000 environmental standards, including more than a third of all pharmaceutical companies. The latter is partly due to a regional ruling that all pharmaceutical companies must possess the environment ISO 14000 by the end 2004. On the other hand, the widespread prevalence of the ISO 9000 quality standards, according to observers, may partly be due to the relatively lax process in securing certification. This is in turn due to many factors, including the lack of independence between the trainers and the assessors.

Institutional support and linkages at the firm level

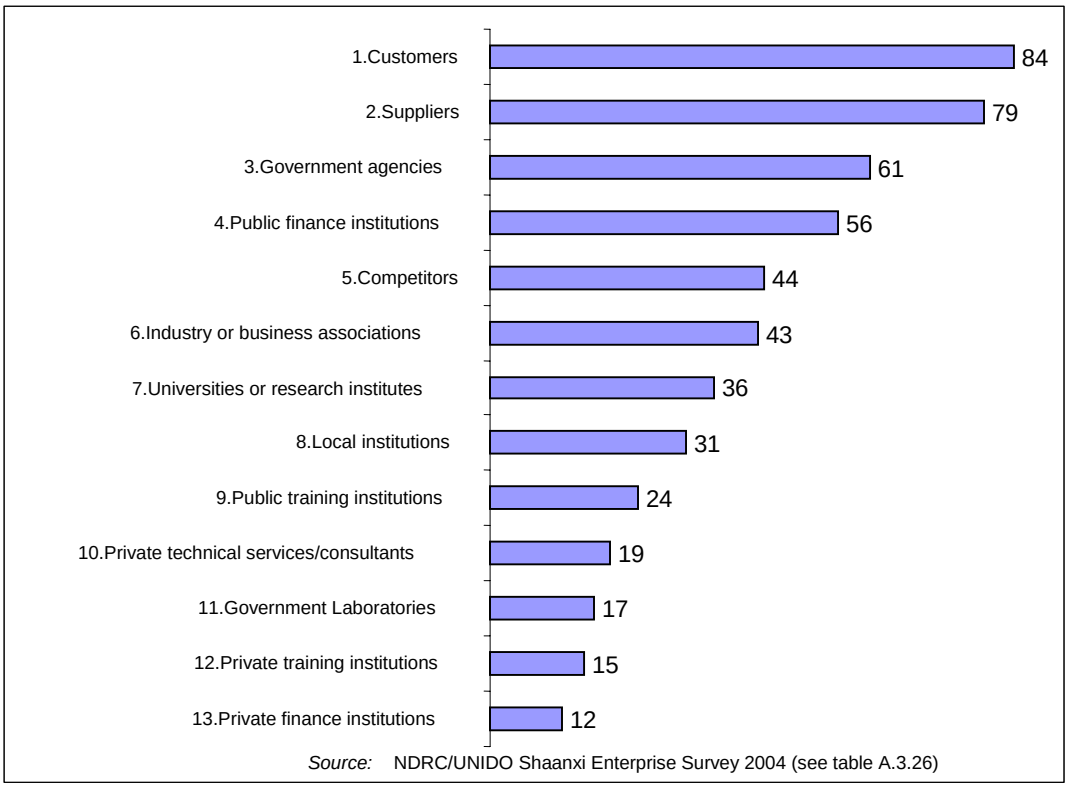
The number of firms reportedly receiving external institutional support in the Shaanxi manufacturing survey was quite large, 63 out of 100 firms or 70 percent. Support was higher machinery and pharmaceutical industries than in food industries (77 vs. 57 percent, table A.3.25). On the other hand, 27 firms, or 30 percent, did not receive any support. Nearly half of these believed that support did not exit for their business, while 18 percent had tried but did not succeed, and a further 18 percent found it too time consuming. The final 9 percent found it too bureaucratic.

The majority of firms, 72 percent of the total, were members of chambers of commerce or business associations. The services provided by associations and their importance are discussed in more detail in chapter 4. In a separate question however, only 10 percent of firms reported maintaining regular contact with them, while a further 16 percent maintained frequent contact (annex table A.3.26). On a scale of 0 to 100, firms rated their contact with industry and business associations at 43 (figure 3.2).

Most firms reported maintaining regular or frequent contacts with customers, suppliers, public financial institutions and government agencies as expected. A quarter to a fifth maintained contact regular or frequent contact with industry associations (as mentioned above), competitors, university and research institutes, and local institutions. Less than a tenth maintained contact with public training institutions or government laboratories. Very few maintained contact with private training institutes, private technical services and private financial institutions, probably because they did not exist in their locality.

The importance surveyed firms attached to contacts with outside institutions corresponded to the frequency of contact described above. However, contacts with competitors, university and research institutes, and industry associations were rated higher than the frequency of contact above (44, 43 and 36 On a scale of 0 to 100, figure 3.2), suggesting that firms which maintained such contacts rated them quite highly.

Figure 3. 2 Interaction with other Firms and Institutions (Order of Importance, Scale 0 to 100)



Source: NDRC/UNIDO Shaanxi Enterprise Survey 2004 (see table A.3.26)

In sum, the level of interaction of the surveyed firms with support organizations which may have been sources of technical information, advice and innovation was very limited. Some 80 percent of firms maintained little or no contact with research institutes, and around 90 percent of firms maintained little or no contact with public training institutes or government laboratories, while hardly any firm made use of technical services. In most cases, pharmaceutical firms were more likely to maintain formal institutional linkages with technology providers. Otherwise, firm size did not seem to matter, except in the case of the very small firms employing less than 50 workers (annex table A.3.27).

Provision of technology support organizations

Infrastructure, together with a conducive business and policy environment, determine the cost of operation and interaction with the outside world. Equally important, firms need access to vital services that support the building of manufacturing and technological capabilities. Many manufacturing enterprises may not even be aware of the existence of support institutions which can assist them in raising their technological capabilities.

Many support services are provided by the market in advanced countries. However, even these countries find it necessary to supplement what is supplied by the market with subsidized services. There is ample justification for public support or subsidy for the provision of services (UNIDO 2002:117). The most important consideration is that they provide knowledge, which is a public good. Another consideration is that the cost of searching and translating even freely available information into terms which are useful to local firms can be significant. There are great economies in centralizing these activities in organizations with special capabilities to carry them out.

A third consideration is the presence of externalities, whereby the benefits from higher productivity cannot be fully captured by the firms that receive the services, and spill over to other economic agents. Finally, under new international rules of trade, policies that were used successfully in the past to accelerate industrial and technological development, including protectionism and infant-industry subsidies, are no longer tolerated. So all that developing regions and countries can do, in terms of industrial policy, is to provide industrial services to develop manufacturing capabilities.

In many countries and regions, the government has set up or encouraged numerous institutions to support the technological efforts of firms, including Metrology, Standards, Testing and Quality Control centres (MSTQ), productivity centres, technology extension or advisory services, research and development laboratories, and information technology centres. Other institutions which provide more general industrial services include investment promotion agencies, export promotion agencies, industrial parks and export processing zones, and information services on technology and markets.

Western regions may be faced with two major issues in raising the technological capabilities of their manufacturing enterprises, namely, effective demand from enterprises and effectiveness of support institutions. It is possible that may enterprises do not recognize the need for change, and may not know where and what they might improve; there may be enterprises which may recognize the need for change but are unclear on how to go about it. The ‘Shaanxi enterprise survey 2004’ revealed for instance that 70 percent of enterprises did not interact with research institutions. This percentage held across small, medium and large firms with the exception of the smallest firms (employing 0-49 workers).

Second, in many regions, the problem may not be the absence of technology support institutions, but that existing institutions may not meet, or only partially meet, the needs of the firms. The key role of support institutions in the development of manufacturing capability can be illustrated in three selected services, MSTQ services, productivity centres and technology extension services.

MSTQ services. Besides defining standards at the national level, they assist firms in meeting International Organization for Standardization (ISO) compliance standards through training, product testing and technical assistance. They also maintain calibrated standards and calibration equipment, with which they calibrate firms' machinery. While the vast majority of ISO standards refer to specific products, ISO 9000 refers to a 'generic management system' standard, specifically catering to quality control. Instead of inspecting each good as it leaves the factory gate, which is clearly not practical, ISO 9000 focuses on a firm's quality control procedures. This is quickly becoming an essential requirement for exporters. To prevent the poor quality of some brands to adversely affect the national and international reputation of others, inspection is often carried out directly by a government agency.

Productivity centres. Their aim is to promote productivity and quality, and often provide training. Productivity centres at the regional level directly advise firms on management strategies, efficient floor layouts, labour-management relations, and workplace environment and environmental concerns. Programmes often include a training component, which range from single-day seminars to longer courses in business administration, site visits at home and abroad. In more advanced settings, the productivity centres assist firms to network and identify private consultants and programmes in the market.

Technology extension or advisory services. These are sponsored and coordinated through the government. Industrial advisers serve as external consultants to the firms; they identify technical production or management problems, and use access to technology and management know-how to solve problems. Their main benefit is that they link SMEs to existing support institutions, including research and development centres, productivity centres, business development services, cluster initiatives and so on. Technology extension is concerned with creating small but profitable improvements, by extending already established technology to smaller firms. Technology extension programmes either pay for firms to identify needs and find appropriate technological solutions, or directly engage in these.

Many industrialized countries offer industrial advisory services. The best known one is perhaps the Medium and Small Business Administration of Taiwan Province of China, set up by the government to coordinate the provision of financial, management, accounting, technical and marketing assistance to SMEs, and with the government covering 50-70 percent of the consultation fees. The government also set up the Centre-Satellite Factory Promotion Programme to integrate smaller factories around a principal one, supported by vendor assistance and productivity raising efforts, reaching some 60 networks mainly in the electronic industry.

In the USA, the Manufacturing Extension Partnership (MEP), set up in 1988 and covering fifty states by 1997, set up a network of 400 offices to connect SMEs to a large network of public and private industrial service providers. Funding is provided by the state, federal and private funds, with the firms covering at most 40 percent of the total costs. In Japan, 170 *kohsetsushi* centres provide technological support to business with fewer than 300 employees. They conduct research, have open laboratories for training, test and examine products for compliance, provide advice and guidance, and promote technology diffusion. Further examples in the UK, Ireland and Canada appear in boxes 3.2 to 3.5. Many developing countries have also recognized the need for extension services to help build the capabilities of SMES, including Thailand (with Canadian technical assistance, see Dhanani and Scholtès, 2002), Chile and South Africa. A final very interesting model which uses only use a minimum of public resources such is the *Steinbeis* Foundation in Germany, which is 99 percent self-financed technical transfer to SMEs.

Box 3. 2 Firm-based Technology Development Schemes in Canada

The *Industrial Research Assistance Programme* (IRAP) has its roots in 1947, when the National Research Council established a Technical Information Service to convert military technology into peacetime commercially useful applications. By 2002, IRAP had some 260 Industrial Technology Advisors (ITAs) who assisted over 12,000 SMEs per year. Its characteristic features included:

- The ITAs were engineers and scientists experienced in technical and industrial matters. They did not just provide information, but were pro-active advisers and problem-solvers. Their commitment to help, coupled with their technical competence as well as that of staff of associated organizations, made IRAP into a most respected and highly popular programme.
- IRAP established two fundamental and complementary concepts: networking and technology transfer. Networking allowed it to respond to the diverse needs of the clients effectively and in a multi-disciplinary manner. Technology transfer allowed firms to build on existing knowledge rather than to re-invent the wheel.
- IRAP developed a network of over 130 public and private research and technology-based organizations, consisting of universities (60), research institutes and technology centres (32), industrial and professional associations (24), regional research organizations (8), business centres (6), regional and municipal agencies (2) and others (9).
- The ITAs were located in 150 locations across the country. Over 70 per cent of them were directly employed by the network member organizations, including industry associations, while the remaining were NRC employers.
- The ITAs could recommend financial assistance for cost sharing of the technical projects. These could include the use of consultants for specific problems, the use of technical students to work on well defined projects, and assistance with small and larger R&D projects. IRAP could contribute to small projects up to a maximum of C$15,000, this funding constituting 40-50 per cent of the eligible project costs (labour, travel, sub-contracting and consultant fees). Larger scale projects could receive cost-sharing funding of up to C$350,000 over three years.
- IRAP delegated disbursement authority at the local and regional level of up to C$100,000, and established local review and decision committees. Due to quality and professionalism of ITAs and network staff, IRAP achieved high administrative efficiency, and was known to respond quickly to the SMEs.

Source: www.nrc.ca/irap

Box 3. 3 Firm-based Technology Development Initiatives in the UK (Part one)

Enterprise Initiative

This programme of the Department of Trade and Industry (DTI) ran for seven years from 1998 to 1995, and assisted some 60,000 businesses. It was one of the most successful programmes ever devised, and was responsible for the UK's lead in ISO 9000 certification. It provided consultancy services to SMEs in six areas: design, marketing, quality, manufacturing and business planning. Its distinguishing features included:

- A television and press campaign to launch the programme nationwide.
- Interested businesses could request a simple application form through free phone lines.
- Enterprise counsellors – recently retired industrialists with broad business experience – were subcontracted to visit the firms who had applied and, if consultancy was needed and agreed with the company CEOs, prepare a report on their requirements and sent to consultancy contractors; if not, the enterprise counsellors would identify other sources of assistance.
- The consultancy contractor would identify a suitable consultant or consultancy organization and, in agreement with the client, prepare a proposal tailored to the client's needs.
- Once approved by both, the consultant would undertake the assignment. On conclusion of the project, the client would pay his share, 50 per cent of the consultancy, directly to the consultant,

while the contractor would pay the remaining 50 per cent on behalf of DTI, after quality checks. Consultancy fee rates were based on a daily figure inclusive of expenses.

- The original Enterprise Counsellors would visit the client about two months after the conclusion of the project, and send a visit report to the contractor.
- Clients were entitled to a single consultancy project of up to 15 person-days spread over a maximum of 16 weeks, forcing the consultants to work efficiently.

United Kingdom Benchmarking Index (UKBI)
This DTI initiative, aimed to give access to comprehensive, low cost benchmarking information to all SMEs (manufacturing and services), to raise the awareness of the importance of measures as a way to improve performance, and to encourage the transfer and adoption of good practice. Based on a questionnaire completed by the SME, a private contractor would prepare a PC-based computerized reply, which would be edited by personal business advisers and innovation and technology counsellors, and which would show the comparative performance of the SME in relation to its chosen comparator. Benchmarking would cover three areas, namely, financial, managerial and business excellence. Its value would lie in the improvement of activities identified.

Other schemes included:

- The DTI *Small Firms Merit Award for Science and Technology* (SMART), which provided funds on a competitive basis for technical and commercial feasibility study for projects involving the application of new technology
- The *Engineers to Japan* programme which placed young engineers with management potential in Japanese host companies for a period of 9-12 months, and managed by the Royal Academy of Engineering for DTI.
- The *Innovation Vouchers* scheme for allocating up to four small vouchers for small businesses to fund the cost of external advice, based on the recommendation of innovation counsellors of the Business Link network. One voucher could purchase the cost of half a day of advice from a local consultant or technology organization. The scheme was administered by a private contractor.

Source: Arnold *et al.* (2002)

Box 3. 4 Firm-based Technology Development Initiatives in the UK (Part two)

The UK *Government' Manufacturing Strategy* (2002) intended to implement the following schemes:

Partnership Fund
Establish up to 150 projects promoting innovation in the workplace. Support a more strategic approach supporting at least eight sector based projects aiming to improve business performance by focussing on people at work, leading to a step change in relationships.

Industry Forum (IF)
The Government planned a further six sector projects, linking where appropriate to the Partnership projects, with an anticipated take up of 3000 companies. Potential sectors were to include healthcare equipment, construction and food processing. Based on results from previous IF programmes, new IFs were to achieve the following Quality, Cost, Delivery (QCD) improvements (or similar, using agreed sector measures):

- Non-right first time: 35 percent
- Delivery schedule achievement: 40 percent
- People productivity: 30 percent
- Stock turns: 50 percent
- Overall equipment effectiveness: 20 percent
- Value added per person: 40 percent

• Floor space utilisation: 40 percent

Manufacturing Advisory Service
The service aimed to provide information and advice to 15,000 manufacturers per year; to proactively undertake 2,500 diagnostic visits to small and medium-sized companies a year through the Regional Centres of Manufacturing Excellences; to undertake 500 follow-on consultancy projects per year; to inform, through the MAS website, 25,000 manufacturers/users per year on all aspects of manufacturing. Specific measures of success will be put in place.

Source: The Government's Manufacturing Strategy, www.dti.gov.uk

Box 3. 5 Firm-based Technology Development Schemes in Ireland

The *National Technology Audit Programme* (NTAP) targeted primarily manufacturing SMEs with 50 or fewer employees. It focused on appropriate technology and recommended how existing technology could be improved to increase profitability. However, this was placed in the context of other areas such as finance, quality, marketing and management. This programme, which was fully funded by the government, was very popular with Irish industry, producing 630 phase-one and 250 phase-two audits since its launch in 1989. Follow-up visits reported an average of 50 per cent of recommendations being implemented within 6-12 months after the audit, and a further 25 per cent of recommendations at a later stage. Profits were reported to be up by around 40 per cent, employment by 5 per cent, turnover per employee by 12 per cent and turnover by 18 per cent. The key features of the NTAP programme were as follows:

- In Phase one, a report identified opportunities which form the basis for the company's future manufacturing or business strategy.
- Phase two produced an action plan which recommends improved manufacturing techniques, including purchase of capital equipment on a cost/benefit basis, opportunities for cost reduction and productivity improvement, improved product quality, reduction of inventory, minimization of waste, and long-term company development.
- Projects were undertaken by a team of experienced consultants, sometimes augmented by technical specialists.
- Each audit involved a half-day of interviews with key personnel, and two to five days of on-site assessment of methods and procedures. Off-site investigations and report preparation of a detailed report took a further five-seven days.
- A follow-up visit was made six to twelve months after the completion of the initial audit.

Other initiatives included:
- The *Techstart* scheme, which placed some 300 young technical graduates in companies, in addition to additional training and consultancy associated with the recruitment of the graduates to support the project that they are working on. Some 80 per cent of the graduates elected to stay with the company after the first year.
- The *Techman* scheme, operated in partnership with the *Techstart* scheme, placed a senior technical project manager to realize a technical project in some 30 companies for a period of up to three years, with larger company contributions in years two and three.
- The *R&D Management* scheme provides training for companies in different technological competencies in four modules to educate R&D managers.
- The *Programme in Advanced Technology* (PATS) was initiated to exploit university-generated technology in industry.

Source: Arnold *et al.* (2002).

3.2 Investment

Investment in fixed assets

Total investment in fixed assets in China increased by 12 percent per year from 1995 to 2002 (table 3.4). Western China's investment in fixed assets grew faster, by 16 percent per year. Nevertheless, this region still only accounted for 20 percent of the total country's investment. In per capita terms, it grew nearly threefold between 1998 and 2002, but was its level was still only half as high as in Eastern China. The share of investment in fixed assets in GDP of Central and Western China increased significantly from 1995 to 2002, reaching 42 percent in Western China in 2002. This was mainly due to the implementation of 'Western China Development Strategy' from 1999 onwards.

Table 3. 4 Total Investment in Fixed Assets by Region, 1995-2002

	Total Investment (100 million yuan)		Share in country's total		Investment per capita (yuan)		Annual growth rate	Investment as % of GDP	
	1995	2002	1995	2002	1995	2002	1995-2002	1995	2002
China	19,374	42,035	100.0	100.0	1,600	3,272	11.7	33.6	35.7
East	12,369	24,183	63.8	57.5	2,745	5,014	10.1	38.6	35.6
Central	3,958	9,336	20.4	22.2	972	2,192	13.0	26.3	31.5
West	3,046	8,515	15.7	20.3	883	2,321	15.8	28.8	42.5

Source: China Statistical Yearbook 1996 and 2003

Foreign direct investment

Foreign direct investment (FDI), in addition to increasing investment funds, can transmit skills, knowledge and technology to developing countries. It can also provide managerial know-how and access to markets abroad. Countries and regions can accelerate their industrial development by participating in global production systems, and becoming regional supply centres. While independent firms can participate in these systems, few have the capabilities to meet the high technical standards set by buyers. Most countries have entered global supply chains recently through FDI by transnational firms (UNDO 2002:36).

Transnational firms, generally the leaders in innovation in their industries, transfer technology to their affiliates and not generally to independent firms. Also, such corporations do not generally locate R&D at the same place as production for economic reasons. Agglomeration, linkages, cumulative learning and economies of scale make it costly to transfer R&D overseas, particularly in places where high-level skills, advanced infrastructure and supporting research institutions are scarce. So FDI is important for industrial performance, not just because of R&D, but because it allows the transfer of managerial and technical skills and other know-how, as well as access to overseas markets.

FDI in China increased from US$ 37 to 52 billion, or 5 percent per year, between 1995 and 2002, compared with 11 percent for overall investment in fixed assets (table 3.5). Per capita FDI increased from $31 to 41. Because it grew slower than GDP, its share of GDP declined from 5.4 to 3.7 percent in this period. Nearly 90 percent of all FDI to China came to Eastern China in this period. The central and western regions only accounted for nine and four percent each of the total. In fact FDI in West China increased by only one percent compared with five and six percent in Eastern and Central China between 1995 and 2002.

Table 3. 5 Actually used FDI by Region, 1995-2002

	FDI (USD million)		Share in country's total		FDI per capita (USD)		Annual growth rate	FDI as % of GDP	
	1995	2002	1995	2002	1995	2002	95-02	1995	2002
China	37,215	52,471	100.0	100.0	30.7	40.8	5.0	5.4	3.7
East	31,969	45,457	85.9	86.6	71.0	94.2	5.2	8.3	5.5
Central	3,372	5,009	9.1	9.5	8.3	11.8	5.8	1.9	1.4
West	1,875	2,005	5.0	3.8	5.4	5.5	1.0	1.5	0.8

Source: China Statistical Yearbook 1996 and 2003

A number of reasons were responsible for the west's poor performance in attracting FDI (Zhang, 2003). First, the opening up of China to the outside world was implemented gradually. Throughout the 1980s and the first half of the 1990s most of China's areas open for foreign investment were found along the coast, which also offered preferential treatment. Second, most foreign investors in China were engaged in export-oriented processing industries, so the coastal areas offered the lowest transport costs. Third, investors from Hong Kong, Macao and Taiwan, as well as overseas Chinese dominated FDI. These all have their ancestral roots in Guangdong, Fujian and other coastal Chinese areas, with common cultures and languages. Fourth, Eastern China boasted relatively more and better physical infrastructure. Fifth, later FDI waves targeted domestic demand and the higher family incomes in the east. The combination of these factors may have produced a higher return of investment in the east in general (37 vs. 13 percent in the West) and FDI in particular (52 vs. 17 percent), according to one study (Wang & Fan, 2004).

Most regional and many county-level administrations have already established investment promotion services. In light of the success of their counterparts in the eastern regions, the western and central regions need to learn to provide comparable or even better services to attract a larger FDI share. In particular, they may want to emphasize their labour and other cost advantages, as well as stress that transport and other logistical costs are not that different for exporters.

3.3 Physical Infrastructure

Traditional infrastructure

Western China made significant strides in expanding its traditional infrastructure in the past few years. The length of railways, highways and navigable inland waterways all grew faster than in other parts of the country, reflecting the government priority given to investment in public infrastructure in this region. Due to its relatively sparse population, the west as a whole had more railways and highways on a per capita basis in 1995, and this lead increased in 2002. For instance, the length of highway per million persons was twice as high in the west as in the east (1,978 vs. 1,047 km, table 3.6).

This relationship did not hold for inland waterways, but these depended chiefly on natural resources. A closer look at regional data indicates that railway density was in fact quite low in some eastern regions such as Zhejiang, Fujian and Guangdong. These regions relied more on highway transport. Nevertheless, even here, highway density on a per capita basis was relatively high in some western regions, including Tibet, Qinghai and Yunnan.

Table 3. 6 Physical Infrastructure in China by Region, 1995-2002

	Length in operation (km)		Share in country's total %		Length per 1,000 km^2		Length per million persons		Annual growth rate
	1995	2002	1995	2002	1995	2002	1995	2002	1995-2002
Railways									
China	54,619	71,898	100.0	100.0	6	7	45	56	4.0
East	15,686	19,734	28.7	27.4	15	19	35	41	3.3
Central	20,314	25,444	37.2	35.4	12	16	50	60	3.3
West	18,619	26,720	34.1	37.2	3	4	54	73	5.3
Highways									
China	1,157,009	1,765,222	100.0	100.0	121	184	955	1,373	6.2
East	375,188	504,856	32.4	28.6	355	477	833	1,047	4.3
Central	341,437	534,642	29.5	30.3	209	328	839	1,255	6.6
West	440,384	725,724	38.1	41.1	67	110	1,277	1,978	7.4
Inland Waterways									
China	107,749	118,750	100.0%	100.0	11	12	89	92	1.4
East	54,031	58,029	50.1	48.9	51	55	120	120	1.0
Central	35,980	37,196	33.4	31.3	22	23	87	88	0.5
West	17,738	23,525	16.5	19.8	3	4	51	64	4.1

Source: China Statistical Yearbook 1996 (tables 3.3 & 15.3) and 2003 (tables 4.3 & 15.3); www.xzqh.org/quhua.
See annex tables A.3.10 to A.3.12 for regional ranking and data.

Modern infrastructure

Differences were much wider in modern infrastructure and in traditional infrastructure. The eastern region accounted for over 50 percent of land lines, and almost 60 percent of mobile phones and internet users (table 3.7). In contrast, Western China accounted for 20 percent of land lines and mobile phones, and 17 percent of internet users. On a per capita basis, people in the east were twice as likely to have a telephone line or mobile telephone as in the centre or west, and two to three times more likely to be an internet user.

However, telephones, mobile phones and internet connections represent as much purchasing power and consumption as they do investment. It is thus more relevant to compare access to these for businesses than for the overall population. The 'Shaanxi enterprise survey 2004' and the 'Baoji SME survey 2004' both indicate that businesses had adequate access to telecommunications and that the latter did not constitute a constraint to their operation and growth (see figure 4.1).

Table 3. 7 Land Lines, Mobile Phones and Internet Users by Region, 2003
(10,000 households)

	Land lines			**Mobile phones**			**Internet users**		
	Users (10 000 household)	**Share**	**Users per 100 persons**	**Users (10 000 household)**	**Share**	**Users per 100 persons**	**Users (10 000 household)**	**Share**	**Users per 100 persons)**
China	26,290	100.0	20.34	26,869	100.0	20.79	5,365	100.0	4.15
East	14,041	53.4	28.88	15,367	57.2	31.61	3,208	59.8	6.60
Central	7,014	26.7	16.38	6,079	22.6	14.19	1,268	23.6	2.96
West	5,236	19.9	14.18	5,423	20.2	14.69	889	16.6	2.41

Source: http://www.mii.gov.cn, Ministry of Information Industry, China Statistical Yearbook 2004, table 4-3; China Statistical Yearbook 1996, table 13-3. See annex table A.3.13.

Infrastructure adequacy at the firm level in Shaanxi

The surveyed enterprises appeared to be generally satisfied with their basic infrastructural facilities. On a scale of 0 to 100, transport, electricity and telecommunications ranked only 31, 24 and 22 as constraints to growth and operation (figure 4.1). This was confirmed by the small number of days with insufficient power, water, telephone and internet services in 2003 (6, 3, 4 and 7 days per year respectively on average, tables 4.4 and 4.5).

3.4 Education

Student enrolment and educational expenditures

Student enrolment. Education enrolment relative to population size was virtually the same between regions at the primary school level, and even higher in the west, due to their younger population. However, the west fell behind in secondary school enrolment (5.8 vs. 6.9 and 6.6 in the west, centre and east respectively), and far behind in higher education enrolment (0.5 vs. 0.7 and 0.9, table 3.8).

Table 3. 8 Student Enrolment by Education Level and Region, 1995-2002

Region	Higher education institutes		Regular secondary schools		Primary schools	
	1995	2002	1995	2002	1995	2002
Enrolment						
China	2,906,429	9,033,631	53,709,600	82,878,700	131,951,477	121,567,086
East	1,397,427	4,224,560	22,167,900	32,028,900	48,496,651	42,333,040
Central	885,220	2,876,435	18,844,700	29,503,500	44,567,959	40,953,000
West	623,782	1,932,636	12,697,000	21,346,300	38,886,867	38,281,046
Share in Total						
China	100.0	100.0	100.0	100.0	100.0	100.0
East	48.1	46.8	41.3	38.6	36.8	34.8
Central	30.4	31.8	35.1	35.6	33.8	33.7
West	21.5	21.4	23.6	25.8	29.4	31.5
Share in Population						
China	0.2	0.7	4.4	6.5	10.9	9.5
East	0.3	0.9	4.9	6.6	10.8	8.8
Central	0.2	0.7	4.6	6.9	10.9	9.6
West	0.2	0.5	3.7	5.8	11.3	10.4

Source: China Statistical Yearbook 1996 (table 18-30, 18-5, 18-26) and 2003 (table 20-31, 20-5, 20-26)
See annex tables A.3.13 to A.3.17.

As a determinant of manufacturing performance, school enrolment data suffer from two major drawbacks. Enrolment data do not take into account the significant differences across regions and regions in education quality and relevance to manufacturing needs. The data also ignore on-the-job learning, both experience and training, which in many countries is a major source of skill formation. Also, gross and net enrolment data are not readily available in China, so comparisons are made relative to total population size, whose age profile changes from region to region. Nevertheless, the available school enrolment data clearly indicate that the west is not providing education at the same level as the centre and the east. This is confirmed by observing educational expenditures.

Education expenditures. The east accounted for 54 percent of total education funds, while the centre and the west accounted for the remaining 46 percent, about equally divided between them (table 3.9). As a result, per capita expenditure of educational funds was almost double in the east than in the other two regions, a gap which did not narrow between 1996 and 2001. Even though all regions spent about the same share of GDP on educational funds, the large per capita difference in educational expenditures means that the east will race

further ahead in human resource development unless the west and centre can somehow manage to substantially raise the resources they devote to education.

Table 3. 9 Educational Expenditure by Region, 1996-2001

	Expenditures (10,000 yuan)		Share in country's total		Expenditure per capita (yuan)		Expenditure as % of GDP		Annual growth rate
	1996	2001	1996	2001	1996	2001	1996	2001	1996-2001
China	22,623,394	46,376,626	100.0	100.0	184.8	363.4	3.3	4.3	15.4
East	11,596,991	24,857,246	51.3	53.6	255.6	518.7	3.1	4.0	16.5
Central	6,227,898	11,508,293	27.5	24.8	151.7	271.3	3.4	4.2	13.1
West	4,798,504	10,011,087	21.2	21.6	137.6	274.7	3.9	5.5	15.8

Source: China Statistical Yearbook 1997 (tables 18-36, 3-3, 2-11) and 2003 (table 20-35, 4-3, 3-8).
See annex table A.3.18.

Education and training at the firm level

Secondary school leavers formed nearly 60 percent of the workforce in the surveyed firms, while college and university graduates formed the remaining 40 percent in the surveyed enterprises (see annex table A.3.24). Less than 2 percent were primary school leavers, though this proportion was higher at around 6 percent in the food industries. The education profile increased from food, to machinery and pharmaceutical industries. As for training, some 55 percent of employees received formal in-house training, either in a classroom, workshop or laboratory. A further 9 percent were trained outside the enterprise. Food and pharmaceutical industries trained their employees more than machinery industries, especially pharmaceutical, which trained 73 percent of their personnel in-house and a further 12 percent outside. Training expenditures averaged 220,000 yuan per firm, or 0.9 percent of total sales.

The top managers of most firms, 86 percent, were college or university graduates, ranging from 73 to 87 and 97 percent for food, machinery and pharmaceutical industries. Their previous experience usually included working for other enterprises and large state-owned enterprises (43 and 38 percent), but some also had experience in university or research institutes, government employment and foreign enterprises (16, 12 and 9). Managers in pharmaceutical industries were more likely to have worked in university or research institutes (27 percent). Nevertheless, top managers did not rate their previous work experience as very important. For instance, on a scale of 1 to 100, work experience in other enterprises and national enterprises ranked 29-30, while experience in research institutes ranked 12.

In light of the above relatively favourable education and skills profile of the workers and managers, the surveyed firms understandably did not rank skills and education as a constraint to their operation and growth. On a scale of 1 to 100, skills and education of the workforce ranked 29 in the Shaanxi survey and 32 in the Baoji SME survey. Nevertheless, the lower educational expenditures in the west will surely increase the regional human resource gap between the west and the east.

3.5 Conclusions and Policy Implications

The differences in manufacturing performance between Eastern regions on the one hand, and Western and Central regions on the other hand explored in the previous chapter are matched by similar differences in total technological effort, of which R&D is a component and which is used here as a proxy, foreign direct investment, modern infrastructure, and education at the secondary and higher education level. In all these cases, the gap is not only substantial but is widening. There are many measures that Western and Central regions can take to redress the balance in these key determinants of manufacturing performance.

Raising technological efforts at the enterprise level

Technological effort, including domestic R&D, foreign direct investment and royalties or licensing, have a most powerful influence on manufacturing performance. The development of manufacturing and technological capability is necessary even at low levels of development, and takes many forms, not just R&D. It includes technology acquisition through the purchase of machinery, turn-key plants, technology development based on incremental design and engineering activities, including reverse-engineering and continuous improvements in logistics, and R&D for more advanced technologies.

Comparative data on R&D in large and medium enterprises indicate that eastern regions not only dominated technological development in China, but also increased their lead over Western and Central China. By 2002, they accounted for 70 percent of total R&D expenditures, 53-55 percent of science and technology personnel and graduates, 70 percent of all contractual inflows to domestic markets, and 95 percent of imported technical contracts for technology and equipment. If these four R&D indicators can be assumed to reflect industrial technology development in general, then they indicate that Eastern regions stepped up their technological effort, while Central and Western regions increased their technological efforts in some areas, such as R&D expenditure and contractual inflows, but these were rather small compared with the east. In other areas, such as technical personnel and imported technology contracts, they made little or no progress.

The Western and Central regions clearly need to step up their efforts to acquire, adapt and develop industrial technology. The regional government can take several measures, without favouring some firms or discriminating against other by taking the following concrete measures: reform or establish technology extension services; reform the government and university research and technology institutes and other serviced providers; and encourage the industry associations to increase their direct involvement in industrial technology development strategies, priorities and programmes. The role of associations in this technology development is discussed in chapter four.

Technology extension services. Some regions provide technological extension services but this is often limited to selected firms located in high technology industrial parks. The vast majority of manufacturing enterprises, up to 70 percent in the Shaanxi survey of manufacturing enterprise in 2004, may be unaware of the existence or usefulness of existing technological support institutions for raising their manufacturing capabilities and competitiveness. In many industrialized countries, extension agents, enterprise counsellors or advisers take the initiative to approach firms to help recognize and identify their need for change.

In order to revamp their existing technology extension services, or establish new ones, the Western and Central regions have many highly successful models to choose from, ranging from the Small and Medium Administration of Taiwan Province of China, the Manufacturing Extension Partnership (MEP) in the USA, the 170 *kohsetsushi* centres in Japan, the Manufacturing Advisory Service in the UK, the National Technology Audit Programme (NTAP) in Ireland, and the Industrial Research Assistance Programme (IRAP) in Canada. There may even be some good models to follow from successful eastern regions.

The Canadian system is particular worthy of study, because it shows that there is no need to establish a cumbersome, stand-alone technology extension service. IRAP has placed its 260 industrial technology advisers in a network of over 130 public and private research institutes, including universities, research institutes and technology centres, business and industrial associations, professional associations, business centres, and even regional and municipal agencies, to assist over 12,000 SMEs per year (box 3.2).

These agencies use a variety of mechanisms to fund their technology extension service, which western and central regions may consider. The UK one, for instance,

established a grant-based scheme, combined with an outreach scheme in two consecutive phases. A first phase funded consultants to prepare an initial audit identifying opportunities for the enterprises' future manufacturing and business strategy. A second phase prepared an action plan tailored to the client's needs, whether in the area of design, marketing, quality, manufacturing or business planning, or a combination of these. Recommendations on improving manufacturing techniques included purchase of capital equipment on a cost-benefit basis, opportunities for cost reduction and productivity improvement, improved product quality, reduction of inventory and minimization of waste, and long-term company development. The UK Enterprise Initiative assisted some 60,000 businesses employing less than 500 employees each (box 3.3).

Government research and technology institutes. Detailed assessments of the government research and technology institutes should be undertaken to evaluate their mandate to provide technology services at the firm level. Some of them may be working below capacity precisely because of the low demand for technology services from the firms themselves. So a major task of the technology institutes should be to raise awareness at the firm level, and raise their demand for technology services.

The institutes should deploy industrial technology advisers who can take initiative to visit firms, provide initial diagnostic services, prepare a plan of action for productivity and technological upgrading, and put manufacturing firms in touch with specialist service providers and technical consultants. The government can contribute financially, either in full or in part, for such services. Keeping in mind the goal of financial self-sufficiency, the government can enter into contracts with technology institutes, under which the institutes would undertake to provide technical advisory services to an agreed number of firms every year. In order for the institutes to recruit and retain professionally educated and experienced industrial technology advisors, the contracts should be of a long-term nature.

MSTQ services, productivity centres and information technology centres. These institutions provide more general industrial services to manufacturing enterprises. As in the case of government research and technology institutes, detailed assessments of the capabilities, strengths and weaknesses of these institutions must be undertaken to reform and make them effective. Ideally, such services should not be solely provided by the government. As quickly as possible, they should be supplied in government-business partnerships, or by private firms and industry or business associations, with subsidies if justified, and without if the market can supply the services.

ISO 9000 certification. Manufacturing enterprises appear to have little difficulty in obtaining ISO certification, ultimately defeating the purpose and advantages that ISO certification is supposed to convey. Regional governments may need to review the ISO certification system to make it more effective. They may also need to consider separating the certification and training functions to allow more independence and objectivity in granting certification.

Investment promotion services

The western and central regions attracted respectively US$2 and 5 billion worth of FDI in 2002, compared with $45 billion for eastern regions. While their FDI grew by only about one percent per year, eastern regions were far more successful in attracting FDI, which increased by 5.5 percent per year between 1995 and 2002, thus increasing their overall share to nearly 90 percent of the total. Western and central regions need to step up their investment promotion services by learning from their eastern counterparts and by learning from successful examples abroad, such as Malaysia. The relatively small share of Western and Central China in FDI strongly suggests that foreign investors lack knowledge of investment opportunities in these areas, due perhaps to misconceptions related to transport costs, skills

availability, infrastructure availability and reliability, quality of life, labour cost advantages, and many other factors.

This chapter, and the next on business environment, show that Western and Central regions possess adequate and reliable infrastructure and skills for the manufacturing sector, and offer substantial labour cost advantages. However, the market for foreign direct investment will not function effectively unless the regions devote sufficient resources to publicize business opportunities to prospective investors, who may have a refined understanding of their own needs. Moreover, since domestic investments are of a much larger magnitude than FDI, Western and Central regions perhaps need to undertake even more efforts to attract investors from the Eastern regions.

Attracting the right kind of foreign and domestic investment requires a good deal more than simply establishing a good business and policy environment, and advertising labour cost advantages. It also requires dedicated efforts in a wide range of activities ranging from the identification of suitable investment prospects, to the active servicing of the strategic needs of firms once established, including the development of skills, recruitment services and identification and upgrading of local suppliers. The promotion agency must have the authority to ensure meaningful cooperation among all entities whose activities must be coordinated to achieve a successful outcome. The agency must be subject to proper oversight at the highest level of government.

Infrastructure

In traditional infrastructure such as railways and highways, the western and central regions were not left behind the eastern regions and, in many cases, were even ahead on a per capita basis, especially in highway density. In terms of modern infrastructure however, the density of land telephone lines, internet and mobile phones, was significantly lower than in the east, largely due to their higher household incomes, but these may not be the case for productive units. Most manufacturing enterprises in the Shaanxi survey had access to and used the internet and had websites. They experienced little difficulty in securing reliable power, water and telecommunication services, and thus did not rank infrastructural facilities, with the exception of transport, as a constraint in their operation and growth.

Education

It appears that the education gap may be higher in the general population than in the manufacturing workforce. In the surveyed firms for instance, college and university graduates formed 40 percent of the workforce, while most of the remaining 60 percent were secondary school leavers. Less than 2 percent were primary school leavers, mostly in low-technology industries such as food. Most top managers were college or university graduates. With such an education profile, the surveyed manufacturing firms did not rank skills and education as a constraint in their operation and growth.

While the education level of the manufacturing workforce was relatively high, at least in Shaanxi province, the west and the centre fell behind the east in educational expenditures and student enrolment rates at the secondary and higher education level. For instance, the student enrolment rate at the higher education level in the west was only half that of the east. Educational funds per capita in the west and centre were also half of the level in the east. This means that the human resource gap will continue to widen in the future, unless the west and centre can somehow allocate more resources to education. The central government can also play a crucial role here by allocating central funds to assist the regions left behind in education development.

CHAPTER 4. REGIONAL BUSINESS & POLICY ENVIRONMENT

Manufacturing enterprises considering locating or relocating in a region will generally undertake a careful study of the cost of doing business there, and the overall business and policy environment. Some of the major cost factors which influence the decision to locate in a particular site include the cost of labour, transport and utilities, land, building and office, financing and taxes. Where the decision requires the relocation of key individuals, personal factors such as cost of living, housing, education, and quality of life may also become important. Other key factors affecting the business environment include labour availability and skill levels, access to markets, customers and suppliers, reliability of transport infrastructure, of utilities and telephone services, suitable land sites and the regulatory environment. Quality of life factors include crime rates, healthcare facilities, schools and universities, climate, and culture and recreation (KPMG, 2004:1).

To enable investors to quickly identify potential sites and competitive locations for further detailed investigation, regional and local governments must produce and make available relevant data and information on all the above costs and factors. A number of regions, including Shaanxi and Sichuan, and some counties already produce some useful data; however this are often confined to industrial or technology parks, or is incomplete and outdated. Therefore this study commissioned *ad hoc* surveys to compile basic costs of doing business of three regions, Shaanxi, Sichuan and Yunnan. To provide additional information on the business climate and policy environment, including the regulatory environment, the two manufacturing surveys commissioned by this study mentioned earlier, namely the 'NDRC/UNIDO Shaanxi enterprise survey 2004' and the 'NDRC/UNIDO Baoji SME survey 2004' included a special section on the major constraints to operation and growth. The findings of these business cost and manufacturing surveys are discussed in turn below.

4.1 Costs of Doing Business in Eastern and Western China

According to a recent study of eleven countries, labour costs represented 57 to 72 percent of location-sensitive costs for manufacturing operations; for service operations, this rose to 75 to 85 percent (KPMG, 2004:51). Facility costs, including financing costs, represented the second most significant cost factor (12 to 24 percent). Transport was the third major factor, representing 1 to 17 percent of the total. Utility costs represented 2 to 10 percent of location-sensitive costs. Finally taxes represented 5 to 11 percent of total location-sensitive costs for manufacturing operations. Business cost data for Western and Eastern China for the above categories are compared below.

Labour costs

The business cost surveys collected basic wage and other labour cost data for nine categories of workers in three selected western regions – Shaanxi, Sichuan and Yunnan — and three eastern regions – Shanghai, Jiangsu and Zhejiang[1]. Besides basic wage rates, data was compiled on official work hours, overtime rate, compulsory benefits, number of holidays and vacation per year, and cost of dismissal for permanent workers (see annex table 4.1 for full findings).

[1] The business costs surveys were undertaken by the Business School of Renmin University of China for Shaanxi, Sichuan and Yunnan, and by Mark Yu (consultant) for Shanghai, Jiangsu and Zhejiang in June-July 2004.

Table 4. 1 Basic Wage and Salary in Selected Regions, June 2004 (5 years of Experience, yuan per month)

	Official minim. Wage	Unskilled worker	Assembler or operator	Tradesman	Production supervisor	Engineer/ accountant	Senior manager	Factory manager
East								
Shanghai	635	900	1,200	1,500	1,900	2,600	2,900	3,850
Jiangsu	550	575	650	850	1,250	1,650	1,900	2,500
Zhejiang	570	610	700	900	1,300	1,700	1,930	2,650
Average	585	695	850	1,083	1,483	1,983	2,243	3,000
(US$)	70	84	102	131	179	239	270	361
% Operator	69	82	100	127	175	233	264	353
West								
Shaanxi	320	500	700	900	1,350	1,950	2,250	2,700
Sichuan	360	550	675	800	1,400	2,025	2,350	2,750
Yunnan	320	400	525	750	1,500	2,200	2,500	2,800
Average	333	483	633	817	1,417	2,058	2,367	2,750
(US$)	40	58	76	98	171	248	374	331
% Operator	52	76	100	129	224	325	356	434
% West/ East	57	70	75	75	96	104	105	92

Source: 'NDRC/UNIDO Survey of Business Costs 2004' (see Annex table A.4.1)

Table 4. 2 Transport and Utility Costs, June 2004 (yuan)

	Total sea freight costs to LA (20 T container)	Air freight per kg	Return air ticket to Beijing	Electricity per kilowatt-hour	Water Indus-trial use	Natural gas, ind. use per m^3	Kero-sene/ Indus-trial fuel	Tele-phone local per min.	Tele-phone, inter-city
East									
Shanghai	22,400	28	1,700	0.56	1.35	7.40	n.a.	0.11	0.70
Jiangsu	24,000	32	850	0.62	1.10	2.98	3.08	0.10	0.70
Zhejiang	24,500	32	1,600	0.65	1.20	3.10	3.25	0.10	0.80
Average	23,633	30	1,383	0.61	1.22	4.49	3.17	0.10	0.73
(US$)	2,847	4	167	0.07	0.15	0.54	0.38	0.01	0.09
West									
Shaanxi	24,355	48	2,100	0.34	1.86	0.95	3.00	0.10	0.70
Sichuan	27,585	56	2,880	0.44	1.40	1.02	3.22	0.10	0.70
Yunnan	23,826	36	3,620	0.30	2.50	0.89	3.43	0.10	0.70
Average	25,255	46	2,867	0.36	1.92	0.95	3.22	0.10	0.70
(US$)	3,043	6	345	0.04	0.23	0.11	0.39	0.01	0.08
% West/ East	107	153	107	59	158	21	102	97	95

Source: 'NDRC/UNIDO Survey of Business Costs 2004' (see Annex table A.4.1)

The average basic wage of assembly workers or operators in Western China was 633 yuan per month (US$76) in mid-2004, or 75 percent of the 850 yuan per month ($102) earned by their eastern counterparts. The minimum wage in the west, at $40 per month, was just under 60 percent of the Eastern level (table 4.1). The wage differential between west and east wage advantage prevailed for all worker categories below supervisory level, but gradually narrowed going up the skills and education ladder, to reach nearly parity professional and managerial employees. Diploma-level technicians and production supervisors earned around

80 percent of their counterparts in the east, while engineers, scientists and accountants, senior managers, and factory managers were paid about the same as their Eastern counterparts.

Other labour costs which firms take into account, such as overtime rate (1.5 times basic wage), compulsory benefits for accident insurance and unemployment benefit (3.3 percent of payroll), number of holidays and vacation per year (ten days each), and cost of dismissal (one month per year worked) were uniformly low throughout China.

Transport and utility costs

As expected, transport costs incurred by exporters in western regions were higher than in eastern regions, but the cost difference was of the order of ten percent only for exporters. Although road freight to get containers to the nearest international sea port, at around 3,100 yuan, was double the cost than for eastern regions, this accounted for 12 percent of the total cost transport of a 20-tonne container to Los Angeles, including sea freight (20,500 yuan), and insurance and handling (1,650 yuan). Of course, to the extent that western regions used imported inputs, they would incur further transport charges to bring these in by road or rail.

Air freight in western regions was over 50 percent more expensive (30 vs. 51 yuan per kg), while air tickets to Beijing were twice as expensive (table 4.2). Western regions charged either lower or equal rates for utilities than their Eastern counterparts. For instance, electricity and natural gas cost 59 and 21 percent of that of the east, while kerosene and telephone calls cost about the same. The west was more expensive for water rates only.

Start-up costs, borrowing rate, tax rates and other costs

Facility costs. The west was quite competitive in facility costs, with land costing less than half of that in the east, and construction costs, office lease and warehouse space ranging from 57 to 76 percent of that in the east (table 4.3).

Table 4. 3 Start-up Costs, Borrowing Rates, Taxes and other Costs, June 2004 (yuan)

	Indus-trial land 000 yuan per ha	Indus-trial construc-tion [a] per m^2	Office lease per day/m^2	Ware house space d/m^2	Commer-cial loan %/year	Income tax, Indus-trial park	Income tax rate, other [b]	House, appt rent per month	Interna-tional school primary
East									
Shanghai	2,400	1,300	4.7	3.15	5.31		33, 18, 27	6,500	100,000
Jiangsu	965	1,200	n.a.	1.75	5.31		33, 18, 27	3,900	40,000
Zhejiang	1,050	1,200	2.7	200	5.31		33, 18, 27	4,050	41,500
Average	1,472	1,233	3.7	2.30	5.31		33, 18, 27	4,817	60,500
(US$)	177,309	149	0.40	0.28	5.31			580	7,289
West									
Shaanxi	685	858	3.0	1.50	5.26	20	33, 18, 27	2,000	10,500
Sichuan	700	850	2.7	1.25	5.26	22	33, 18, 27	2,600	18,800
Yunnan	650	1,010	2.7	1.20	5.26	21	33, 18, 27	2,000	12,000
Average	662	906	2.8	1.32	5.26	21		2,200	13,767
(US$)	79,719	109	0.30	0.16	5.26			265	1,659
% West/ East	45	73	76	57	99		100	46	23

Source: 'NDRC/UNIDO Survey of Business Costs 2004' (see Annex table A.4.1)
Note:
a. Built-to-suit, single level, turnkey, 10 percent finished office space.
b. Income tax rate: basic, below 30,000 and 30,000-100,000.

Borrowing and tax rates. Secured commercial borrowing rates were uniformly low throughout China at 5.3 percent per year. In order to attract investment, regions in Western China provided a preferential income tax rate of 20 percent in industrial parks, compared to the standard income tax of 33 percent elsewhere. Smaller businesses paid a lower rate of 18 and 27 percent depending on size. Eastern areas also provided tax incentives, including total exemption for the first two years of operation, and half exemption for the following three years, provided the investment was approved by the local government. Large or influential investors are often able to negotiate special tax rates with regional and local government in all regions.

Living costs. Living costs in Western China were substantially lower than in Eastern China. An international standard house or apartment cost just $305 per month to rent, compared with and an average of $580 per month in Eastern China. International schools also charged about half of the fees charged in the east ($4,620 vs. 8,440 per year in secondary school).

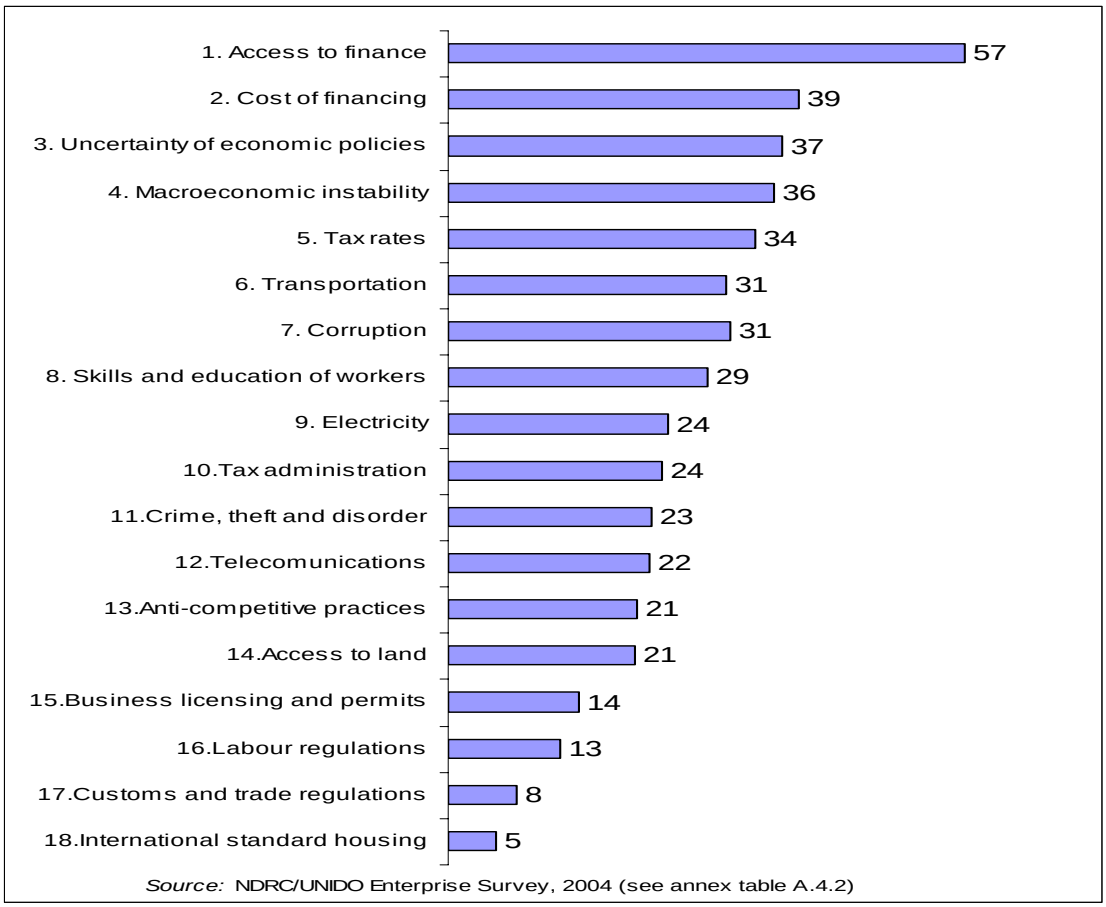
4.2 Business Environment and Investment Climate

Access to finance. In the manufacturing enterprise surveys, firms were asked to rate various constraints to their operation and growth on a scale of 1 to 4. These numbers referred to the degree of obstacle encountered, ranging from minor obstacle, moderate obstacle, major obstacle, and serious obstacle. When converted to a scale of 0 to 100, by far the most serious obstacle reported by the firms was access to finance (57 and 68 in the Shaanxi and Baoji SME surveys respectively figure 4.1). This is understandable considering they were growing at 24 and 40 percent per year on average in 2001 to 2003. The next major obstacle, but significantly less serious, was the cost of financing (39 and 31). Next, but much further down in order of importance, came uncertainty in economic policies, macroeconomic uncertainty, and tax rates (37, 36, and 34 percent). Transport, corruption, and skills and education of workers came next (31, 31 and 29). This was followed by electricity, tax administration, crime and telecommunications, anti-competitive practices, and access to land (24, 24, 23, 22, 21 and 21).

Physical infrastructure. Manufacturing enterprises appeared to be generally satisfied with their basic infrastructural facilities since few firms complained about transport, electricity and telecommunications. That infrastructural quality was not an impediment to investment was confirmed by two surveys of some 4,000 firms in total organized by the World Bank in 23 cities across China in 2002 and 2003 (World Bank 2004:4). This was further confirmed by the small number of days with insufficient power, water and telephone, and internet services in 2003 (6, 3, 4 and 7 days per year respectively on average, table 4.4).

Regulatory environment. The average processing time for imports and exports were nine and five days. The longest time required was ten and 14 days for imports and exports on average, though this varied much from firm to firm and sector to sector (table 4.5). Business licensing and permits, labour regulations, customs and trade regulations, international standard housing and international education were the least serious constraints (less than 14). The regulatory environment over which the government has influence, and which often stifle business in other countries, including business licensing and permits, labour regulations, and customs and trade regulations, were not considered significant obstacles to growth and operations by enterprises in Shaanxi.

Figure 4. 1 Constraints to Growth and Operations (Order of Importance, Scale 0 to 100)



Source: NDRC/UNIDO Enterprise Survey, 2004 (see annex table A.4.2)

Table 4. 4 Days without or with Insufficient Power, Water & Telephone Services, 2003

	All	Food	Machinery	Pharmaceutical
Electricity	5.6	4.0	5.6	7.4
Water supply	2.9	2.8	2.3	3.5
Telephone	3.5	3.5	4.2	2.8
Internet	7.0	6.9	4.7	9.3
Total number of enterprises	90	30	30	30

Source: Same as figure 4.1

Table 4. 5 Processing Time for Imports and Exports, 2003 (days)

	All	Food	Machinery	Pharmaceutical
Import				
Average processing time	9.2	4.0	10.8	8.5
Longest processing time	15.2	10.0	12.4	20.0
(Responding enterprises)	(10)	(1)	(5)	(4)
Export				
Average processing time	5.2	1.9	6.7	4.2
Longest processing time	8.4	5.0	9.7	8.2
(Responding enterprises)	(21)	(4)	(12)	(5)

Source: Same as figure 4.1

That informal payments were not a major investment impediment was also found in the two surveys organized by the World Bank noted above (World Bank 2004:7). However another World Bank study of SMEs in Southwest China found significant barriers to entry, related to registration procedures for new businesses (World Bank 2004:10-16). Licensing requirements for construction, safety, fire, sanitation, water use, environment, one-time operating licenses and annual registrations, all imposed an additional burden on management, and encouraged some rent-seeking behaviour. While the study found that many firms spent much time and effort to get things done, informal payments, including money, gifts and banqueting, were relatively small by other country standards. Firms in the worst cities, Wenzhou and X'ian, paid 0.3 and 0.5 percent of sales, while firms in other cities commonly paid less than 0.2 percent of sales on informal payments to get things done or done quickly (Dollar *et al.*, 2003:37).

Registration time, licensing requirements and inspections varied widely from one city to another. In theory, anybody can register a business with just one yuan, but in practice a limited liability company involved 12 procedures, 41 days to complete and required 500,000 yuan in capital requirement for a manufacturer in a large coastal city in China. A number of advanced economies, including Malaysia, Thailand, Singapore, Hong Kong, UK and USA, have no minimum capital requirements for such companies.

On average, firms in the 2002 World Bank survey had to endure about 30 inspections or official visits during the previous twelve months, lasting more than a day and involving two officials on average. This absorbed 14-18 percent of management time, much more than in coastal China, other East Asian industrializing countries and OECD countries, where as little as five percent of management time was required for regulatory compliance activities (World Bank 2004:15).

Contract enforcement. The Shaanxi and Baoji manufacturing surveys did not probe into the judicial service that firms had to deal with in their operations. However, the importance of this government service increases with economic development. Firms gradually rely less on personal relationships to do business, and more on arms-length contracts with suppliers and contracts. Moreover, the need for transactions rises with increasing specialization and out-sourcing. This requires a strong and impartial court system to enforce such contracts and resolve commercial conflicts. Locations which have build up a strong reputation for an efficient and speedy court system will be favoured with increased investment flows.

The length of time for the local court system to resolve the latest commercial dispute of a firm varied substantially from city to city, from six to 13 months, and averaged ten months (Dollar *et al*., 2003:39). This waiting time was related to a number of factors, including the adequacy of judiciary staff, their knowledge of commercial laws and other regulations, and their professional competence. While legal fairness and impartiality are equally important, the court waiting time was clearly too long, and a deterrence for business persons to take their dispute to court for settlement.

4.3 Business and Industry Associations

Business and industry associations as technology promoter

The traditional role of business and industry associations has focused on lobbying government, and on providing their members with information about emerging government policies. Trade liberalization and globalization is however changing the role of industry associations around the world. More intense competition in the global economy provides the impetus for firms to seek improvements in production organization, with faster delivery schedules and lower stock costs. It also requires them to develop design capabilities, improve

quality and access new markets that have yet to be targeted by lower-waged producers. Finally global standards are increasingly gaining importance in international trade, which are in many ways new forms of non-tariff barriers. Associations can play a catalytic role in enabling the process of industrial upgrading and adopting global standards, in addition to sharpening their lobbying function. Thus, not only firms but also industry associations need upgrading, because joint action and cooperation are increasingly required by domestic firms to face the challenges of the new competition (Nadvi, 1999:19).

Effective and dynamic industry associations can provide many benefits to their member firms, including horizontal coordination among producers, vertical coordination of upstream and downstream linkages, setting and enforcement of product standards, and the provision of information and technical training (Doner and Schneider, 1998:11). They can provide a neutral forum for identifying common needs, constraints and opportunities, and serve as focal points for efforts to address them (Porter, 1998:258). Associations can provide political voice, concrete business services such as seminars, information and library services, exhibitions and trade fairs, foreign contracts, contract adjudication, specialized legal advice and assistance, and certification of documentation and of product quality, as well as an arena for social contact between members, and sometimes a 'cover' for cartel arrangements, and participation in framing or implementation of public policy, including the performance of regulatory duties (Moore and Hamalai, 1993:1897).

In the context of SME clusters, there is a clear relationship between support through the association and a cluster's overall competitiveness. In the case of four clusters (three shoe manufacturing clusters in the Sinos Valley, Brazil, in Guadalajara, Mexico, and Agra, India, and one surgical instrument cluster in Sialkot, Pakistan), the majority of sampled firms reported a rise in the level of joint action with their respective trade associations following the onset of the particular crisis that their cluster faced. In addition, in a number of these clusters there appeared to be a relationship between increasing joint action through the business association and improved firm performance (Nadvi, 1999:9).

However, business associations often act more in the interest of their own staff and organizers than of their members (Moore and Hamalai, 1993:1895). The potential for 'unproductive' rivalry and conflict between competing associations is high. The more effective associations are those not financially dependent primarily on membership fees, and which can offer specialized services. Business Associations are often numerous, because they charge relatively small fees, and face no opposition from employees.

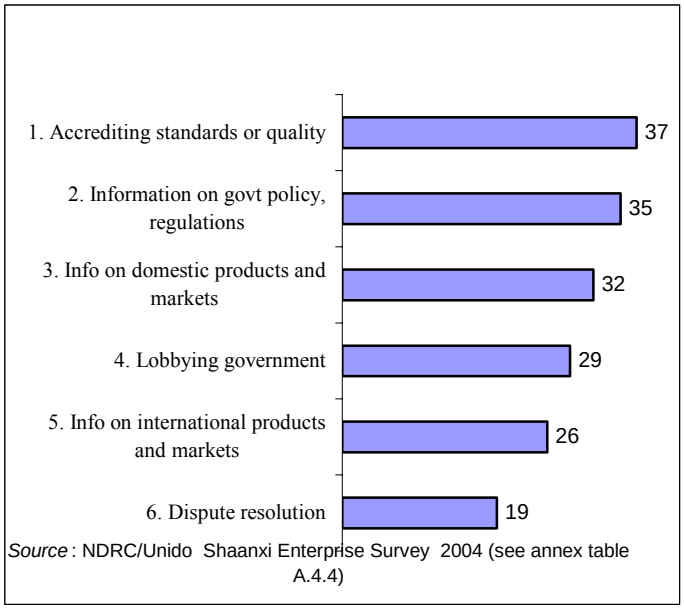
Association organizers belong to two categories. They are either administrative employees of the associations, whose salaries, status and career prospects and opportunities for supplementary remuneration are perceived to be linked to the success of the organization in terms of its financial turnover, the volume of its activities, and the extent to which it can command the attention of influential external agencies, notably government and perhaps aid agencies. Alternatively, organizers could be businesspeople, who view office-holding as an opportunity to enhance their own status, to make valuable business contacts with politicians, bureaucrats and other businesspeople, to advance their own political careers, or to promote particular causes with which they identify closely. Organizers may often have more interest in the existence and activities of associations than members, and may have considerable autonomy to manage associations. This helps explain why they are so numerous, but also why they often have overlapping formal areas of jurisdiction and actively compete, in the same sphere, for members and for government recognition.

Business associations in Shaanxi

Shaanxi has a large network of business and industry associations at the regional and county or prefecture level. They include both apex organizations such as chamber of commerce and industry, or industry-level bodies such as the association of pharmaceutical industries. Many of the industry-level associations emerged when entire government departments were dissolved, including many dealing with specific industries, such as the Ministry of Steel. Some government officers were re-employed by these associations to continue coordinating activities between the government and the enterprises.

The regional and prefecture-level governments retain control of most apex organizations such as chambers of commerce and industry, and provide most of their staff, office space and operational funds. In recent years however, an independent private sector chamber of commerce and industry has emerged in Xian, at the behest of wealthy and influential business persons and industrialists.

Figure 4. 2 Role of Industry and Business Associations (Order of Importance, Scale 0 to 100)



Source: NDRC/Unido Shaanxi Enterprise Survey 2004 (see annex table A.4.4)

To assess the role and importance of business and industry associations, the Shaanxi enterprise survey 2004 included several questions on their level of contact and the range of services provided to manufacturing enterprises. A total of 65 firms, or 72 percent, were members of chambers of commerce or business associations. In general the firms did not rate the value of their traditional services very highly. On a combined scale of 0-100, most services were rated at 19-37 (figure 4.2). In order of importance, standards accreditation, information on government policy and regulations, and information on domestic products and inputs rated higher than lobbying government, information on international products and markets, and dispute resolution.

As for more modern roles, the business and industry associations similarly played a minor role in technology acquisition or promotion. Thus the relatively high membership level of firms of all sizes, with the exception of the smallest and least visible ones, may indicate that the firms may have had little choice but to belong to the existing government-sponsored associations, but did not draw much benefit from them.

Changing the role of business and industry associations

Business and industry associations now provide some information on government policies, and on market and business information services to their member firms. However, they have not yet taken up the role of technology promoter. For instance, they do not provide technical information and services such as product and process advice, productivity improvement at the plant level, advice on sources and costs of production equipment, and so on. In this era of globalization and trade liberalization, the challenge is to upgrade industry associations, not just firms, particularly their capacity to deliver technological upgrading services to their members.

Industry associations should play a critical role in promoting industrial development, however they face several constraints. Many associations are dependent on government funding and are staffed by government officials in active service or retired, and therefore raise issues of independence and how well they can represent the interests of firms. This also raises the issue of sustainability after government assistance comes to an end or is withheld. Thus, encouraging firms to form their own independent associations, and strengthening and upgrading existing ones is an important area for forging effective government-business partnership.

On the other hand, from the point of view of members, promoting joint action may be difficult given that in many cases the producers are often also local rivals. The possibilities of external economies and the free rider gains can also discourage cooperation among local agents. This is often mentioned as a crucial constraint in many countries.

Nevertheless, if these constraints can be overcome, as in some other countries, industry associations can potentially offer a range of valuable services to their members. These include representing the interest of their members to government, undertaking coordination and regulatory tasks, and providing members with a wide range of producer services such as: (i) technical and managerial advice, and information to help link local producers with distant markets, including data on markets, prices, competitors, trade policies as well as general trade information; (ii) technology support to help local producers upgrade, both in process and product technologies ad well as moving up the value chain into areas such as design and research and development; (iii) linking of local producers to local and global trade fairs that provide exposure to local firms and bring external buyers; (iv) benchmarking services to help local producers compare their performance with global best practice; and (v) technical assistance to meet new global standards and the development of local quality labelling (Nadvi, 1999:6).

Interactions between government officials and the existing private sector industry associations have not often taken the form of meaningful government-business dialogue and collaboration in important areas such as investment and trade promotion strategy, industrial and export diversification, productivity enhancement and mastery of product and process technology, international competitiveness and skills development. The analytical capacity of most industry associations needs to be upgraded to enable them to contribute effective arguments and ideas related to industrial development and increasing competitiveness, especially needed in the face of regional and global liberalization.

4.4 Industrial Competitiveness and the Environment

China’s vast environmental resources have contributed to its rapid economic development, but urbanization and industrialization have seriously damaged air, water and soil quality over the last two decades[1]. China’s air and water are apparently among the most polluted in the world, particularly in urban areas. There is chronic air pollution from burning coal to supply energy, water pollution from untreated industrial wastes and sewage, and soil erosion from deforestation. Agriculture is a large contributor to the country’s GDP, however about 20 percent of China’s arable land has been lost since 1949. China's rivers and lakes are polluted by improperly treated industrial, agricultural and urban waste. Much has been written about the state of China’s environment and natural resource base (World Bank 2001b, Finamore and Szymanski, 2002, and Liu & Diamond 2005), and the ecological systems on which it depends for water, food, energy and materials. The purpose here is merely to highlight some serious environmental issues that may impede China’s industrial competitiveness.

[1] This section was prepared by Halton Peters, Research Fellow, UNIDO Beijing Office and Fellow, Department of Global Ecology, Carnegie Institution of Washington.

The case of China's township and village enterprises (TVEs), which have played an important role in manufacturing growth, is highly illustrative. Widely distributed and small-scale, with an average of six employees, TVEs account for a third of China's production and half its exports, but nevertheless cause disproportionate adverse impacts to the environment. TVEs account for 50 percent of industrial air and water pollutant emissions, due primarily to the emission of large volumes of waste and the inefficient consumption of resources, notably coal and water. China's continued economic growth suggests that output from TVEs is likely to remain high and grow rapidly, at least in the short run. On the other hand, polluting TVEs often foul the very resources upon which they depend, which may stifle their future growth.

China's State Environmental Protection Administration (SEPA) estimates that overall environmental pollution could force a 10 percent loss in GDP by 2010. Massive investment in environmental protection has yielded some positive benefits. Nevertheless the continued degradation of environmental resources threatens not only the integrity of the natural ecosystem, but China's continued industrial development. In response to the challenges posed to global economic development presented by environmental degradation, the international community has adopted the United Nations Millennium Development Goal (MDG) number 7, to ensure environmental sustainability. This goal is to be accomplished by integrating the principles of sustainable development into country policies and programmes; reversing loss of environmental resources; reducing by half the proportion of people without sustainable access to safe drinking water; and achieving significant improvement in lives of at least 100 million slum dwellers. The need to sustain high economic growth to achieve goals of economic development has often been viewed as counter to efforts to reduce environmental pressures. More recently, however, there is increasing recognition of the reflexive connection between industrial performance and environmental sustainability.

The recently released findings of the Millennium Ecosystem Assessment (MA)[1] underscore that while industrial development may conserve or degrade environmental resources, environmental quality may promote or constrain industrial competitiveness. The main report of the MA, released in March 2005, indicates that more than half the world's ecosystem services which support human activities, including economic activities, are being utilized in an unsustainable fashion. Six major environmental trends — greater water scarcity, climate change, habitat change, biodiversity loss and invasive species proliferation, ocean exploitation and nutrient overloading — will each have profound effects on business and economic development.

The MA concludes that if current trends continue, ecosystem services that are freely available today will cease to be available or become more costly in the near future. Loss of these services will transform the conditions under which businesses operate, including customer preferences, stockholder expectations, regulatory regimes, governmental policies, employee well-being, and the availability of finance and insurance. While these effects will be largely negative, the depletion of these key environmental services will create new industrial opportunities as demand grows for more efficient or different ways to use ecosystem services, for mitigating impacts, and for tracking and trading services. Commercial opportunities will likely emerge in industries including energy production, agriculture,

[1] The Millennium Ecosystem Assessment (MA) is a four-year scientific appraisal of the conditions and trends in the world's ecosystems and the services they provide (such as clean water, food, forest products, flood control, and other natural resources). It is conducted under the auspices of the United Nations, with the secretariat coordinated by the United Nations Environment Programme (UNEP), and governed by a multi-stakeholder board including representatives of international institutions, governments, business, NGOs, and indigenous peoples (Millennium Ecosystem Assessment, 2005b). The MA serves as an international scientific assessment of the consequences of ecosystem change for human well-being, including economic development. A special report of the MA summarized the findings of the MA that are particularly relevant for the business community in the industrial and developing world (Millennium Ecosystem Assessment, 2005a).

tourism, and construction. As a result, the report suggests that corporations and other businesses should be preparing now for the depletion of these natural services.

The relationship between business and the environment is of growing concern to governments, business enterprises, and the general public (UNIDO, 2002). Calculating comprehensive indices of environmental quality is beyond the scope of this publication. Data limitations and conceptual complexity make it a particularly difficult undertaking. Nevertheless, when formulating strategies to improve industrial competitiveness in China it is important to consider the environmental issues and policies that influence the context of industrial performance.

Threats to Biological Diversity

Conserving biodiversity is crucial to maintaining the balance of ecosystem services, but China's rich biodiversity is threatened by the loss of habitat and the proliferation of noxious invasive species from outside China. China has more than 10 percent of the world's vascular plant and terrestrial vertebrate species (Liu and Diamond 2005), and the biodiversity of Western China, the country's richest region in terms of biodiversity, is of global importance. Up to 20 percent of China's species are threatened by human activities such as habitat conversion. Moreover, China contains about a quarter of the world's endangered species listed by the International Endangered Species Trade Convention. Desertification is a serious problem in China and is among the most important threats to biological diversity. Desert expansion, largely due to overgrazing, has accelerated with each successive decade since 1950, converting biologically significant forests and grasslands, and productive rangeland and farmland, into desert.

In addition to these declines in native species, there has been a dramatic increase in the number of invasive plant and animal species in China. Currently, half of the world's 100 worst invasive species have entered China. Most invasive species were brought into China during the course of international trade, often unintentionally. Some of these alien species (more than 400 by 2004) have become pests that inflict substantial economic losses on the agricultural, forestry and livestock production sectors. These invaders accounted for economic losses of about US$14.5 billion in 2000 alone, 1.4 percent of China's GDP in that year (Liu and Diamond 2005). Moreover, invasive species may displace native biodiversity, destroying future potential in pharmaceutical development and chemical development.

China's historical high native biodiversity, combined with its recent accumulation of successful invasive species, means that China in turn now exports many invasive species. An increase in the risk of receiving an invasive species through international commerce has the potential to alter the terms of trade. As noted, most invasive species are introduced, often unintentionally, via international trade. Fear of the economic losses associated with invaders, or government regulation of invasive species by trading partners, may provide disincentives to trade with partners with poor controls on invasive species. The un-managed alteration of China's biodiversity may thereby undermine industrial development by hindering access to international markets.

Population and Household Size

The rate of population growth in China has declined steadily in recent decades. The natural growth rate of the population fell from 14.26 in 1985 to 10.06 in 1997, and 6.01 in 2003[1]. China is also becoming more urban. Its total population doubled from 1952 to 2003 while the proportion of this population living in urban environments tripled from 13 to 40 percent

[1] Natural growth rate of population = [(number of births - number of deaths)/average number of population] × 100% (Yearbook of Statistics 2004, National Bureau of Statistics).

(NBS 2004). Although a slower population growth rate and the densification of the population may be expected to yield positive benefits to the environment, working in opposition to the declining trend in total population is the marked increase in the number of households over this period. Average households size in China fell from 4.5 to 3.4 people per household between 1985 and 2003.

This decline in average household size resulted in an increase of 80 million households over this period, more than the total number of households in Russia and Canada combined (Liu and Diamond, 2005). Declines in average household size have interacting and synergistic effects on the environment (Liu *et al*., 2003). First, more households implies more housing units, which increases the consumption of land and building materials required for construction, and threatens biodiversity. Second, these smaller households achieve lower efficiencies of resource use because goods and services are shared by fewer people than in larger households. The fragmentation of the population of China into smaller and smaller households provides markets for industrial products and services, but simultaneously these additional households threaten biodiversity and compete with the industrial sector for critical resources, especially energy and water.

Management of Municipal Solid Waste

The production of solid waste is becoming a serious problem in China. There are solutions however, with the potential to result in positive ancillary benefits to the energy sector, and thereby promoting industrial competitiveness.

China recently surpassed the United States to become the world's largest generator of municipal solid waste (MSW). In 2004 urban areas of China produced about 190 million tonnes of MSW (World Bank 2005). Lands contaminated from spills or inadequate disposal practices, i.e. "brown fields", adversely impact land values, public health, and environmental quality. There are now at least 2,000 of these sites in Chinese cities. The cleanup costs associated with these sites will likely exceed the cost to dispose of the waste properly in the first place, but the situation could become much worse. By 2030 China is expected to generate at least 480 million tonnes of MSW. Both the size and the rate of this increase in MSW production are unprecedented anywhere in the world, and the management of this waste has enormous domestic and international implications. Between now and 2030 China must deal with 250 percent more waste, requiring the environment to assimilate an amount of waste equivalent to that produced by two additional US economies of today.

The number of incinerators is expected to grow in China, but there is little knowledge and experience with incineration facilities. The goal of the Ministry of Construction's increasing the rate of waste incineration to 30% (up from the current 1%) will reduce MSW and provide benefits to the energy sector, but this plan would also be likely to at least double the global ambient levels of dioxin[1] (World Bank 2005), and to substantially increase the output of other forms of airborne pollutants, including mercury.

Solving the MSW problem is important for public health, environmental quality, and economic development. The implementation of this solution may be expensive, but as with many other environmental problems, the undertaking presents ancillary opportunities to improve industrial competitiveness. For instance, China's cities could generate as much as US$ 1 billion per year from the sale of carbon emissions reductions (CERs), resulting from

[1] Dioxin is the name for a family of toxic chemicals that are widely distributed throughout the environment in low concentrations. There are an issue of international concern because they are persistent, bio-accumulate, and result in increased risk of cancer in animals and humans. Elevated dioxin levels in China have been an issue of concern for importers of Chinese fish and livestock.

landfill gas recovery, composting, recycling, and anaerobic digestion[1] (World Bank 2005). Perhaps more importantly, the gas associated from this recovery would generate 950 PJ of energy annually, with 2400 PJ of annual energy production from MSW possible by 2030 (UNIDO analysis). Landfills therefore need urgent attention to improve overall operating conditions and gas yields. Additional attention is also needed to develop productive uses of landfills after they close.

Air Pollution

Air pollution is perhaps the most conspicuous of China's environmental problems, especially in urban areas. This pollution is generated mostly through the combustion of fossil fuels, and the sources are dominated by the industrial sector. China's electric power industry has played a fundamental role in its national industrial development. Power generation has grown faster than any other energy source in China over the past 20 years, averaging 7.8 percent growth annually (World Bank 1997). Continued expansion of energy production sector is a key ingredient of continued industrial growth, but potential gains in industrial competitiveness may be offset by economic losses associated with resultant air pollution. Total urban air pollution costs China U.S. $32.3 billion per year in human health impacts, while outdoor air pollution in excess of average national standards is responsible for 178,000 premature deaths annually. The three principle culprits for China's urban air pollution are: (a) small and relatively inefficient coal-fired industrial boilers; (b) residential coal use, which is responsible for air pollution far disproportionate to its contribution to energy production; and (c) the rapid increase in the number of passenger cars. Of these, coal combustion is by far the leading source of industrial air pollution in China today, contributing up to 87% of total sulphur dioxide (SO_2) and 75% of carbon dioxide (CO_2) emissions.

Total suspended particulates (TSP) are China's most significant air pollutant, followed by sulphur dioxide (SO_2). Coal combustion is the dominant source of both pollutants, although dust from construction sites and wind-blown soil is an important contributor to TSP in some cities. In 2001 China emitted 19.48 million tons SO_2 emissions, down almost 18% from a 1995 peak of 23.7 million tons (Finamore and Szymanski 2002). Much of this decline is attributable to the economic slowdown and shutdown of highly polluting and inefficient power plants and other coal-intensive industrial entities over this period. Power plants were still responsible for 46% of total SO_2 emissions in 2001, a proportion that some predict will reach two-thirds by 2010 as the share of end-use coal consumption continues to decline. Nevertheless, emissions of TSP and SO_2 have stabilized or even declined in some parts of the country. In contrast, nitrogen oxide (NO_x) levels have increased considerably, reflecting the growing prevalence of passenger cars, and therefore of vehicle emissions (World Bank 2001).

These industrial and vehicular emissions to the air contribute heavily to acid rain[2], smog, and climate change both within China and around the world, causing severe damage to the natural resources that are the foundation of China's industrial sector, and to human health. Acid rain is responsible for US $14 billion in economic losses in China, nearly 2 percent of GDP (Asian Development Bank 2001). Acid rain falls in 82 percent of Chinese cities and affects 29 percent of China's total land area (Finamore and Szymanski 2002). Furthermore, without significant action, SO_2 emissions are expected to increase from current levels of 20

[1] This estimate is based on a sale price of $4.50 per tonne and a maximum diversion rate of 50 percent LFG recovery and 10 percent composting levels. It excludes the CERs that would be generated from the substitution of this gas for other sources of energy.

[2] Acid rain is the common term for acid wet deposition, which is caused by emissions of SO_2 and NO_x that are converted in the atmosphere into secondary pollutants such as sulfuric and nitric acids. Both acids dissolve easily in water, and the resulting acidic water droplets return to earth as acid rain, snow, or fog.

million tons to 30 million tons by 2010 (Finamore and Szymanski 2002). In recognition of the serious problems presented by acid rain in China, China's national SO_2 emission control strategy aims to reduce ambient SO_2 pollution in designated cities (SO_2 control region) and reduce acid rain impact in designated areas (acid rain control region). Coincident with this undertaking, between 2001 and 2004 an SO_2 emissions trading program was established among large (more than 50 MW generation capacity) state-owned electricity generating facilities in the Yangtze River Delta region. This market-based approach to emissions reductions was implemented in order to achieve the benefits of reduced air pollution at the lowest economic cost.

Global Climate Change

Climate change may prove to be the most important industrial issue of the 21st century. The implications of changing climate for weather patterns, access to raw materials, commodity prices, regulatory frameworks, and geopolitical stability are widespread. The industrial sector in China should be explicitly aware of ramifications of climate change, its barriers and its opportunities, when formulating strategies for sustaining recent increases in industrial competitiveness.

The narrow range of temperatures occurring on earth is a product of the concentrations of "greenhouse gases" (GHGs) in the atmosphere. The chief GHG is carbon dioxide (CO_2), which is released by the burning of fossil fuels and deforestation. Other important GHGs include methane (CH_4) and nitrous oxide (N_2O), which are produced through industrial and agricultural processes. The concentrations of these GHGs and others are increasing, driving increases in global average temperatures. By the end of the 21st century, global average temperatures are expected to have increased by 2.3 to 4.5 degrees Celsius (IPCC, 2001). Anticipated environmental impacts of climate change include: rising sea levels; more frequent and severe storms; worsened droughts, heat waves, and more rapid desertification; loss of biological diversity; and reduced global agricultural output. Changing climates are also expected to promote geopolitical volatility as nations confront each other in aggressive confrontation for energy food, and water (Schwartz and Randall 2003). Further contributing to this volatility is the fact that many of the areas most sensitive to climatic modification are poor, politically unstable, or both.

In 1992 the international community agreed on the United Nations Framework Convention on Climate Change (UNFCCC). This Convention states the need to stabilize greenhouse gas concentrations at a level preventing dangerous climate change. China joined more than 180 countries in signing and ratifying the UNFCCC. The Kyoto Protocol under the UNFCCC was agreed to in 1997 and obliges the industrialized countries that have ratified it reduce their greenhouse gas emissions by several percentage points below 1990 levels. China signed the Kyoto Protocol in 1997, and ratified it in 2002. The Kyoto Protocol also allows for trading of emission reductions and allowances by means of the so-called flexible mechanisms. The Clean Development Mechanism (CDM) is one of the three flexible mechanisms established under the Kyoto Protocol (Yamin and Depledge, 2004), and is the only one of particular relevance for China. The CDM allows developed countries listed in UNFCCC, which have specific emissions reduction targets, to invest in GHG emission reduction projects in non-Annex 1 developing countries, which have no such specific reductions targets. The reductions in overall GHG emissions that result from the implementation of the CDM project (Certified Emissions Reductions, or CERs), count toward the fulfilment of the emissions reduction goals in the industrialized country that sponsored the project. CDM projects thus reduce the overall cost of developed world compliance with the emissions targets of the Kyoto Protocol while contributing to sustainable development in the developing countries that host these projects.

China is now the world's second largest emitter of CO_2 (after the United States), emitting about 12 percent of the world's total. China is also the world's largest generator of HFC, among the most potent gases in terms of global warming potential (GWP) to be regulated by the Kyoto Protocol. As a non-Annex 1 country under the UNFCCC, China is not bound by specific GHG emissions targets, but may partner with developed countries to implement projects designed to lower the global quantity of GHG that would otherwise be emitted. More than 50 percent of the world's total CDM potential is in China (Haites 2004, Nygard *et al*., 2005). CDM therefore provides substantial opportunity to finance the acquisition of advanced technology for industrial development. For instance, it is estimated that China's power sector will need almost US$315billion in capital expenditure to meet expansion plans, between 2000-2010, with an anticipated 85 percent increase (from 32650 MW installed to 60450 MW installed) in renewable energy production in the areas of wind, hydropower, bio-energy, and solar between 2006-2010 (Tennant 2003). With GHG mitigation potential equivalent to 1.045 billion tonnes of CO_2 in these renewable sectors alone, more than US$4 billion of foreign financing could be available through CDM. An additional US$500 million of CDM financing could potentially support the planned expansion of coal-bed methane utilization over this period (UNIDO analysis).

Barriers to Environmental Protection

China has increasing comprehensive environmental legislation, and substantial investments are being made in cleaner production technologies, energy efficiency, and environmental management and rehabilitation programmes. International development organizations, multilateral banks, and foreign investors have been highly supportive of these steps. This support is evidence of stakeholder recognition of the importance of the connection between environmental quality and sustainable industrial development. Nevertheless, barriers remain to achieving the protection of environmental resources that would be consistent with China's goals for economic development.

Inadequate financing from the central government may be partially inhibiting environmental protection. Since the 1980's, environmental protection has become one of the country's core national policies. The Tenth Five-Year Plan calls for 1.3 percent of GDP to be spent on environmental protection and biological construction by 2005. More than 80 percent of this spending is allocated to pollution control, but SEPA believes a minimum investment of 1.5 percent of GDP is required to control pollution arising from economic development.

Institutional barriers to environmental protection are also problematic (NDRC, 2004). Fines for environmental regulations are generally too low to inhibit proscribed behaviour with negative ramifications for ecosystem services and the broader environment. Fines are rarely calibrated to compensate or offset costs of the environmental damage inflicted, and often contribute only to the financial benefit of enforcement bodies rather than to mitigation of negative environmental impacts. There are almost 100,000 local environmental protection officials in China charged with the enforcement of China's environmental laws and regulations, but these officials are paid and supervised by the local municipalities in which they work. As a result, loyalties tend to reside with the local officials who finance the environmental regulators and directly supervise their work rather than with the central government, from whom their actual mandate emanates. Since localities view economic and social concerns as more immediate and politically weighty than environmental protection, they tend to disregard or under-enforce environmental standards.

Localities that compete in industry at the expense of their environment do so at their own economic peril. As discussed above, there is increasingly greater recognition of the dependence of industrial performance on environmental quality. Rather than simply ignore environmental standards, localities striving to increase their industrial competitiveness may

be better served by incorporating environmental opportunity costs into their economic calculus. Recently introduced market mechanisms for environmental protection and pollution reduction in China provide a blueprint for the commercialization of the ecosystem services upon which industry depends.

4.5 Conclusions

A preliminary comparison of business costs between selected western and eastern regions indicates that western regions offered a solid cost advantage in labour costs, facility costs, utility costs and living costs. Western regions were only marginally more expensive in transport costs for exporters, because sea freight accounted for most of the transport costs. However, their higher road transport costs put them at a disadvantage for inter-regional trade, especially in the lucrative costal markets.

Labour costs. Since labour costs are so important in the selection of the location of manufacturing plants, western and central regions can certainly publicize more aggressively their solid wage advantage in the unskilled and semi-skilled worker category, as well as the availability of skilled, professional and managerial personnel of comparable quality to the East and at the same wage to attract more domestic and foreign firms in their region on the other hand.

The official minimum wage rate in three Western regions was less than 60 percent of three Eastern regions, while the market wage rate for unskilled workers, assemblers, operators and tradesmen ranged from 70 to 75 percent of their eastern counterparts. At supervisory, professional and managerial levels, the wage rates were about the same. Other labour costs which firms take into account, such as overtime rate (1.5 times basic wage), compulsory benefits for accident insurance and unemployment benefit (3.3 percent of payroll), number of holidays and vacation per year (ten days each), and cost of dismissal (one month per year worked) were uniformly low throughout China.

Transport and utility costs. The west was not as much at a disadvantage when it came to transport and utility costs. Sea freight costs incurred by exporters in Western regions were some ten percent higher than in Eastern regions only, because the road transport cost to get containers to the nearest international sea port, while double the cost incurred by Eastern regions, was only a minor component of the total cost, whereas the most important cost, port-to-port freight costs, was the same. As for utilities, western regions charged either lower or equal rates than their Eastern counterparts. For instance, electricity and natural gas cost 59 and 21 percent of that of the east, while kerosene and telephone calls cost the same. Only water rates were higher in the west. Air freight however was over 50 percent more expensive.

Facility costs, borrowing rate, tax rates and other costs. The west was very competitive in facility costs, with the land costing less than half of that in the east, and construction costs, office lease and warehouse space ranging from a third to three quarters of that in the east. Secured commercial borrowing rates were uniformly low throughout China at just over 5 percent per year. Most regions provided tax incentives. Western China provided a preferential income tax rate of 20 percent in industrial parks, compared to the standard income tax of 33 percent elsewhere. Smaller businesses paid a lower rate of 18 and 27 percent depending on size. Eastern areas also provided tax incentives, including total exemption for the first two years of operation, and half exemption for the following three years, provided the investment was approved by the local government. Living costs in Western China were substantially lower than in Eastern China, about half for international standard housing and international schools.

According to a recent international study by KPMG Consultants, labour costs represent 60-70 percent of the location-specific costs for manufacturing operations. Facility

costs, including financial costs, and transport costs are the second and third factors (12-24 percent and 1-17 percent respectively). Utility and tax costs are relatively unimportant. Since western regions offer generally lower business costs in most of these categories but especially for labour, they should advertise them aggressively to potential investors, both domestic and foreign, as part of their comprehensive investment promotion services.

Business registration, regulations and inspections. Though the two Shaanxi manufactured surveys commissioned by this study did not rate business licensing and permits as an obstacle, the findings of other sources differ. Recent World Bank studies found that many local governments undertake too many non-productive, intrusive inspections of businesses. These findings are too important to ignore, especially since firms in advanced regions appear to have lower regulatory burdens than less advanced ones. This is likely to create further divergence between rich and poor regions, and capital will flow to where it is less difficult to get things done.

Local governments should make their staff and agents realize that business registration procedures are arduous and inspections require 30-35 days of management time which businesses, especially SMEs, can ill afford. All local governments should request inputs and collect reliable information from businesses and, where necessary, review local practices to reduce inspections to the absolute minimum. The SME Promotion Law in fact prohibits improper administrative behaviour, which can only encourage rent-seeking and informal payments. There is an obvious role here for business and industry associations, however local government must be proactive and make the effort to listen to them.

Contract enforcement. The importance of the judicial service rises with economic development. Firms gradually rely less on personal relationships to do business, and more on arms-length contracts with suppliers and contractors. Moreover, the need for transactions rises with increasing specialization and out-sourcing. This requires a strong and impartial court system to enforce such contracts and resolve commercial conflicts. Locations which have build up a strong reputation for an efficient and speedy court system will be favoured with increased investment flows. According to a recent study, the length of time for the local court system to resolve the latest commercial dispute of a firm varied substantially from city to city, from six to 13 months, and averaged ten months. This waiting time was clearly too long, and a deterrence for business persons to take their dispute to court for settlement. To improve the overall business climate, business and industry associations have a key role to play here, to work with the local government to achieve an efficient and speedy local court system.

Business and industry associations as technology promoter. The traditional role of business and industry associations has focused on lobbying government, and on providing their members with information about emerging government policies. However, associations can play a catalytic role in enabling the process of industrial upgrading and adopting global standards, in addition to sharpening their lobbying function. Thus, not only firms but also industry associations need upgrading. The regional authorities should encourage business and industry associations to provide technology services at the firm level. To start with, regional authorities should undertake detailed assessments of their capacity and willingness to do so, and formulate appropriate action plans accordingly.

Encourage local industry associations. Regional and local governments should promote and encourage the formation of local industry associations run by their own members. The associations should then be encouraged to invest in common facilities such as quality certification, information services, joint marketing and so on.

Protecting the environment. Continued increases in industrial competitiveness are necessary for the achievement of China's sustainable development goals. However, increasing industrial development may degrade the quality of environmental resources. At the

same time, industrial development in China is dependent on essential goods and services derived from the natural environment. Businesses will increasingly face governmental regulation and pressure from stakeholders (including customers, investors, activist shareholders, and civil society) as threats to environmental resources become more severe and more obvious. Leading businesses in competitive industries are seeking to build brand recognition and reputation by being the first to address the issues surrounding environmental degradation. As a result, exports in which China enjoys great competitive advantages seem the most likely to encounter environmentally motivated consumer challenges in international markets. In addition, new industries will emerge in response to the growing desire to protect and manage ecosystem services[1]. Therefore, the identification and monitoring of ecosystem services is critical to the development of effective strategies for increasing industrial competitiveness.

More market tools should be applied to environmental issues as China continues to move toward a market-based economy. As part of this movement industries and governments should ascertain the full price of ecosystem services upon which they depend, as these services are currently often under-priced or not priced at all. Moreover, the price of ecosystem services should be incorporated into the accounting when formulating strategies for improving and sustaining industrial competitiveness. In developing such strategies, businesses and governments should be explicitly aware that although new environmental regulations may sometimes hinder short-term industrial development, the early adopters of such policies are likely to enjoy a head start in the emerging industries of the environmental economy.

Since the 1980s environmental protection has been one of China's core national policies, prompting a great deal of environmental legislation. But China's record of compliance is poor, especially in rural areas. Fines for environmental regulations are often too low to inhibit prohibited behaviour, or produce conflict issues by contributing more to the financial health of enforcement agencies than to mitigation of environmental impacts.

The problems confronting China's natural environment are many, with diverse implications for economic development and industrial competitiveness. Clearly each environmental problem will require individual consideration and specific action. Many such specific recommendations flow directly from the assessment of industrial competitiveness and environment. Nevertheless, the focus here is on the broader challenge, i.e., to formulate an integrated strategy for dealing with the consequences of existing and proposed industrial policies on the state of ecosystem services required for sustained economic growth. As part of its current programme in China, UNIDO has offered a number of recommendations on achieving sustainable industrial development through effective stewardship of environmental resources. These recommendations are summed up in chapter 7.

[1] One example is China's nascent eco-technology industry. Since 1999 more than US$575 million have been invested in upgrading the technology of China's producers of environmental protection implements. The annual output of China's environmental equipment industry will likely reach more than US$484 million by the end of 2005. More than 100 Chinese companies have benefited from projects designed to assist them in obtaining and mastering foreign techniques to upgrade their production capacity.

CHAPTER 5. SMALL AND MEDIUM-SCALE MANUFACTURING ENTERPRISES (SMEs) [1]

5.1 Mapping of Manufacturing SMEs in China and Shaanxi

The Chinese government's concern with SME promotion is relatively recent, and official statistical agencies have only just begun to pay attention to their diversity and scope. Definitions of SMEs, which were modified in moving from the planned to the market economy, were only finalized when the law on SME promotion came into effect in 2003.[2] To this day however, statistical data are mostly collected for units with an annual sales turnover above 5 million yuan, the so-called 'above-scale' enterprises, whether in urban or rural areas. This cut-off point, equivalent to about US$50,000 in monthly sales, is relatively high and probably misses out most of the micro and small-scale enterprises, especially in the rural areas.[3] In pulling the available statistics together, the picture that emerges so far is far from complete and sometimes inconsistent. Nevertheless the following general observations can be made regarding the importance of industrial and manufacturing SMEs in employment and value-added in China and in Shaanxi province.

The available data suggest that below-scale manufacturing enterprises were the largest manufacturing employers in China. They accounted for 41 percent of total manufacturing employment and 68 percent of employment in manufacturing TVEs in 2003 in the country. Their average firm sizes were respectively 30 and 8 workers per enterprise. The manufacturing sector as a whole employed 83 million people or over 11 percent of the total workforce of 737 million in 2002 in China (figure 5.1 and table 5.1). It accounted for 91 percent of the total industrial workforce, the remaining being employed in the production and supply of electricity, gas and water utilities. Manufacturing data are not available separately for large and medium enterprises.

The remaining 59 percent of manufacturing workers were employed in above-scale enterprises for which data are collected systematically, about equally divided between medium and large-scale enterprises, and small enterprises (31 and 28 percent).[4] Their average firm sizes were 1,264 and 146 for large and medium, and small enterprises respectively. Most above-scale enterprises were thus relatively large by international standards. Value-added in below-scale and small enterprises was only 14 and 56 percent of that of medium and large

[1] Huang Hanquan and Lan Haitao of the Institute of Industrial Development, National Development and Reform Commission, and Christoph David Weinmann (independent consultant) contributed numerous inputs presented in this chapter and provided technical feedback.

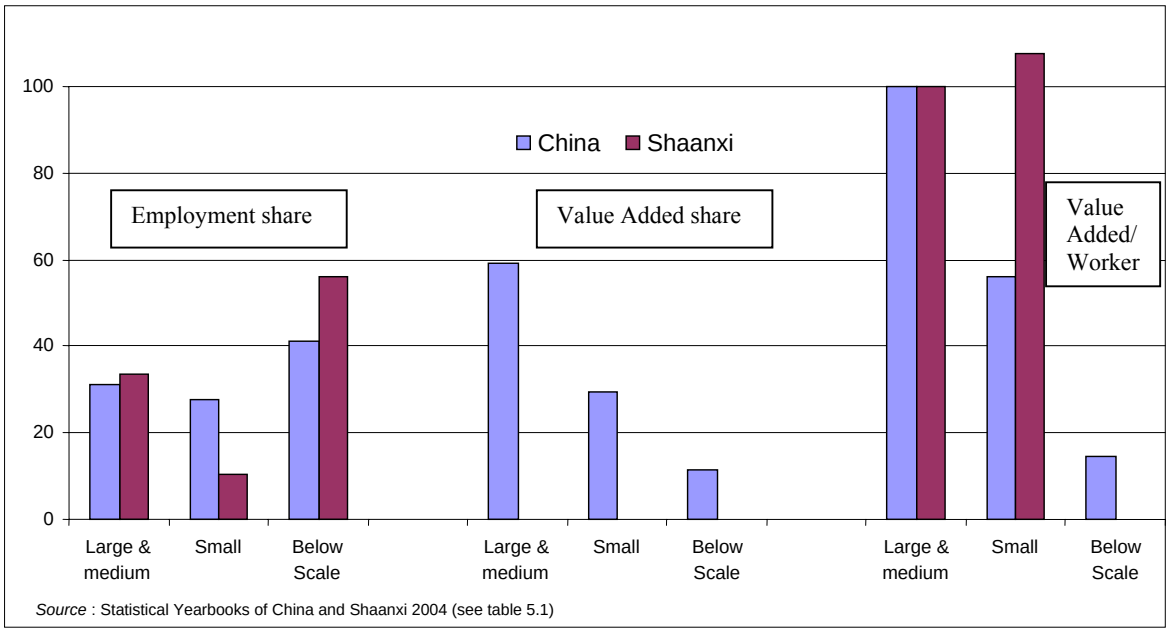
[2] *Law of the People's Republic of China on Promoting Small and Medium-sized Enterprises*, adopted at the 28th Meeting of the Standing Committee of the Ninth National People's Congress on June 29th, 2002. The definitions can be found in the *Notice for Circulation Concerning Trade Regulations on Temporary SME Standards Stipulated* (2003). The previous official size definitions were extremely detailed by industrial sub-sector and guided by material output figures which were not useful for application in a market economy.

[3] There are two similar Chinese terms used in the statistics: *above scale* and *above norm*. The category *above scale* includes by definition all state-owned enterprises (i.e. independent of size) plus those non-state-owned enterprises which have a turnover of more than 5,000,000 yuan, and therefore is not a clear-cut size category. The category *above norm* is different and usually is applied in the trade sector, i.e. not to industrial enterprises. Both categories are officially translated to English by the same term *'above designated size'*. We choose to use the English term *above scale* which is not applied to the trade sector.

[4] The comparably large employment share for large-scale enterprises is only intelligible within the framework of the *above-scale* statistical concept, even if China's transition is not yet completed and some large-scale industrial combines may remain. Large-scale enterprises usually do not account for more than 1-5 percent of total employment in market economies. On the other hand, the employment shares of medium, small, and micro enterprises generally vary, depending on the structure of the economy.

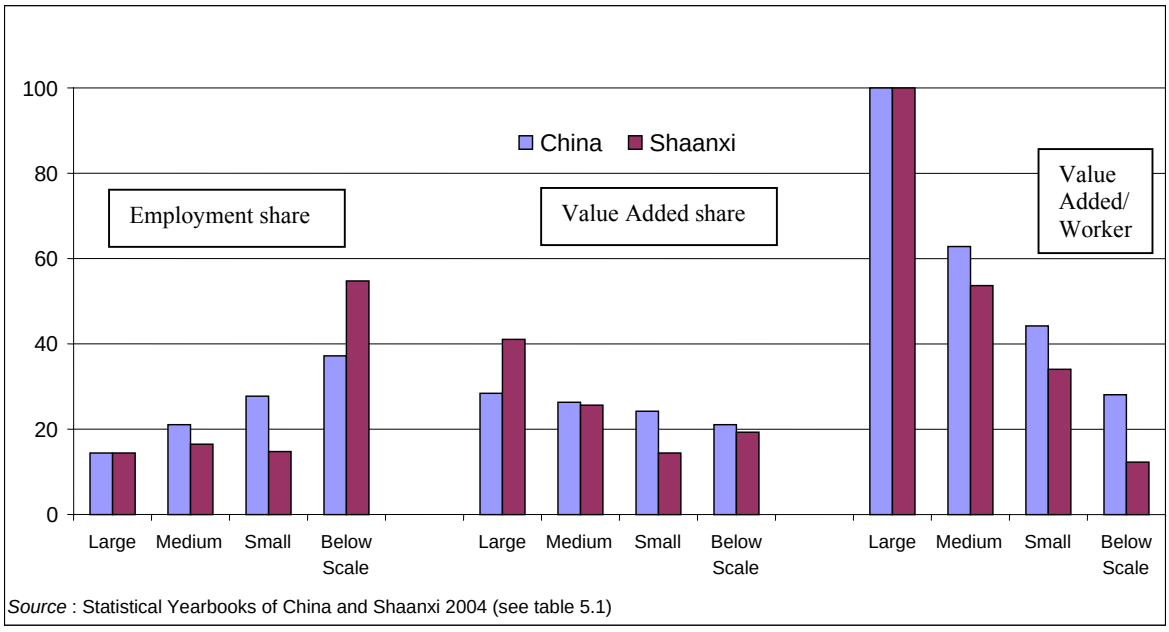
enterprises. The below-scale segment employed relatively more workers in Shaanxi than in China as a whole (56 vs. 41 percent), but value-added per worker in above-scale small enterprises was the same as in medium and large enterprises. Unfortunately, separate data for large and medium enterprises are not readily available for the manufacturing sector.

Figure 5. 1 Employment, Value Added and Labour Productivity by Size Manufacturing Enterprises, 2003 (Percent Share)



Source : Statistical Yearbooks of China and Shaanxi 2004 (see table 5.1)

Figure 5. 2 Employment, Value Added and Labour Productivity by Size Industrial Enterprises, 2003 (Percent Share)



Source : Statistical Yearbooks of China and Shaanxi 2004 (see table 5.1)

Table 5. 1 Employment, Value Added and Labour Productivity by Size, China 2003

Industrial and Manufacturing Enterprises

	Industry	Percent	Manufacturing	Percent
Enterprises	n.a.	100.0	1,298,870	100.0
Large	1,984		n.a.	
Medium	21,647		n.a.	
Large and medium	23,631	n.a.	20,431 [a]	n.a.
Small	172,591		157,097 [a]	
Above scale	196,222		177,528 [a]	
Below scale	n.a.			
Employment (000s persons)	91,555 [a]	100.0	83,070 [a]	100.0
Large	13,070	14.3	n.a.	n.a.
Medium	19,180	20.9	n.a.	n.a.
Large and medium	32,250	34.2	25,821	31.1
Small	25,240	27.6	23,004	27.7
Above scale	57,490	61.8	48,824	58.8
Below scale	34,065 [b]	32.7	34,246 [b]	41.2
Workers/Enterprise (persons)				
Large	6,588		n.a.	
Medium	886		n.a.	
Large and medium	1,365	n.a.	1,264	n.a.
Small	146		146	
Above scale	293		275	
Below scale	n.a.		31	
Value added (100 million yuan)	53,093	100.0	38,433 [c]	100.0
Large	15,138	28.5	n.a.	n.a.
Medium	13,936	26.2	n.a.	n.a.
Large and medium	29,074	54.8	22,733	59.1
Small	12,917	24.3	11,345	29.5
Above scale	41,991	79.1	34,078	88.7
Below scale	11,102	20.9	4,355	11.3
Value Added/Worker (000 yuan)	58	48.8	46	52.6
Large	116	100.0	n.a.	n.a.
Medium	73	62.7	n.a.	n.a.
Large and medium	90	77.8	88	100.0
Small	51	44.2	49	56.0
Above scale	73	63.1	70	79.3
Below scale	31	28.1	13	14.4

Source: China Yearbook of Statistics 2004. See annex table A.5.1 and A.5.2.
Note:
n.a.: not available.
[a] 2002. [b] Calculated as residual. [c] Calculated based on 1998-2002 annual growth rate.

In the industrial sector as a whole, which includes manufacturing and the production and supply of utilities, data are available separately for large and medium enterprises. Here too, below-scale accounted for the largest share of employment, 33 percent of the total, while large, medium and small-scale enterprises accounted respectively for 14, 21 and 28 percent of the total industrial workforce of 92 million in 2002 in China (figure 5.2). The average enterprise size was 6,588, 886 and 146 workers per enterprise in respectively large, medium, small enterprises.

Large and medium enterprises accounted for 55 percent of the total industrial value-added (29 and 26 percent respectively), while the small and below-scale enterprises accounted for 20-25 percent of the total. As a result, value-added per worker declined rapidly going from large to medium, small and below-scale enterprises, reaching respectively 63, 44

and 26 percent of that of large enterprises. This indicates that machinery and equipment available per worker was largest in the largest enterprises, and declined with size. The main difference in Shaanxi was that below-scale enterprises employed relatively more people than in China as a whole, 55 percent of the total, and value-added per worker in these enterprises was correspondingly lower, only 12 percent of that in large enterprises.

Because of the change in definition between 2002 and 2003, movements among size categories, trends in employment of SMEs are much more difficult to assess. As already noted in chapter 2 (figure 2.2), overall manufacturing employment stagnated at around 83 million in China between 1998 and 2002. However, value-added increased by 10 percent per year, with a corresponding increase in labour productivity. The Shaanxi data points to a significant decline of the number and employment in above-scale enterprises, large and medium as well as small. On the other hand, employment in below-scale enterprises appears to have increased by 12 percent per year between 1998 and 2002, though some may have been due to the classification downwards of some above-scale small enterprises (see annex table A.5.1).

Town and Village Enterprises (TVE) were mostly small-scale enterprises. According to the Ministry of Agriculture, some 6.1 million manufacturing TVEs employed 73 million people in China in 2003, or an average of just 12 persons per enterprise (table 5.2). Of these, only 2 percent were above designated size, and employed a total of 23 million workers, averaging 183 workers per enterprise. The remaining 98 percent of TVEs employed 50 million workers, or just 8 workers per enterprise. The size distribution of Western China and Shaanxi was similar to that of the whole country.

Table 5. 2 Township & Village Manufacturing Enterprises, 2003

	Above-designated size		Below-designated size		Total
		%		%	
China					
Number of Enterprises (unit)	125,636	2.1	6,000,849	97.9	6,126,485
Employment (persons)	22,953,475	31.6	49,777,410	68.4	72,730,885
Gross Output Value (10,000 yuan)	493,331,836	46.7	563,796,418	53.3	1,057,128,254
Value-added (10,000 yuan)	114,190,082	46.9	129,378,445	53.1	243,568,527
Employment/Enterprise	183		8		12
Value-added/Person	49,748	148.6	25,991	77.6	33,489
Western China					
Number of Enterprises (unit)	4,397	0.8	572,368	99.2	576,765
Employment (persons)	754,423	18.1	3,421,224	81.9	4,175,647
Gross Output Value (10,000 yuan)	12,578,734	38.9	19,746,334	61.1	32,325,068
Value-added (10,000 yuan)	2,992,705	38.5	4,780,180	61.5	7,772,885
Employment/Enterprise	172		6		7
Value-added/Person	39,669	213.1	13,972	75.1	18,615
Shaanxi					
Number of Enterprises (unit)	696	0.4	182,368	99.6	183,064
Employment (persons)	117,671	8.5	1,260,709	91.5	1,378,380
Gross Output Value (10,000 yuan)	2,044,775	20.4	7,979,112	79.6	10,023,887
Value-added (10,000 yuan)	519,808	20.5	2,011,438	79.5	2,531,246
Employment/Enterprise	169		7		8
Value-added/Person	44,175	240.6	15,955	86.9	18,364

Source: China Township and Village Enterprise Statistics 2003 (pp. 127, 129, 131), Ministry of Agriculture

5.2 SME policy environment

SME Promotion Law 2003. In response to the rapid increase of SMEs, the 15th National CPC Congress of 1997 introduced the formula *zhua da fang xiao* ("seizing the large, releasing the small") as a first step in opening the economy to the competition of SMEs by giving a free hand to small state-owned enterprises in restructuring and adjusting to market conditions. The creation of the SME Department at the State Economic and Trade Commission (SETC) in 1998 was an expression of the political will to put this policy in to practice. [1]

The existing bias of most government policies towards large-scale enterprises has been addressed in numerous policy documents,[2] and culminated in a SME Promotion Law which was promulgated in 2002. This law, which became effective in early 2003, aims to improve the business environment for SMEs and foster their growth, thereby generating employment and contributing to national growth and socio-economic development. The scope of the law is wide-ranging, from offering financial support, such as setting up SME development funds and encouraging commercial banks to loan more to SMEs, enhancing their production and technological capabilities, facilitating their interactions with larger enterprises, and calling for preferential government procurement of goods and services produced by SMEs.

It is still early to judge the impact of this new law in practice; however it has at least focused the attention of the national, regional and local governments on the importance that Chinese law makers attach to the development and impact of SMEs. As in any economic promotion law, the implementation to a large extent depends on the allocation of funds. At the same time, some of the provisions, such as the protection of SMEs' rights, lack specific mechanisms of enforcement. At the same time, policy continues to be developed and refined.[3]

SME definition. The SME Promotion Law has selected different criteria for defining SMEs in different sectors. In the manufacturing sector, a small enterprise is one employing less than 300 workers, with annual sales below 30 million yuan and gross assets below 40 million (table 5.3). The Law does not distinguish micro enterprises as a separate category. As can be seen in the table below, the criteria for SMEs are far too generous by international standards. An enterprise employing 200 to 300 workers would be classified as small in China, but as medium to large elsewhere. [4] Also the Chinese definition is operationally more difficult

[1] At the national level, the SME Department has been integrated into the National Development and Reform Commission (NDRC) in the meantime. At the local level, government structures may deviate from central government structures, and the function of SME promotion may therefore also be assumed by different government units.

[2] Important documents initially developed by the Government of China regarding SME promotion include *Notice on the Temporary Regulations on a Fund for Technology Innovation of Science and Technology Oriented Enterprises of Medium or Small Size* (1997); *Opinions of the People's Bank of China on Further Improvement of Financial Services for SME* (1998); *Circular Concerning Opinions Regarding Certain Problems which occurred during the Sales of Small-sized SOE* (1999); *Guideline for the Establishment of a Credit Guarantee System for SME* (1999); *Several Political Recommendations Regarding the Promotion of SME* (2000).

[3] More recent policy documents, developed after adoption of the SME Promotion Law, include *Interim Regulations on the Administration of the Usage of Subsidies Earmarked for the SME Service System* (2003); *Interim Regulations on the Administration for SME Development* (2004); and *Notice on the Improving the Role of the Industrial and Commercial Administration and Promoting the Development of the Private Economy* (2005).

[4] For more detail on both other definitions as well as their objective requirements, see Weinmann, Christoph David 2004: *The Current Draft of China's SME Promotion Law and the Setup of SME Promotion Systems*. in: Financial and Economic Committee of the National People's Congress & GTZ Advisory Service to the Legal Reform in China (ed) *The Law of the People's Republic of China on the Promotion of Small and Medium-Sized Enterprises, Part 2*, Beijing: CITIC Publishing House, ISBN 7-5086-0207-2/D.183, pp.251-274.

because it introduces sales and asset criteria for different economic sub-sectors, though it is not unique in this respect (for instance, the USA definition is operationally more difficult). Many countries adopt the simpler method of focussing on employment and ignoring economic sub-sectors.

Table 5. 3 Current Definitions for Manufacturing SMEs

	Micro	Small	Medium	Large
China				
Employment (persons)	1-7	< 300	300-2,000	> 2,000
Annual sales (million yuan)	n.a.	< 30	30-300	> 300
Gross assets (million yuan)	n.a.	< 40	40-400	> 400
European Union				
Employment (persons)	1-9	10-49	50-249	250+
Turnover (million EUR)	2	10	50	> 50
	2	10	43	> 43
Japan				
Employment (persons)			≤ 300	> 300
Capital Size (million JPY)			≤ 300	> 300

Source:
China: *Notice for Circulation Concerning Trade Regulations on Temporary SME Standards Stipulated* (2003);
EU: *Commission Recommendation amending Recommendation 96/280/EC*, effective as of 01 January 2005;
Japan: Ministry of Economy, Trade and Industry Small and Medium Enterprise Agency.
Note:
China has a special category of enterprises called Individual Household Enterprises which allows for up to seven employees which is similar to micro-enterprises, even though no reference is made to it in the temporary SME standards.

Defining whether an enterprise is an SME or not is not merely a statistical question, but an important policy decision for resource allocation. The available statistics indicate that over 40 percent of manufacturing employees worked in below-scale enterprises with an average of just 30 workers per enterprise in China in 2003 (table 5.1). The TVE statistics further indicate that 68 percent of TVE employees worked in enterprises employing on average just 8 workers per enterprise (table 5.2), many of them likely to be owner-operated micro-enterprises with less than 5 workers each. If SME promotional funds and other incentives are not exclusively targeted at these smaller enterprises, they can easily be siphoned off by large and more powerful enterprises which also fall under the current SME criteria.

Interest rate ceiling. The People's Bank of China has set limits to interest rates, which are currently in the region of 5 percent per year. In December 2002, the ceiling was raised for SME loans. Nevertheless interest rate caps do not always allow banks to cover the costs of loan initiation and administration and expected cost of SME default. As is widely acknowledged by all concerned and also as emerging from practical research (see below), access to finance is currently the single most binding constraint facing SME for their operation and growth.

Collateral requirements. China's civil law system does allow the use of movable property as collateral[1]. However, the rights which may be hypothecated are still limited compared with highly evolved market economies, and the procedures and practices in registering properties often work to the disadvantage of the mortgagee. Furthermore, there is

[1] See *Secured Interests Law*, adopted on 30 June 1995 and effective as of 01 October 1995, Chapter IV. See also the interpretations provided in *Explanations by the Supreme People's Court on Certain Questions Regarding the Application of the Secured Interest Law* (2000).

no centralized system for public registration of properties which means that multiple mortgages can easily be granted on the same piece of property. Improving administrative procedures and, in the light of current practices, cautiously broadening the range of movables, e.g., by including receivables, may thus generate further opportunities for strengthening SME financing.

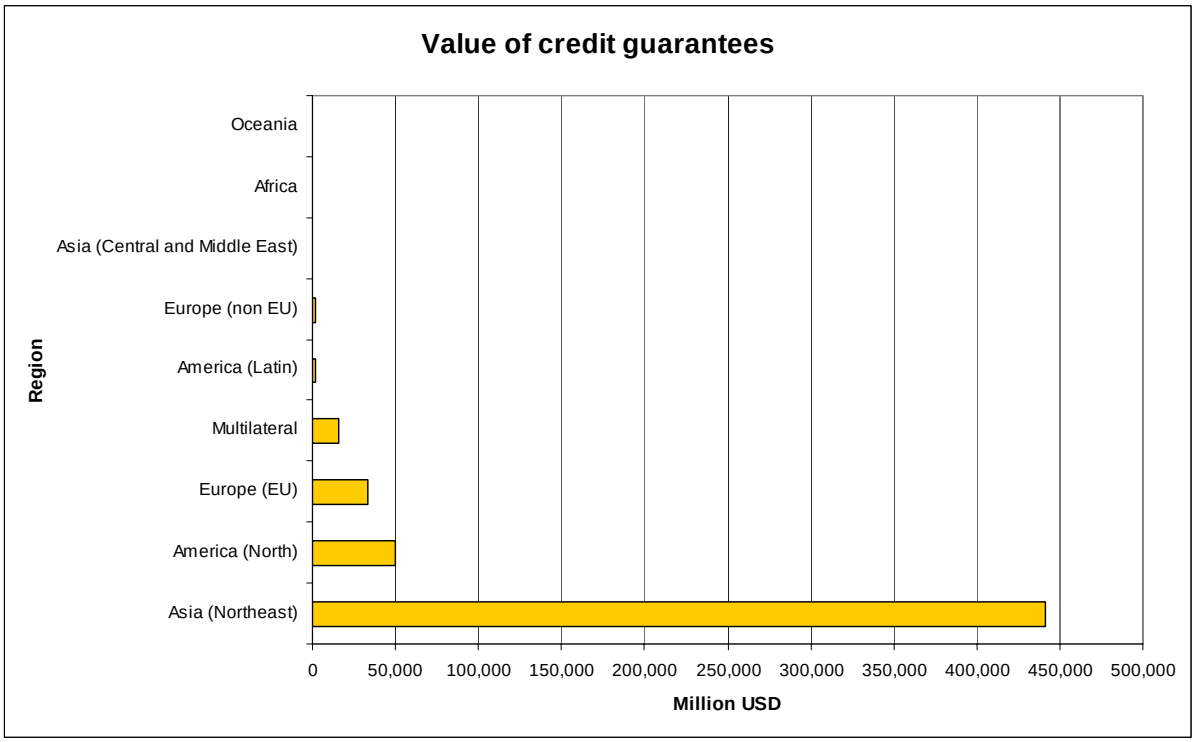
Credit guarantee schemes. Since bank lending to SMEs occurs at very low levels, the government has opted to establish credit guarantee schemes to encourage banks to lend to SMEs. Given the international experience with credit guarantee funds, this will only have a limited effect on SME lending by the banking sector. Moreover, given the prevailing practice that many credit guarantee funds assume 100 percent of the loan risk, there is a strong incentive for banks to shift their bad portfolio to the credit guarantee funds. This problem needs to be urgently addressed to avoid a potential future crash of the credit guarantee system. Central Government bears the ultimate risk of default in a cascading system of credit guarantees and re-guarantees.

Box 5. 1 Credit Guarantee Funds: Quenching One's Thirst by Thinking of Plums (*wang mei zhi ke*)

Credit guarantee schemes appear to be a panacea to bridge the gap in SME financing due to the leverage they may provide. The funding amount is significantly lower than the guaranteed amount. Therefore, one yuan in credit guarantee funding may generate 3-8 yuan in guarantees and trigger the respective loans from banks to SME. Highly efficient funds, e.g. in Austria, France, and Germany, may even trigger a twenty-fold increase in funds. However, the effectiveness and efficiency of credit guarantee schemes have not been proven, while the risks inherent in these schemes are considerable.

Historically speaking, there are no examples for credit guarantee industries developing before the banking sector. To the contrary, any thriving credit guarantee industry usually only develops once the whole financial system, with banks as a major part, is highly evolved.

Globally, the total number and value of credit guarantees are highest in Northeast Asia (i.e. mainly in Japan): more than 2.5 million with a total value of more than USD 440 billion. In contrast, the total number (value) of credit guarantees reaches only 550,000 (USD 50 billion) in North America, and only 1.77 million (USD 33 billion) in the European Union. Credit guarantees are even less significant in the rest of the world. The average values of credit guarantees in different world regions lie between USD 2,000 and 180,000. The average credit guarantee value in the EU equals only an eighth of that in Japan, or a fifth of an average North American guarantee. This difference possibly reflects a difference in organization because the higher average guarantees are granted in regions where the credit guarantee system is dominated by the public sector (AECM, 2003).



Other than in China where the level of commercial lending to SME by banks is extremely low due to a set of specific institutional factors, the volume of guarantees is insignificant in comparison with the volume of lending that commercial banks usually provide to SME anywhere in the world. The outreach of such schemes is therefore rather limited, and these schemes usually prove more effective for very specific high-risk/ high-potential client groups such as new technology ventures than as a general "crutch" for banks which have no incentives to lend to SME.

On the technical side, there are numerous reasons which question the usefulness of credit guarantee schemes:

- Credit guarantee schemes must recover their cost. This can only occur if a high volume of guarantees is being issued efficiently. Many credit guarantee schemes never achieve such high volumes.
- Frequently, fees and profit margins of credit guarantee schemes are set by government. If full risk of SME lending is considered, these fees are often not sufficient to provide for losses, and there is a risk of de-capitalization.
- Under normal circumstances, credit guarantee schemes have no technical advantage over banks in assessing credits. Bankers are at least as good at credit assessment as are credit guarantee administrators.
- If a bank rejects a credit on the grounds of lacking collateral, and the credit guarantee scheme accepts the same client for guarantee, the guarantee scheme by definition uses a more narrow credit assessment than the bank (and entails a higher risk).
- If guarantee schemes are in place, there is an incentive for banks to shift the lower quality portfolio to the guarantee scheme. This is particularly the case where there is no risk sharing between the bank and the credit guarantee scheme regarding nonperforming loans.
- There is basically no difference for a lender (e.g. a bank) between a third party guarantee and an additional fee charged to build up a loan loss reserve, except that building a loan loss reserve internally may be less costly and easier gauged and controlled.
- If banks are fully loaned out, then capital adequacy ratios prevent banks from going any further even if there are credit guarantees.

High-tech bias in SME promotion. There is a strong emphasis on the promotion of

high-technology industries in China, including SMEs, with special facilities granted through the Ministry of Science and Technology, for instance, the Fund for Technology Innovation[1], established in 2000 and administered by the Ministry of Science and Technology, as well as credit guarantee facilities (CGF) to be led by local governments. The National Industrial Technology Policy of August 2002 calls for the state to establish a comprehensive venture capital system for SMEs, and facilitate their access to the securities markets. These programmes focus on high-technology firms. On the other hand, mechanisms for enhancing the manufacturing and technological capabilities of "ordinary" firms appear to be lacking.

Government procurement. While Article 34 of the SME promotion law stipulates that goods and services shall be preferentially purchased from SMEs, there is no corresponding provision in the existing procurement law,[2] and it is unclear which law overrides the other. Since SMEs are defined so widely that they include many large and powerful companies, this measure may not make much difference to the business opportunities on offer to the really small-scale enterprises, and further regulations and guidelines may be necessary to turn this mechanism of support into an effective instrument for fostering SMEs.

Separate administration for urban and rural SME. During China's transition to the socialist market economy, the first policy focus was on rural areas, i.e. township and village enterprises (TVE). Faced with growing numbers of SMEs in the urban areas since the 1990s, urban SMEs have gradually become the major focus of development efforts. This has led to a dualism of administrative structures which is incompatible with the current economic situation. Many TVEs have already established production facilities in urban areas. While some local governments have already unified the two administrations, the central government itself has not yet streamlined its SME administration. Yet this is necessary to provide equal opportunities to SMEs located in rural and urban areas. It may also provide more visibility to SME administration and consistency in the government as a whole.

In Shaanxi the traditional division of labour appears to remain: the Development and Reform Commission (DRC) looks after SMEs in urban areas, while the Township and Village Enterprise (TVE) Bureau under the Ministry of Agriculture is responsible for the development of TVEs in rural areas. The functions now assumed by the Development and Reform Commission used to be part of the Economic and Trade Commission, where an SME Department had been created in 1998. A third agency, the Supervision Bureau of Private Economy, is also involved because most SMEs are in the private sector.

Unfortunately, the current system leads to overlaps at the local level, and administrative conflicts of interest, essentially about demarcations of bureaucratic territory. Though adequate during the 1990s, the differential treatment between urban and rural SMEs also does not correspond to the current requirements of SME development in China. The dangers are fragmentation, inconsistencies and duplication of support systems.

At the local level, government departments exercise many functions over public and private enterprises with mixed impacts on enterprise performance. In the transition to the market economy, some local governments still have a tendency to micro-manage enterprises in their jurisdiction instead of acting as facilitators and regulators. Besides safety and health inspections, which are a necessary part of government services to protect consumers and workers, many services currently provided by government agencies, including quality inspections, certification and accreditation services, could actually be transferred to private

[1] See *Notice on the Temporary Regulations on Fund for Technology Innovation of Science and Technology Oriented Enterprise with a Medium or Small Size by the Ministry of Sciences and Technology and the Ministry of Finance* (1997) and the *Notice About the Regulations on Transferring of Scientific Research Achievements by the Ministry of Sciences and Technology and Some Other Government Departments* (1999).

[2] See *Government Procurement Law of the People's Republic of China*, adopted at the 28th meeting of the Standing Committee of the Ninth National People's Congress on 29 June 2002 and effective on 1 January 2003.

and non-government entities such as quality management associations, allowing the government to better focus on its core functions, as well as on increasing quality and outreach.

Business and industry associations. Many business and industry associations were set up with the active encouragement of government or even spun off from former government institutions. The extent to which they are sufficiently independent, self-sustaining, or even fully operational remains unclear. The success of transferring functions from the government to such organizations depends on an array of institutional factors, as discussed in chapter 4.

Shaanxi Leading Group for Promoting SME Reform and Development. In October 2002, the Leading Group for Promoting SME Reform and Development was established in Shaanxi. It was charged with comprehensive planning, organization and policy coordination of SMEs, and preparing development strategies and their implementation mechanisms. The Leading Group was also given the task of reporting key problems facing SMEs to the most senior regional authorities.

5.3 Manufacturing Competitiveness of SMEs in Shaanxi

As already mentioned earlier, manufacturing performance depends on a range of factors, including the macroeconomic environment, the overall investment climate, the business environment, the policy environment, foreign direct investment, political and social stability, supporting institutions, skills, technologies, infrastructure, and many other factors. The key structural influences directly relevant to building manufacturing capabilities are discussed here first, followed by the overall business and policy environment, and the role and availability of selected support institutions.

When economic growth is rapid and broad-based, as appears to be the case in China, SMEs can be expected to do well generally because many of them supply consumer goods for which demand is rising from ordinary citizens, and in close proximity to these consumers. In order to better understand the patterns of growth of SMEs in China, and to assess their manufacturing competitiveness, this study commissioned two small manufacturing enterprise surveys as noted earlier.

The first survey of 90 enterprises was undertaken in several prefectures of Shaanxi, and included small, medium, and large firms ranging from 20 to 3,000 employees per firm. The second survey focused on 35 SMEs in Baoji City, and was implemented by the Beijing-based Institute of Industrial Development (a policy research arm of NDRC) in October 2004, in cooperation with the municipal Development and Reform Committee of Baoji City[1].

Since the firms were not randomly selected and the sample sizes relatively small, the survey results cannot be used to derive conclusive estimates about the total population of manufacturing SME in Shaanxi respectively Baoji, or the selected manufacturing sub-sectors. Nevertheless they provide many useful insights on the services provided to manufacturing SMEs in the area, as well as an understanding of the challenges facing them.

Baoji is an industrial town located 125 km west of the capital Xi'an. Some 13 food processing, 12 machinery and ten pharmaceutical establishments were selected in Jintai and Chencang districts, and Fengxiang, Qishan and Taibai counties. The average employment size was 125 workers per enterprise in 2003, with the following distribution: firms each employing less than 50 workers per firm, 30 percent, firms employing 50-100 employees per firm, 30 percent; 100-200 employees per firm, 20 percent and 200 and above employees per firm, 20 percent. Of the latter 3 firms employed between 400 and 500 workers in 2003, but these employed only around 200 workers in 2001.

[1] Detailed results of the NDRC/UNIDO Baoji SME survey 2004 appear in annex tables A.5.3 to A.5.13.

After briefly describing the firms' general characteristics, this section discusses their performance, their technology and human resources, which constitute their internal competitiveness factors, and their business environment and institutional support and linkages, the latter forming their external factors for competitiveness. The following findings refer to the Baoji SME survey, complemented where useful, by findings of SMEs in the larger Shaanxi survey.

Profile of Surveyed SMEs

Some 70 percent of the Baoji survey firms were located in urban areas, while the remaining 30 percent were in rural areas (see annex table A.5.3). All firms were in the private sector, while some 12 firms were originally state-owned but now privatized, for about four years on average. The enterprises were owned by domestic investors, with the exception of a minority foreign ownership in a dairy product company, and minority state ownership in three other companies. They had been in business on average for 18 years, but more than 50 percent were just ten years old, having started operations after 1994, when China turned to a mixed market economy. Most firms were owner-operated. In nearly 90 percent of the enterprises, the owner was also the principal manager or director.

Box 5. 2 How representative is Baoji of other regions in Shaanxi?

In a country as large and diverse as China it is always difficult to infer from one region to another. The surface of China equals 96 percent of Europe's (continent), stretches across different geographic and climate zones, and the population represents 20 percent of the current planet total. Despite the long existence of a unified empire with a unique culture and administrative practice, there is a host of local traditions and habits in which the local economies remain embedded.

The overall size of Baoji's economy is roughly comparable to that of Armenia. While Baoji's surface area is somewhat smaller, and its population slightly larger, per capita income levels are the same. Despite Armenia's transition-induced deindustrialization of recent years, the country is more urbanized than Baoji, i.e. (the capital city) Yerevan's population is larger than that of the urban centre of Baoji. This comparably lower level of urbanization, however, is a general phenomenon of current Chinese economic space which reduces the potential for exploiting economies of agglomeration.

On a Chinese scale, Baoji belongs to the more industrialized cities. With 51 percent of GDP coming from industry, it ranks 96 on a scale of 284 cities (2003). Its industrial sector is still increasing its relative contribution to the growing GDP. However, Baoji's low rank regarding per capita GDP does not reflect its rather high level of industrialization. With 7,132 yuan in 2003 it only ranks 175 on a scale of 284 cities.

Compared with other city regions under the Western Development Strategy, Baoji emerges as a strongly industrialized economy (rank 15 out of 81 cities in 2003), but its per capita GDP also falls behind (rank 32 out of 81). Considering the overall importance of industry for achieving economic growth, the ranking indicates that Baoji has not yet been able to fully capitalize on its industrial structure. The city needs to enhance its industrial performance to reap the benefits.

Within the province of Shaanxi, however, Baoji is the second strongest region after the regional capital Xi'an. Yet, its per capita GDP amounts to only 58 percent of that of Xi'an, i.e. there is a large gap between the regional capital and the rest of the province. The regions of Yan'an and Yulin have a higher share of industry in GDP than Baoji due to extraction activities.

In sum, Baoji is neither typical for Shaanxi where it is an above-average performer, nor for the regions of the Western Development Strategy where it has an above-average share of industry in GDP. Yet, with regional economic development strategies taking an increasingly local flavour in the globalized economy, it may also become increasingly difficult to discover the "average" region in order to develop an "average" strategy prescription.

Half of the companies produced final products, while the remaining half produced intermediate products. Only seven firms, or 20 percent of the total, were export-oriented. Five of these were pharmaceutical companies, and the remaining two were machinery companies, while there were no exporters among the food industries. Several other firm characteristics followed the same pattern. For instance, product diversification was highest in

pharmaceutical companies, average for machinery industries, and lowest for food industries.

The surveyed firms were generally successful businesses.[1] They nearly doubled their combined sales volumes between 2001 and 2003 (annex table A.5.4). If smaller companies and large companies are given equal weight, the average growth rate came to 43 percent per year. The machinery industries increased their sales most, followed pharmaceutical and food companies. The firms' combined employment increased by 13 percent per year in this period, while average employment increased by 15 percent per year. As a result, nominal labour productivity, in terms of sales per worker, grew by 29 percent per year, ranging from 12 percent in food firms to 33 percent for machinery and pharmaceutical companies.

Turing now to their markets, the surveyed firms sold mainly in their own province (61 percent of total sales, annex table A.5.5). Sales to other regions and exports accounted for respectively 31 and 8 percent of the total. In fact, their own prefecture accounted for 37 percent of their total sales. As in case for export orientation and product diversification, machinery and pharmaceutical companies were more likely to sell outside the province and abroad. They sold almost two thirds of their exports to industrialized countries, while East Asia and Southeast Asia accounted for the remaining third. Other developing countries accounted for the 3 percent.

The surveyed firms bought most of their raw materials, intermediate inputs and other inputs from within the regions, ranging from 85 percent for raw materials and intermediate inputs, to 91 percent for services and 99 percent for labour and working capital. Purchases from other regions were only significant for equipment procurement (55 percent). They bought very little from abroad, 1 and 4 percent of services and equipment. In fact their own prefecture supplied 32 percent of their raw material and intermediate inputs, this share rising to 42 percent for pharmaceutical companies, many of which specialized in plant medicine. The concentration of suppliers and buyers suggests that the prefecture constituted a significant industrial cluster in its own right, while the province as a whole provided a large and thriving market for their inputs and products.

Manufacturing and technological capabilities

Technology. The surveyed firms introduced three new products in the last three years on average. However, product innovation or modification was highly skewed, with the top three enterprises accounting for 80 percent of all new products or processes, while around 60 percent of the firms did not introduce any new products (69, 58 and 60 percent for food, machinery and pharmaceutical industries, table A.5.5). Six firms held patents, and only one firm had a licensing agreement with a foreign company.

Manually operated machinery accounted for 60 percent all the machinery and equipment used by the surveyed SMEs, while automatic and computer-controlled machinery accounted for the remaining 40 percent. Interestingly, the proportion of automatic or computer-controlled equipment was higher in food industries than in machinery and pharmaceutical industries (55, 34 and 33 percent). This is probably because the food industries produced a smaller number of mature products using a continuous process, while the other industries produced a range of old and new products necessitating batch processing.

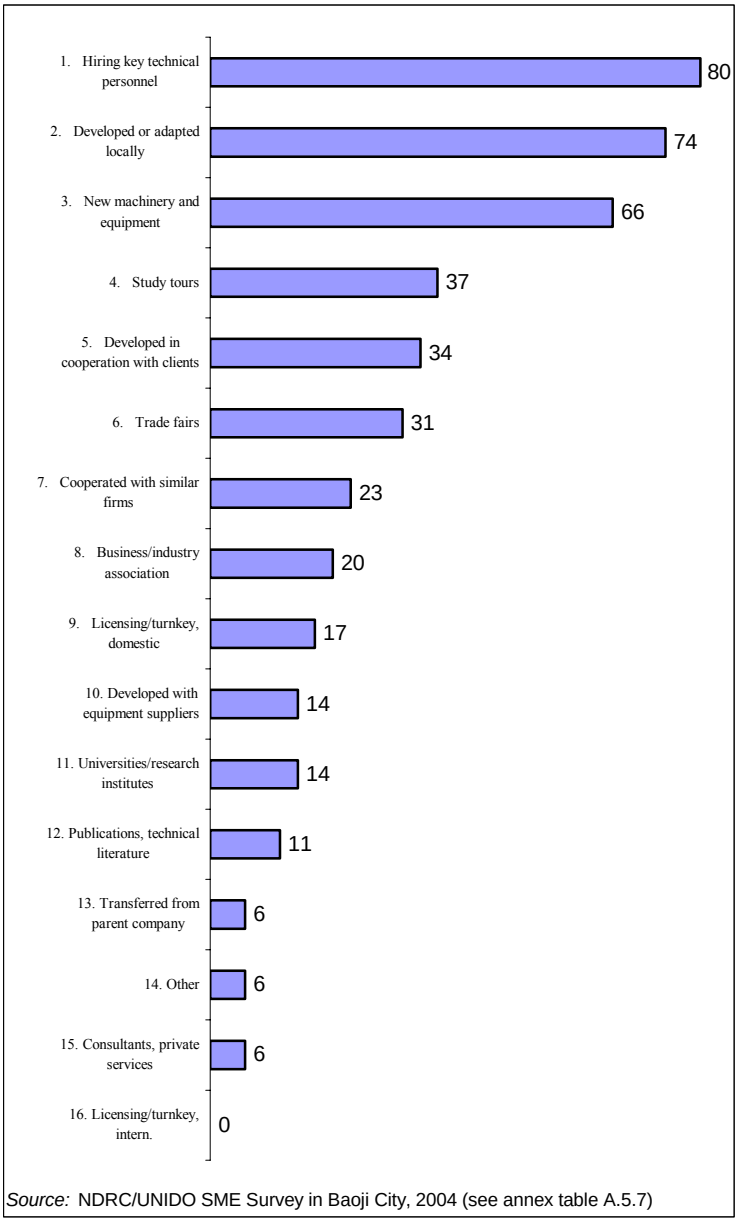
Some 57 percent of the firms used email in their business contacts, with this share rising to 80 percent in pharmaceutical industries, which also did more business outside the province and even abroad. Only a third of the firms had a Chinese language website, while 11 percent had an English language website. Pharmaceutical companies were again more likely to maintain a website in either languages (50 and 20 percent respectively). About 40 percent

[1] The reader is reminded that the sample drawn was based on convenience, and thus may not be fully representative of enterprises in Shaanxi or Baoji.

of the surveyed firms possessed the ISO 9000 quality standards, with no significant difference between sectors, while only three firms, or 9 percent, had the ISO 14000 environmental standards, none of which were in the machinery sector, which presumably had less pressing reasons for acquiring them.

The surveyed firms employed seven persons in research and development on average, or 5.4 percent of their total work force, with no appreciable difference between sectors. Of these, two to three persons had a science or engineering degree, somewhat less in machinery and more in pharmaceutical industries. The firms spent an average of 375,000 yuan on research or development, or 0.8 percent of their sales in 2003. This proportion was lowest in food, average in machinery, and twice the average in pharmaceutical industries.

Figure 5. 3 SME Channels of Technology Acquisition
(Order of Importance, Scale 0 to 100)



Source: NDRC/UNIDO SME Survey in Baoji City, 2004 (see annex table A.5.7)

The three most important channels for acquiring technological innovation were hiring key technical personnel, developing or adapting technology locally, and purchasing new machinery and equipment (80, 74 and 68 percent of firms, figure 5.3). Only about a third of the surveyed firms acquired technology through study tours, in cooperation with clients, or by attending trade fairs. About a quarter of the firms cooperated with similar firms (half of pharmaceutical firms), and a fifth used business or industry associations. The proportion of firms making use of technology institutes, universities, consultants and technical service providers, or publications and technical literature was negligible. This last finding should worry the large number of university department and technology institutes present in Shaanxi province – which are not even on the map of the SMEs – regarding their client orientation if they do count manufacturing enterprises among their clients.

Education and Training. Senior secondary school leavers formed nearly half of the work force, while junior school leavers formed a third in the surveyed SMEs (Annex table A.5.8). Nearly 15 percent were

university or tertiary education graduates. Very few were primary school leavers (5 percent). The education profile increased from food, to machinery and pharmaceutical industries. For instance 39, 45 and 60 percent were senior secondary school leavers in these sectors. As for training, only 23 percent of employees did not receive formal training, while 65 percent received in-house training, either in a classroom, workshop or laboratory. The remaining 12 percent were trained outside the enterprise. Food and pharmaceutical industries trained their employees better than machinery industries, especially pharmaceutical, which sent 23 percent of their personnel for outside training. Training expenditures averaged 63,000 yuan per firm, or 1 percent of total sales.

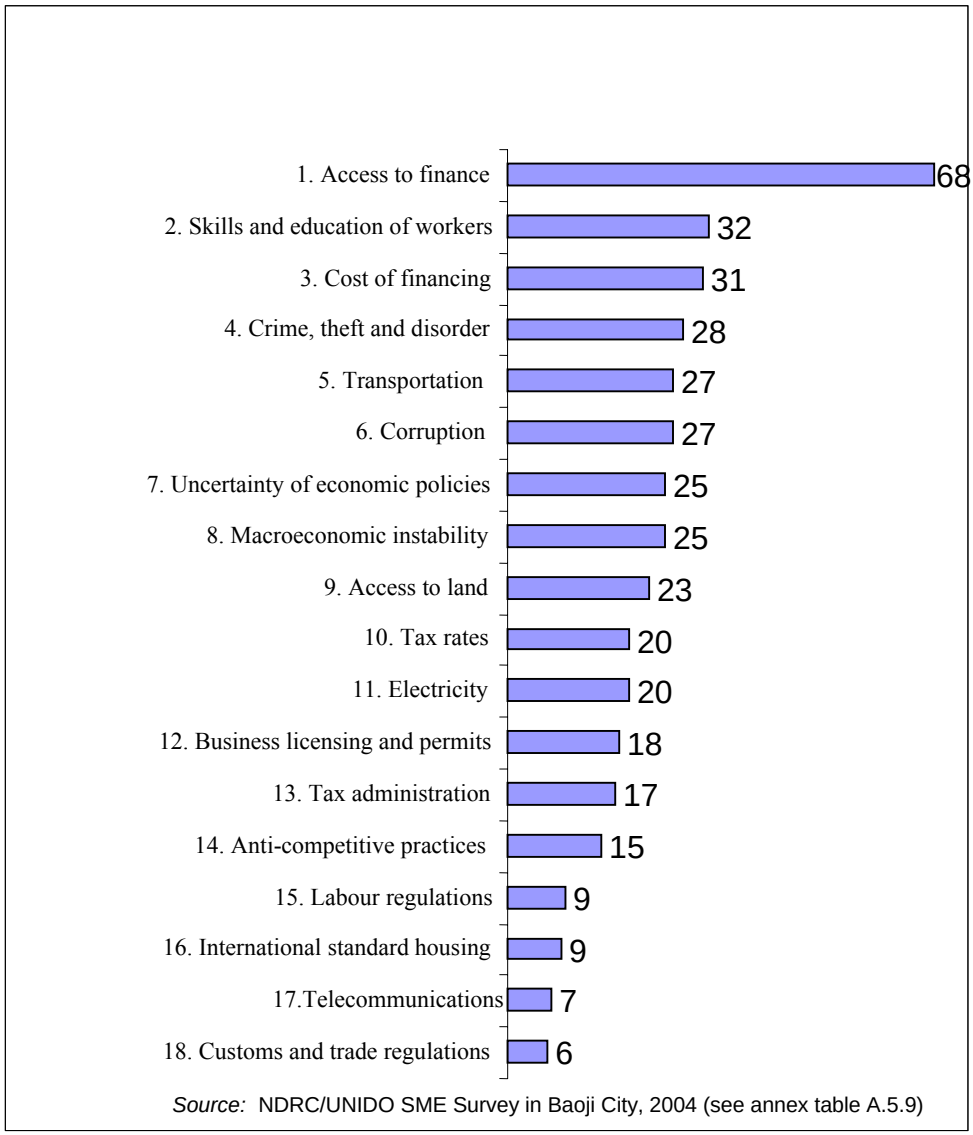
The top managers of most SMEs, 80 percent, were university graduates, ranging from 61 to 83 and 100 percent for food, machinery and pharmaceutical industries. Their previous experience usually included a stint in other SMEs (55 percent), rather than large enterprises (21 percent), or foreign enterprises (9 percent). Some came with experience in family business or university or research institutes (21 and 12 percent). Managers in pharmaceutical industries were more likely to have worked in large domestic and foreign enterprises, or in university or research institutes (38 percent each). Many of them had worked in government too (63 percent). Most of the top managers rated previous work experience as very important, with the possible exception of government for pharmaceutical industries, and family business for food industries.

Investment climate and business environment

The surveyed firms were asked to rate various factors on a scale of 1 to 4. These numbers referred to the degree of obstacle encountered, ranging from minor obstacle, moderate obstacle, major obstacle, and serious obstacle. When converted to a scale of 0 to 100, by far the most serious obstacle reported by the firms was access to finance (68 percent, figure 5.4). This is understandable considering they were growing at more than 40 percent per year in 2001 to 2003. The next two major obstacles, but only half as serious, were the skills and education of workers, and the cost of financing (32 and 31 percent). Next in order of importance came crime, transport corruption, uncertainty in economic policies, macroeconomic uncertainty, and access to land (28, 27, 27, 25, 25 and 23 percent). Tax rates, electricity, business licensing and permits, tax administration, anti-competitive practices, labour regulations, telecommunications, and customs and trade regulations were not considered obstacles (less than 20 percent). The business and regulatory environment over which the government has influence, and which often stifle business in other countries, including macroeconomic instability, business licensing and permits, tax rates, labour regulations, customs and trade regulations, and anti-competitive practices actually were not considered as significant obstacles by the SMEs in our sample.

SMEs also appeared to be generally satisfied with their basic infrastructural facilities since few firms complained about electricity and telecommunications with the exception of transport. This is confirmed by the small number of days with insufficient power, water, telephone and internet services in 2003 (4.5, 3.6, 2.0 and 2.0 days per year respectively on average, annex table A.5.10). Only 16 percent considered transport as a severe obstacle, a figure which may be due to their major input and product markets being located in the province. Finally, the average processing time for imports and exports were five and ten days. The longest time required was ten and 14 days for imports and exports on average, though this varied much from firm to firm and sector to sector (annex table A.5.11).

Figure 5. 4 SME Constraints to Operation and Growth (Order of Importance, Scale 0 to 100)



Source: NDRC/UNIDO SME Survey in Baoji City, 2004 (see annex table A.5.9)

Institutional support and linkages

The number of SMEs reportedly receiving external institutional support was quite large, 24 out of 35 firms or 69 percent. Support increased gradually from food to machinery and to pharmaceutical industries (54, 67 and 90 percent, table A.5.12). Even so, they did not rate these contacts as particularly valuable. On a scale of 0 to 100, government agencies rated 34, while universities and research institutes scored 10-15. On the other hand, some eleven firms, or 31 percent, did not receive any support. Nearly half of these believed support did not exit for their business, while 18 percent had tried but did not succeed, or found it too time consuming.

Most responding firms maintained contact with government agencies, often at different levels (regional, prefecture and county). They consulted government agencies for a range of services, including raising product quality, quality standards accreditation, technical upgrading, marketing and skills upgrading. Only half as many firms maintained contact with universities and research institutes, for product quality improvements, new product development, technical upgrading and skills development. Half of the food industries

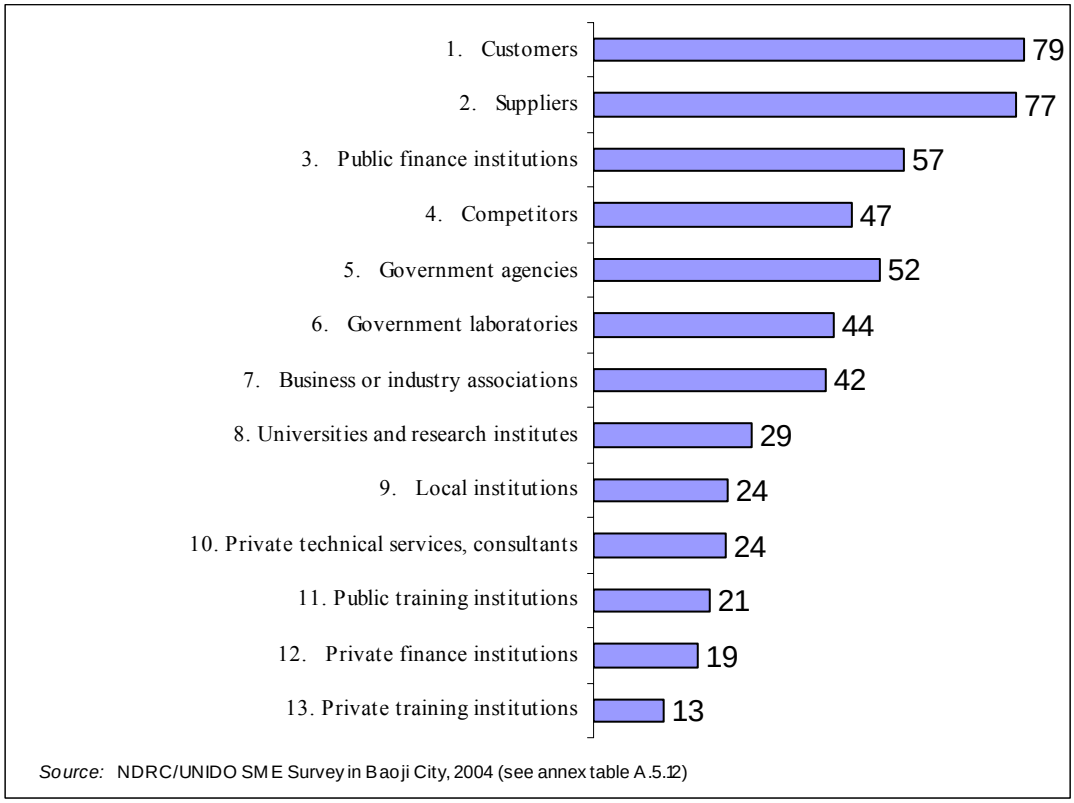
maintained contact with industry associations, for a variety of services including standards accreditation, but this was not the case for mechanical and pharmaceutical industries.

Some 19 firms, or 56 percent of the total, were members of chambers of commerce or business associations, yet only food industries rated them as important earlier. In terms of importance, the most valued services provided by associations were standards and quality accreditation, information on domestic products and inputs, and information on government policy and regulations (58, 48 and 48 percent). Other services such as lobbying government, information on international products and markets and dispute resolution (34, 30 and 28 percent) were not considered of great value, except for pharmaceutical companies which were more export-oriented.

In a separate question, most firms reported maintaining contacts with customers, suppliers and public financial institutions as expected. A third maintained contact with competitors, government agencies, government laboratories and associations. But few maintained contact with private financial institutions, public or private training institutions, government agencies, government laboratories, industry or business associations, university or research institutes, and private technical services or consultants. Only three to five companies, or ten percent of the total, reported maintaining regular contact with universities and research institutes. On a scale of 0 to 100, which combined frequency of contact with their importance to the companies concerned, the latter scored 29, though they scored 39 for pharmaceutical firms (figure 5.5). By comparison, contacts with customers and suppliers scored 77-78, contacts with public finance institutions and competitors scored 52-56, and government laboratories and industry associations scored 42-44. Private financial institutions scored only 19, despite the overwhelming need for finance of the companies interviewed, which suggests either their absence altogether, or their exclusion of SMEs in their lending programme.

Figure 5. 5 SME Interaction with other Firms and Institutions

(Order of Importance, Scale 0 to 100)



Source: NDRC/UNIDO SME Survey in Baoji City, 2004 (see annex table A.5.12)

Summary of survey findings

The surveyed SMEs in Baoji City, about equally divided between food, machinery and pharmaceutical industries, grew quite rapidly between 2001 and 2002, by 40 percent annually on average. Their employment grew from 110 to 125 workers per firm, or 7 percent per year. Nominal labour productivity thus rose substantially.

Their substantial growth relied principally on the thriving local market, equally divided between intermediate and final demand products, and which perhaps meant that they did not need to look beyond their city or regional borders. Baoji City itself possessed a relatively developed industrial cluster, able to supply more than a third of the raw materials, intermediate inputs and many other factor inputs and services required by its various industries, as well providing a substantial market for their products. With the exception of pharmaceutical enterprises, surveyed SMEs had limited contact with firms from outside their regions and abroad, either as buyers or suppliers. The lack of first-hand interaction with firms in other parts of China and abroad may have restricted their opportunity to learn and acquire best practices in production and marketing.

Human resources. The education and training profile of the SME work force was relatively high, at least on paper. The majority of the workers were senior secondary school leavers, while 15 percent were university graduates. Some 80 percent of the top managers were university graduates. The majority of workers had reportedly received in-house formal training, Moreover, research and development staff formed five percent of the total workforce, half of whom were engineering or science graduates. Yet, when asked about obstacles to operation and growth, a third of the surveyed firms expressed concern with the level of skills and education of their workers.

Manufacturing and technological capabilities. The competitiveness and productivity of firms depend less on equipment nowadays, and more on the technical and organizational skills involved in production. The manufacturing and technological capabilities of most SMEs were relatively weak, based on the following observations. Most SMEs did not introduce new products or models in the past three years, few held patents, and only one surveyed firm has a licensing agreement with a foreign company. Half of the machinery used in the companies was manually operated, this proportion rising to 67 percent in the pharmaceutical industries. For technology acquisition, firms relied mostly on hiring key technical personnel or purchasing new equipment, though two thirds reportedly developed and adapted products or processes in-house, but the extent of which is difficult to ascertain. They apparently did not make use of the existing university and research institutes, industry associations, or equipment suppliers. Yet frequent and proactive contacts with these sources of technology and best practices are essential channels to improve manufacturing and technological capabilities. In other words, apart from hiring key technical personnel, they did not look outside their own firm for technical support.

Education and training. The concern expressed by a third of the manufacturing SMEs about the skills and education of their workers was apparently not translated into action. Training expenditure accounted for just 1 percent of sales, and only 7-8 percent of their employees were sent for training outside in the food and machinery industries, though this proportion rose to 22 percent in pharmaceutical industries. They also maintained little contact with public and private training institutions. Training institutions will spring up once the potential demand for training becomes translated into effective demand, i.e., when firms start to spend money on outside training.

Institutional support and linkages. While two thirds of the companies reported maintaining contact with government agencies and universities or research institutes, and considered them important, they met these institutions rather infrequently. In the case of government agencies, the companies probably had little choice but to do so to have their

product inspected and their quality certified, though some companies also reported receiving support to improve quality and upgrade technology. As for universities and research institutes, what the surveyed firms said regarding their role in technology upgrading was not consistent with what they actually did to acquire technology (they did not refer them as a channel for technology acquisition), and the fact that they rarely met them. These actions may be more telling than their perceptions. Finally, over half of the firms consulted business associations to obtain market information, product accreditation, and information on government regulations.

Investment climate and business environment. The SMEs in our sample were apparently satisfied with the basic infrastructural facilities and most government services in Baoji City, and did not fear competition or anti-competitive practices from larger firms. Very few complained about power and telecommunications, and only a minority complained about transport and access to land. A similarly small minority of firms were concerned about corruption and public safety. Most firms were not concerned about tax administration, business permits and licenses, customs administration, tax rates, labour regulations and macroeconomic instability. Rather, their top concern was access to finance: this was rated as a major obstacle to growth and operations by nearly 85 percent of the firms, and a severe obstacle by 56 percent of respondents. They were also concerned by two other factors, education and skills, and cost of finance, but these two were much less widespread. These were considered a severe obstacle by only around a quarter of the firms, and a major obstacle by less than half of the firms.

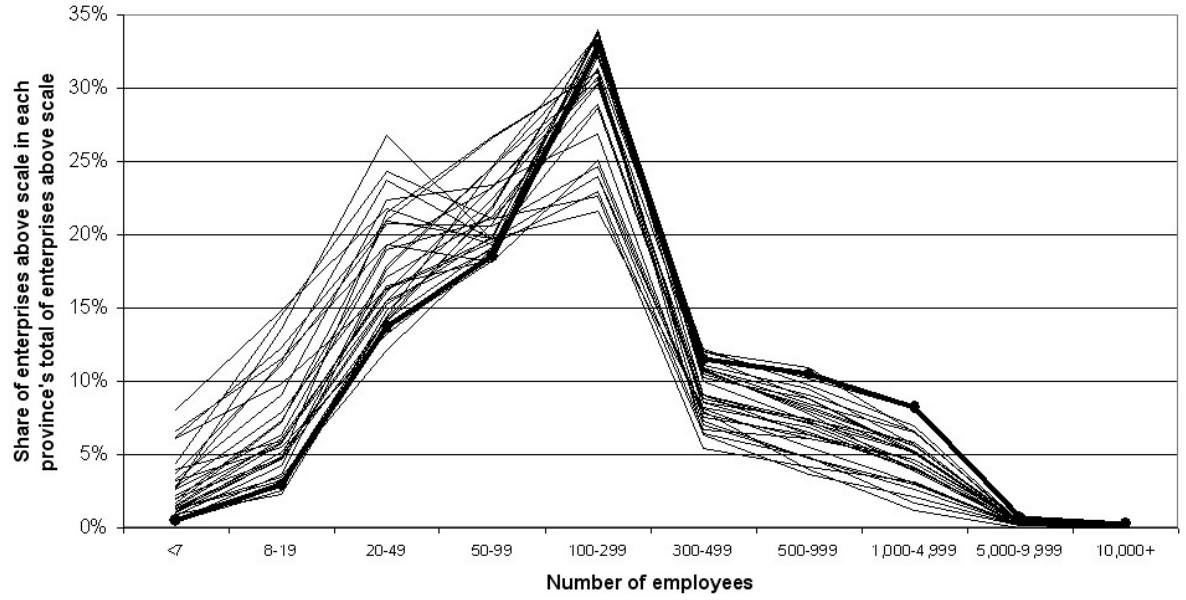
To sum up, the SMEs apparently responded to their favourable market conditions, investment climate and business environment by growing at over 40 percent per year between 2001 and 2003, and by improving their labour productivity substantially. They would have probably grown even faster had their financial constraints somehow become less binding, although managing exceptionally high growth raises its own challenges.

Box 5. 3 Shaanxi's Small and Medium Enterprises in Perspective: A View from the Top

In the absence of more complete data due to what is essentially a concept of above-scale "statistical visibility", one way of positioning Shaanxi's SME within the national context is to take a view from the top, i.e. determine how Shaanxi's SME compare above the designated scale. If we take above-scale enterprises for what they are, namely enterprises which stand out due to their higher level of turnover, then the following picture emerges for Shaanxi's SME.

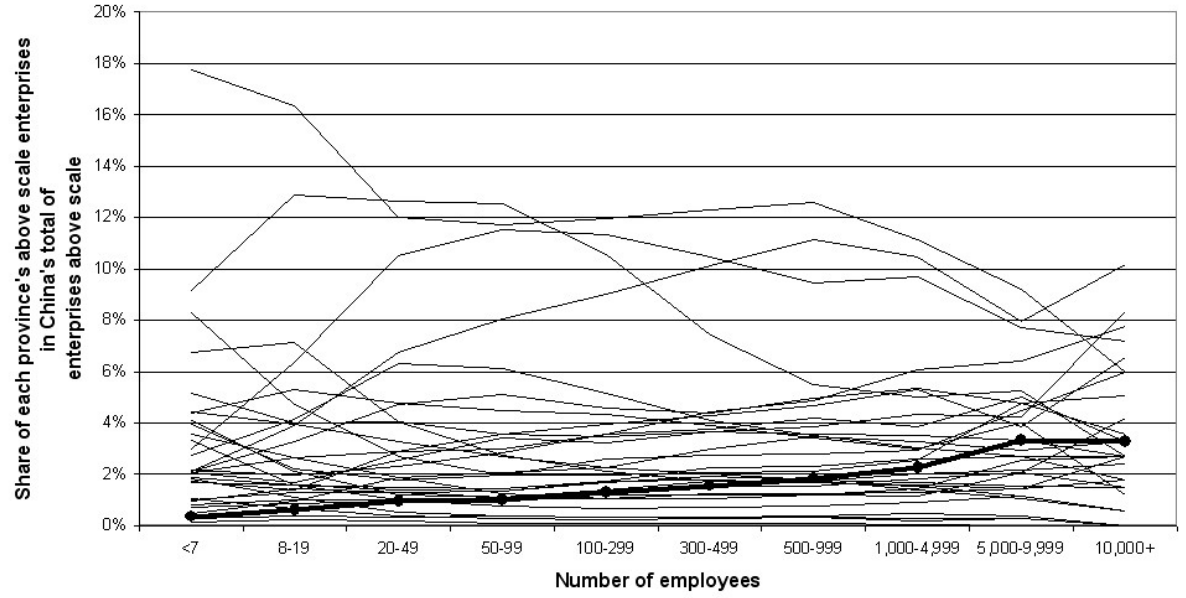
Information on above-scale enterprises may be disaggregated according to employment figures which constitute the most important element of any SME definition. Figure a below displays the share of enterprises of given employment ranges in each province among the above-scale enterprises. The figure responds to the question: "How many percent of the above-scale enterprises of province A have x employees?" Figure a organizes the data in a national perspective. This figure responds to the question: "What is the share of the above-scale enterprises with x employees of province A in the national total of the above-scale enterprises with x employees?"

Figure a: China's enterprises above scale (2003)
grouped by number of employees, intra-provincial shares



Both figures appear to indicate that Shaanxi's economic strength is emanating from its large scale enterprises. In Figure a, Shaanxi remains at the lower end until the threshold of 100 employees is reached. Then, Shaanxi crosses over to the higher end of the spectrum. The economies of Anhui, Chongqing, and Sichuan follow a similar pattern as Shaanxi. In Figure b we may observe that the larger the enterprises in terms of employment the more important the share of Shaanxi's enterprises among the national above-scale enterprises. Anhui and Chongqing's patterns are most similar whereas Guizhou and Xinjiang follow an opposite pattern.

Figure b: China's enterprises above scale (2003)
grouped by number of employees, shares in national total



From this point of view, Shaanxi's small scale enterprises are not particularly noteworthy performers, i.e. not only in comparison with the "high performing" provinces of Guangzhou, Zhejiang, and Jiangsu. In the micro and smaller (<20) small enterprise categories, Shaanxi only exceeds Tibet and Ningxia which have a rather low total population in comparison. In the larger small enterprise category (<50), Shaanxi's share only exceeds Tibet, Ningxia, Hainan, and Inner Mongolia (all of which still have a lower total population than Shaanxi). At the large-scale enterprise end, on the other hand, Shaanxi is a middle-field player: while exceeding Shanghai, Beijing, and Tianjin, its share remains smaller than that of the three provinces of the Northeast as well as several other provinces.

5.4 Policy Implications

Policy implications for SME development, from the survey and other information above, are presented according to levels of government administration. Recommendations which affect all government levels have been included under the central government because they need to be initiated at a national level, i.e. for the whole country. Some issues affect all enterprises, not just SMEs, such as commercial and company legislation; quality management, certification, and accreditation systems; protection of intellectual property rights; enforcement of contracts; restructuring the banking industry; and infrastructure development. Many of these were addressed in chapter 3 above, and will not be repeated here.

Central government

1. *Promotional efforts and funds for real small enterprises*. SME promotion is a means for creating broad-based income and employment, as well as to redress regional disparities. Government funds, preferential measures and other promotional efforts should more explicitly target below-scale enterprises, which accounted for 41 percent of total manufacturing employment in the country, and 68 percent of employment in manufacturing TVEs. The average size of a below-scale manufacturing enterprise was 30 workers per enterprise, and that of a below-scale TVE was 8 workers per enterprise in 2003 in China. Enterprises which are owned by other firms should be excluded, and only independent firms included. Likewise, promotion efforts should focus on such enterprises which fall under the current small enterprise definition, and promotion of medium enterprises should become an exception. Otherwise, there is an inherent risk that most funds would be siphoned off by economically more powerful and larger enterprises.

2. *Increase the flexibility of interest rate ceilings*. The ceiling on interest rates, set by the People's Bank of China, is one major cause restricting SME access to finance. The manufacturing surveys commissioned by this study have confirmed that access to finance is the single most binding constraint facing SME for their operation and growth. The cost of financing, however, was a much less serious issue for the surveyed firms, meaning that access to finance, not interest rates, was the determining factor. Relatively low interest rates do not always allow banks to cover the costs of loan initiation and administration and expected cost of SME default. So banks should be allowed to charge fully commercial rates to cover their operations and make a profit.

3. *Improve collateral regulations and practices*. As there is no centralized system for public registration of properties, and some regulations have a tendency to favour mortgagers over mortgagees in China, improving the respective laws, regulations, and procedures is very important for broadening the range of movables which may be used as collateral for SME financing.

4. *Limit the risks of credit guarantee schemes.* Credit guarantee schemes to encourage banks to lend to SMEs may induce moral hazard and reduce transparency. Given the international experience with credit guarantee funds, this will only have a limited effect on SME lending by the banking sector. Moreover, given the prevailing practice in China that many credit guarantee funds assume 100 percent of the loan risk, there is a strong incentive for banks to shift their bad portfolio to the credit guarantee funds. This problem needs to be urgently addressed to avoid a potential future crash of the credit guarantee system. Banks must share credit risk. Since the central government bears the ultimate risk

of default in a cascading system of credit guarantees and re-guarantees, it therefore needs to protect its funds by appropriate risk sharing at the lower echelons.

5. *SME development funds channelled through commercial banks*. To ensure that funding decisions take adequate account of commercial criteria, the government's SME promotion funds should be disbursed through the existing network of commercial banks and rural credit cooperatives. This will also maximize the outreach: funds can be made available via any bank so that SMEs may go to the closest branch office to apply for credit. Banks should be allowed to charge a profitable yet competitive fee for on-lending, but must also bear the full risk of their on-lending decision. At the same time, banks should be allowed to charge fees which cover the higher risk of lending to enterprises which, or the owners of which, do not have any credit track record.

6. *Increase the competency and incentives of bank staff to effectively deal with SME.* Lending to SME can become a major source of growth and revenue for banks. Most banks in China do not possess sufficient competency to efficiently handle lending to SMEs. They lack appropriate procedures, and their staff lack training and experience in appraising SME loan applications. Central Government should assist the banking sector in developing commercially viable SME lending practices. Efforts to establish a nation-wide credit rating and information systems need to be accelerated. Bank staff may also need internal *incentives* to increase lending to SMEs. At present, they devote more time and resources to larger, more secure loans, because they are held personally accountable for default. This discourages them from making relatively riskier loans to SMEs.

7. *Remove high-tech bias in SME promotion.* There is a strong emphasis on the promotion of high-technology industries in China, including SMEs, with special facilities granted through the Ministry of Science and Technology. However, mechanisms for enhancing the manufacturing and technological capabilities of ordinary firms appear to be lacking. The central government, and the Ministry of Science and Technology in particular, should take the lead in encouraging the development of manufacturing and technological capabilities of ordinary firms.

8. *Unify administration for urban and rural SMEs.* While some local governments have already unified SME administration in urban and rural areas, the central government itself has not streamlined its SME administration yet. Yet this is necessary to provide equal opportunities to SMEs located in rural and urban areas and enhance consistency in government. It will also provide more visibility to SME administration and development in general in the government as a whole.

9. *Improve SME Promotion Law*. Many provisions of the SME Promotion Law lack appropriate specification. In particular, there is no guidance as to which principles and procedures are to be employed in achieving the aims in the different areas of promotion, and there is no reference to international best practice. While over-regulation is to be avoided, the central government should fill the gap by developing specific guidelines for best-practice in each field. This is particularly important given that many local governments still do not have developed sufficient competency regarding SME promotion. Also one of the most important provisions of the SME Promotion Law during the period of transition to the socialist market economy is the protection of the rights of SMEs. The law, however, does not specify any mechanism of appeal and enforcement for

the SMEs whose rights have been violated. Such a mechanism needs to be established for the law to become an effective protection measure.

10. *Metrology, standardization, testing and quality management services (MSTQ), productivity centres and information technology centres*. Detailed assessments of the capabilities, strengths and weaknesses of these institutions must be undertaken to reform them and make them effective. In the interest of systematically raising quality levels, such services should not be solely provided by the government or any other single provider, but there must be a government-led coordinated network of truly independent technical organizations which will provide the complete service package necessary in a modern economy.

11. *Improve data and information on SMEs*. The central government should request the statistical authorities to begin collecting and reporting of comprehensive statistics on below-scale enterprises as well as offering disaggregated statistics comparable to international size criteria (micro, small, medium, and large enterprises). The below-scale and above-scale classification may become obsolete in line with progress in data collection. An annual or bi-annual SME development report should summarize the trends and patterns in SMEs, as well as provide assessments of the effectiveness and efficiency of SME promotion measures across the whole country.

12. *Effective and efficient SME promotion*. The central government must continuously monitor and evaluate SME promotion programmes to ensure efficiency and effectiveness. To ensure balanced regional development, lagging areas should receive higher resource allocations.

13. *Employ SMEs to address global concerns while furthering China's competitiveness.* While SME promotion benefits the SMEs, the country may also benefit from SME promotion. SME promotion is an effective channel to disseminate good practices to the majority of the enterprises throughout the country. Two major areas are of *immediate* concern and should find an appropriate space in SME promotion: environmental protection and the transition to the economy without petroleum. The first one concerns the effects of pollution of the environment by SME with effects on health of the local population and external effects on the global population (e.g. from greenhouse gas emissions). The second one concerns the effects of the expiration of petroleum (oil) and its derivatives (e.g. plastics, fertilizers) as major inputs (energy, raw materials, components) into production processes – which will impose major efforts in agricultural and industrial reengineering during the coming years[1]. This will require a concerted effort and special facilities administered jointly by the authorities responsible for SME promotion, environmental protection, and science and technology.

[1] While important environmental concerns are finally topping agendas on a world-wide scale, the requirements for a transition to the economy without petroleum are largely ignored. World petroleum production will most likely reach its peak during 2005, and soaring world demand for fuels will lead to accelerated depletion. By the end of the second decade of this century most of the remaining oil will have been extracted. This leaves a time span of only 15 years to reorganize the whole economy. Countries which immediately prepare for the transition to the economy without petroleum may still stand a chance to avoid the worst of shocks and are likely to emerge with increased competitiveness.

Regional governments

1. *Promote technological upgrading for all firms, not just hi-tech firms*. Chapter 3 showed that technology upgrading is not just concerned with R&D, but encompasses a range of technology acquisition, design and engineering, and R&D activities, and benefit all manufacturing enterprises, not just high-technology industries. The regional authorities must disseminate the knowledge to all officials concerned that technology upgrading is important for firms of all sizes and at all technology levels, not just high-technology, because it boosts the manufacturing competitiveness of all firms, and consequently of the whole manufacturing.

2. *Focus technology extension services on SMEs*. The vast majority of manufacturing enterprises, up to 70 percent in the 2004 Shaanxi manufacturing survey and 86 percent in the Baoji manufacturing SME survey, may be unaware of the existence or usefulness of existing technological support institutions for raising their manufacturing capabilities and competitiveness. The regional and local governments can encourage a broadening of the horizons of the SMEs owners and managers by initiating or developing an active industrial extension service. The experience of many industrialized countries, including USA, UK, Canada and Ireland show significant benefits of public research institutions deploying knowledgeable and experienced industrial advisers. These sectoral specialists proactively visit SMEs and provide on-site advice on plan layout, product and process improvement, health and safety, marketing channels, and best industrial management practices. Industrial advisers also put interested SMEs in touch with other technical, management and marketing service providers. Governments in the above countries also subsidize part of the fees of such external service providers to encourage the active participation and technological upgrading of SMEs, eventually resulting in large improvements in productivity and competitiveness. There are also alternative models of organization of demand-driven technology transfer to SME which only use a minimum of public resources such as the *Steinbeis* foundation in Germany.

3. *Revamp existing technology extension services*. Chapter 3 showed that extension agents, enterprise counsellors or advisers can the initiative and be proactive in approaching firms. There is no need to establish a cumbersome, stand-alone technology extension service, but regional authorities need to establish a small but efficient unit to coordinate a network of advisers located in existing public and private research institutes, including universities, research institutes and technology centres, business and industrial associations, professional associations, business centres, and even regional and municipal agencies.

4. *Proactive universities and private and public training institutions*. Government research and technology institutes and universities can become more proactive in selling their services in particular to the local SMEs. At the same time, detailed assessments should be undertaken to evaluate their mandate to provide technology services at the firm level. Some of them may be working below capacity precisely because of the low demand for technology services from the firms themselves. So a major task of the technology institutes should be to raise awareness at the firm level, and raise their demand for technology services.

5. *Business and industry associations as technology promoter*. The traditional role of business and industry associations has focused on lobbying government, and on providing their members with information about emerging government policies. However, as shown

in chapter 4, associations can play a catalytic role in enabling the process of industrial upgrading and adopting global standards, in addition to sharpening their lobbying function. Thus, not only firms but also industry associations need upgrading. The regional authorities should encourage business and industry associations to provide technology and other services at the firm level. To start with, regional authorities should undertake detailed assessments of their capacity and willingness to do so, and formulate appropriate action plans accordingly.

6. *Facilitate access to business development services (BDS).* Regarding all types of non-financial support services, the priority of SME promotion by regional governments should be to promote the development of facilitator organizations which enhance the development of local business development service (BDS) markets for SMEs. While most BDS can be provided based on commercial principles, targeted government financial support is required for facilitation organizations. The functions of facilitating organizations should not be confused with providers of BDS. As different levels of commercialization of BDS may be appropriate for different regions of the country, the central government should assist regional governments in providing criteria and specific guidelines for the development of BDS markets under different economic conditions. There may also be an important role for the regional government to provide accreditation of BDS providers.

7. *Tax deduction for R&D and Training*. The government has already provided inducements for all firms, not just SMEs to begin to invest in technology upgrading and training by making R&D expenditures and training expenditure tax deductible. Many SMEs may not be aware of this facility, which the regional governments can publicize through business and industry associations.

8. *Match central government funds with own resources.* Generally speaking, developing SMEs in practice is a task of the regional and local governments. SME development is a key building block to achieve a solid economic foundation for the local socialist market economy. While Central Government needs to lead on the regulatory side and therefore issue more documents, it cannot be responsible for generating and disbursing the majority of the funds required for promoting SMEs across the country. Regional governments need to take the lead and supplement their policy declarations with appropriate funding. Central Government intervention will essentially be limited to demonstration exercises and experiments.

Local government

1. *Improving the enabling environment.* While the regulation of the economic system changes during a transition process and therefore requires comprehensive administration, many changes have already been legislated for and many biases against SMEs have been formally removed. Therefore, local governments increasingly become the focus for improving the enabling environment for SMEs. Local governments need to systematically reduce the cost of doing business in the areas under their jurisdiction, improve the attitude of staff regarding SMEs, and eliminate remaining extortionary practices. They should facilitate the provision of BDS for small businesses, and they should also provide guidance to SMEs how to operate within the law, and maintain social and environmental standards.

2. *Encourage local industry associations*. Local governments should promote and encourage the further development of local industry associations run by their members. The associations should then be encouraged to invest in common facilities and information services, joint marketing and so on.

3. *Withdraw from business development services*. Government agencies and public service units (*shiye danwei*) should gradually withdraw from the direct provision of business development services, such as accounting, legal, consulting, brokerage and other business intermediation activities. Private sector establishments are better able to provide relevant services at competitive costs. This may necessitate selling off public units.

4. *Information services*. Local industry associations should take the lead in providing information services particularly on business opportunities. Local governments, as already initiated in some cases, should complement this with information, not yet available through industry associations, in documentation centres as well on the internet, including on business development service producers, technology providers, marketing agents and equipment suppliers.

5. *Bridge the gap between universities and SMEs.* While universities and research institutes generate many spin-offs in the area of technology-based SMEs, their interaction with other local SMEs appears to be virtually non-existent in Western China. Thus a major opportunity for improving SME industrial performance on a permanent basis is being ignored. Local governments should actively foster contacts between universities and research institutes and the local SMEs.

6. *Encourage increased collaboration between education and training providers and SMEs.* Education and skills were the most important resource sought by SMEs after finance in the Baoji SME survey. Local governments are in effect responsible for providing most of the educated and skilled labour needed by SMEs. While government supervision remains a necessary ingredient, local providers of education and training must develop an intimate relationship with the SMEs so that the labour force can be qualified in line with SME needs. Local governments can also effectively take the lead in encouraging SMEs to retrain their staff in line with market developments and new technologies to enhance competitiveness.

7. *Overcome the "kuai-kuai" culture and encourage natural clusters.* Traditionally, local governments, and even regional governments, see themselves in rivalry with their neighbouring local or regional economies. Cluster management seeks to overcome administrative boundaries and encourage the development of natural clusters which may however cross county, district, city and regional boundaries. Cluster management also provides a coherent overall administration for regional marketing, strengthening of institutional linkages, attracting qualified human resources, technology, and other inputs, and furthering the tacit knowledge available to the members of the cluster on product and process development. Cluster management organizes a coordinated system of support to the cluster's enterprises to avoid the pitfalls of administrative fragmentation.

CHAPTER 6. SUB-SECTORAL COMPETITIVENESS PROFILES OF SHAANXI, SICHUAN & YUNNAN

The competitiveness analysis of selected industries is a natural extension of the competitiveness analysis of the whole manufacturing sector undertaken in chapter 2. While sub-sectoral analysis is usually undertaken at the national level, the novel feature introduced in this chapter is the benchmarking of key manufactured exports of three selected regions, Shaanxi, Sichuan and Yunnan, in the world market. In other words, just like countries, the manufactured export performance of these three regions is directly compared against world performance[1]. In Shaanxi's case, as agreed with the regional authorities, three selected industries, namely food, machinery and pharmaceutical, receive more extensive treatment.

Non-discriminatory policies such as those outlined in chapters three and four have gained favour over those with a sub-sector or industry focus. They require less detailed information and less implementation capacity on the part of government agencies, while averting the risk that policy-makers would pursue capacity creation in non-competitive industries. However, the practice of policy implementation has shown that many policies need to address sub-sector issues. Focus on sub-sectoral or industry-specific analysis is justified as follows.

Trade and commercial policies, beyond an initial thrust towards trade liberalization and reform with universal rules, need to be formulated according to the specific needs of different industries, for instance to deter anti-dumping and unauthorized subsidies, as well as offering temporary relief when necessary. Export promotion programmes often involve industry associations which are usually industry-specific. Industrial restructuring programmes and cluster support policies are also industry-specific. Some sub-sectors are characterized by significant market failures, externalities or technological economies of scale, and may require targeted support for capacity creation. Government-business sector networks are typically organized around sub-sectoral issues. Thus sub-sectoral policies are a natural response to addressing issues of competitiveness. Nevertheless, when specific sub-sectors are being promoted, an appropriate industrial strategy is one that acts selectively. It should identify a narrow group of industries and set out transparent policies to promote them, as well as clear-cut guidelines against which their success can be evaluated (Rodrik, 1997).

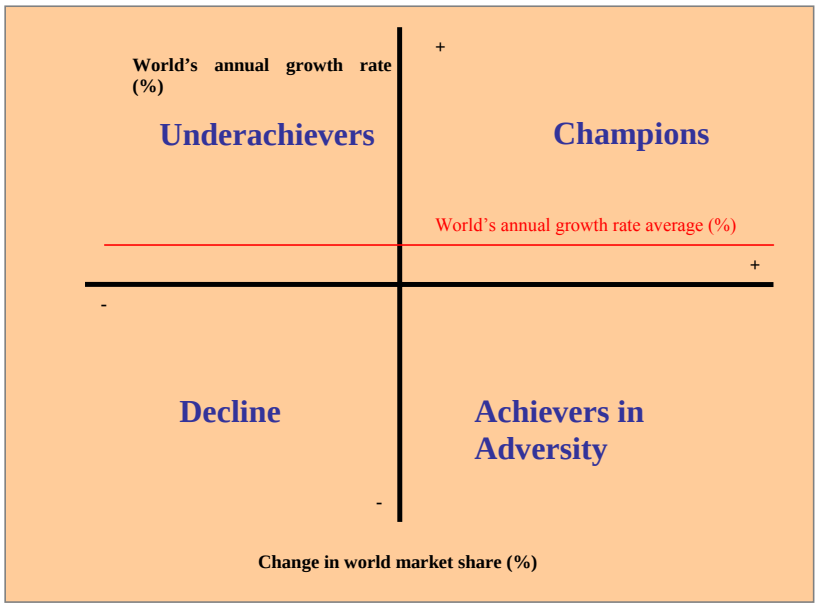
The export competitiveness of particular industries is measured here using three indicators (box 6.1). The first is the changes in world market share relative to whether the world demand for that product is growing faster than the average for world trade. This leads to a four-way classification for a product as a 'champion' (gaining market share in a dynamic product) 'under-achiever' (losing market share in a dynamic product), 'achiever in adversity' (gaining market share in a product that is growing below world average exports), or 'in decline' (losing market share in a product growing slower than world average exports). The second indicator measures the regional performance of exports that are significant in world trade, i.e., with a value above US$5 billion, and which are dynamic, among the fifty fastest growing exports. The third indicator is the ability to produce higher value-added or more processed goods. Ideally, export competitiveness analysis should be complemented by an assessment of the domestic competitiveness of these industries. However, the lack of readily available data on trade flows between regions precluded this.

The chapter begins with a comparison of the overall industrial and trade performance of three western regions, Shaanxi, Sichuan and Yunnan. This is followed by a closer look at the sub-sectoral export performance in the world market of each of the three regions in turn.

[1] Manuel Albaladejo (consultant) was responsible for the sub-sectoral competitiveness analysis of this chapter.

Box 6. 1 Three Main Indicators of Export Competitiveness

- **Champions, Under-achievers, Achievers in Adversity and in Decline.** Exports can be classified into four types according to their position in the quadrants below:
  - *Champions*: exports which are highly dynamic – growing above the average of world exports – and which are gaining world market share. Successful exporters tend to have a large number of champions.
  - *Underachievers*: exports which are highly dynamic in world markets, but where the country is losing world market share. They are considered 'lost opportunities' since the country is failing to maintain competitiveness in fast growing products.
  - *Achievers in adversity*: exports which are not very dynamic products – growing below the average of world exports – and yet where the country is gaining world market share. This tends to be a common feature of many resource-rich developing countries as their major exports, mainly slow growing agricultural commodities.
  - *In Decline*: exports which are not dynamic, and where the country is losing world market share. This is a sign of exiting sunset industries, particularly when this occurs in combination with producing champions. This is indeed a feature of many industrialized countries which exit slow growing, labour-intensive exports, while strengthening their position in high value-added and technology-intensive exports.



- **Position in the world's fastest growing and largest exports.** This ranks a country or province's exports in the fifty fastest world exports and with a volume of US$5 billion and above.
- **Value chain analysis**. This is the ability to shift towards higher value-added stages within a chain. For example, the agro-industry value chain shows the capacity of a country or province to move into more processing activities.

6.1 Shaanxi, Sichuan and Yunnan: Industry & Trade Compared

Manufacturing Performance

Sichuan's manufacturing sector accounted for nearly one fourth of the west's total MVA, and grew by 14 percent per year between 1998 and 2003 (table 6.1). Shaanxi's MVA accounted for 11 per cent of the west's total, and reached only half of that of Sichuan. Yet, in per capita terms Shaanxi was ahead of Sichuan, though its slower growth rate means that the latter may catch up very soon. Yunnan's manufacturing sector accounted for 16 percent of the west's total, i.e., half way between that of Shaanxi and Sichuan. Its MVA grew at just 7 percent per year, well below the 13 percent average for the west between 1998 and 2003. Nevertheless its per capita MVA was nearly 50 percent higher than the other two regions. Resource-based

industries accounted for more than 70 percent of Yunnan's MVA.

Table 6. 1 Manufacturing Value Added, Shaanxi, Sichuan and Yunnan 1998-2003

	Manufacturing Value-Added, Nominal (Million yuan)		Share in West's total MVA		MVA per capita (yuan)		MVA annual growth rate 1998-2003 %
	1998	2003	1998	2003	1998	2003	
Shaanxi	21,626	41,154	10.6	10.6	615.4	1,120.1	13.7
Sichuan	47,479	92,173	23.2	23.8	419.2	1,062.8	14.2
Yunnan	44,132	63,420	21.5	16.4	1,106.1	1,463.6	7.5
West China	204,859	387,757	100.0	100.0	593.5	1,056.8	13.6

Source: Same as table 2.1

In terms of the components of the CIP index introduced in chapter 2, Sichuan had the strongest industrial base of the three regions, ranking 15th out of 31 regions in the country, but losing four places in the production of technology-intensive industries (annex table 2.6). Shaanxi had the smallest industrial base, ranking 22nd in 2003, and lost three places in the industrial deepening index, though it was ahead of Sichuan. Though Yunnan was only one place behind Sichuan in the industrial base index, it ranked 30th in the production of medium and higher technology industries, only ahead of Tibet.

While Sichuan made substantial progress in MVA capacity both overall and in terms of medium and high-technology industries, Shaanxi and Yunnan lost competitiveness between 1998 and 2003. Shaanxi and Sichuan presented an advanced MVA structure with medium and high technology sectors accounting for 62 and 57 per cent of their total MVA respectively. Yunnan has a much simpler structure with resource-based sectors accounting for 71 per cent of the province's total MVA.

Shaanxi ranked 11th in the country in the production of medium and high-technology manufactures, ahead of Hubei and Hebei, though it lost two places due to the more rapid technological upgrading of regions such as Guangdong and Jiangsu. Sichuan also lost four places in medium and high-technology industries between 1998 and 2003. Yunnan had one of the less technology-oriented MVA structures in the country, only ahead of Tibet in the MVA structure index. Finally, Shaanxi was ahead of Sichuan in MVA per capita for technology-intensive sectors, but shared similar levels for low-technology industries.

Manufacturing Export Performance

Sichuan exported US$2.4 billion of manufactures in 2002, and accounted for 1 per cent of China's total manufactured exports. Its export volume was comparable in size to that of Egypt and Peru in 1998 (UNIDO, 2002:163). Shaanxi exported half of that amount (US$1.2 billion), comparable to Guatemala and Mauritius in 1998, and Yunnan only US$906 million, comparable to Ecuador, Zimbabwe, El Salvador and Oman (UNIDO, 2002:163). Both Shaanxi and Sichuan experienced a significant fall in primary exports between 1995 and 2002, while Yunnan's primary exports increased by 10 percent for the same year (figure 6.1). By contrast both Shaanxi and Sichuan saw a manufactured export increase, particularly the later with 4 percent annual growth between 1995 and 2002, while manufactured exports contracted in Yunnan by 1.4 percent.

Despite their wage advantage over China's coastal regions, Shaanxi, Sichuan and Yunnan faced strong competition in low-technology sectors, with exports declining between 1995 and 2002. The worst affected sectors were leather (exports declined by 98 percent), iron

and steel bars (-48.4 percent) and fabrics (-32.8 percent) in Shaanxi; flat rolled iron (-45 percent), flat rolled alloy steel (-40 percent), and leather (-36 percent) in Sichuan; and leather manufactures (-39.4 percent), and flat rolled iron (-30 percent) in Yunnan. The leather and iron and steel industries were big losers in these three regions with exports falling dramatically in seven years.

Shaanxi experienced the fastest growth in medium-technology exports (5.3 per cent), though it only exported US$344 million in 2002, half of Sichuan's exports. Shaanxi's boat industry was the most dynamic sector growing at 107 percent per annum between 1995 and 2002, reaching US$29 million in 2002. Sichuan's television and sound recorder industry grew at 21 percent, reaching US$231 million in 2002, which accounts for 36 percent of the province's total medium-technology exports.

Sichuan's high-technology exports grew rapidly between 1995 and 2002. Steam and vapour turbines (annual growth rate of 83 percent) and television receivers (68 percent) were the fastest growing products in the province. The performance of the television industry is particularly impressive in Sichuan – television receiver exports reached US$500 million in 2002, or 20 percent of the province's total manufactured exports and 21 percent of China's total television exports. By contrast, Shaanxi's high-technology export only grew at 1 percent between 1995 and 2002, though exports of medical equipment and steam and vapour turbines grew at 160 percent and 107 percent per annum respectively.

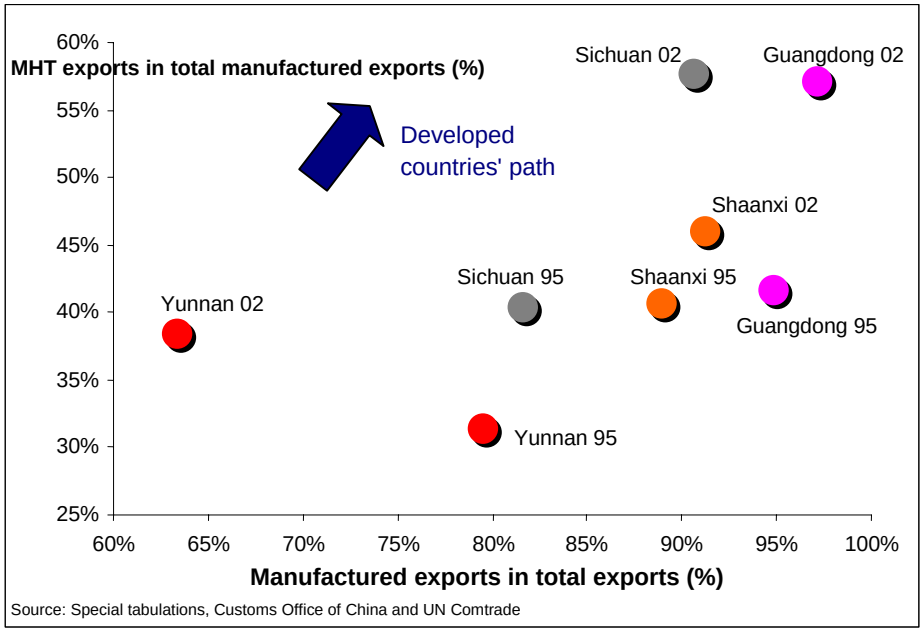
Yunnan was the only one of the three regions with per capita manufactured exports below the average for western China in 2002, US$21 in manufactured exports compared to US$25 for western China. Also resource-based, low-technology and medium and high-technology per capita exports for Yunnan declined between 1995 and 2002. This puts Yunnan 22nd in China's ranking for resource-based and low-technology exports per capita, and 26th in the ranking for medium and high-technology exports per capita.

Shaanxi had the strongest manufactured export capacity of the three regions, particularly in resource-based and low-technology exports. Shaanxi's manufactured exports per capita reached U$34 or US$10 more than the average for west China. Yet sluggish export growth meant that Shaanxi started to lose significant ground to other Chinese regions in export capacity – it lost four places in the manufactured exports per capita ranking, 1 in MT and HT, and three places in the RB and LT exports per capita ranking.

Sichuan did not have a strong export base, but made large improvements in the MT and HT category. It reached US$16.3 per capita of MT and HT exports in 2002, US$5 more than the average for west China. Sichuan is now 11th in China the MT and HT exports per capita ranking, jumping eleven places since 1995.

Technological upgrading. Sichuan's manufactured exports accounted for 91 per cent of the province's total exports in 2002 (up from 89 per cent in 1995), and the share of medium and high-technology manufactures increased from 40 per cent in 1995 to nearly 58 per cent in 2002. A substantial industrial restructuring towards technology-intensive sectors put Sichuan 5th in China's ranking in the share of medium- and high-technology exports in total exports, even ahead of Shanghai and Beijing. Yet its export capacity in complex sectors was still comparatively low; medium and high-technology exports per capita in Shanghai and Beijing were 63 and 25 times higher than those of Sichuan. Sichuan has followed a similar path to that of Guangdong, today one of the most industrialised hubs in the world, and where manufactured exports accounted for 97 percent of its total exports, of which 55 percent were medium and high-technology manufactures.

Figure 6. 1 Manufactured export dependency and technological upgrading in Shaanxi, Sichuan and Yunnan, 1995-2002 (%)

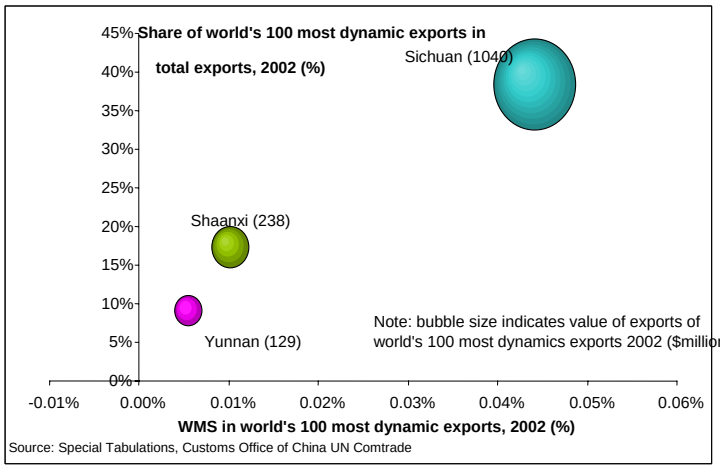


Source: Special tabulations, Customs Office of China and UN Comtrade

Shaanxi's export structure slowly moved in the right direction. This was one of the most manufactured export-oriented regions in China, 6th in China's ranking in the share of manufactured exports in total exports, ahead of Sichuan and Tianjin. Yet, as in the case of Sichuan in complex exports, Shaanxi's manufactured export base was weak, with manufactured exports per capita 7 times less than the average for China. Shaanxi moved up the technology ladder, with medium and high-technology exports rising from 41 percent in 1995 to 46 percent in 2002 of total manufactured exports.

Yunnan faced a significant downgrading of its export structure. Manufactured exports had less weight in its export structure in 2002 than in 1995. It ranked 26th in the country in the share of manufactured exports in total exports, losing six positions since 1995. Its apparent technological deepening within manufacturing does not mean much when total manufactured exports declined by US$93 million between 1995 and 2002. The increased share of medium- and high-technology exports in total manufactured exports reflected more the competitive loss of resource-based and low-technology industries than gains generated by technology-complex industries (figure 6.1).

Figure 6. 2 World market share in world's 100 most dynamic exports, Shaanxi, Sichuan & Yunnan, 95-02



Source: Special Tabulations, Customs Office of China UN Comtrade

World market share. This is most important indicator of export competitiveness None of the three regions gained world market share in all three technological categories of manufactured export. Sichuan increased its position in medium and high technology sectors, increasing its export share in

world markets from 0.03 percent 1995 to 0.05 percent in 2002. Sichuan was the 10th largest Chinese regional exporter of medium and high-technology products. Sichuan's world market penetration was highly concentrated in the television receivers and television recorders industry, where it accounted for 2.6 per cent of world market. Shaanxi lost competitiveness in resource-based and low-technology industries. This was mainly due to the US$50 million export decline in low-technology sectors between 1995 and 2002. Yunnan stagnated both in simple and complex manufactured industries, with manufactured exports declining by US$93 million between 1995 and 2002. The competitive impact was greater in resource-based and low technology sectors, where the province's comparative advantage lies.

Sichuan's export surge was partly due to its specialization in highly dynamic world exports (figure 6.2). It exported US$1 billion of these high growing products, and its export structure was geared to supply these (nearly 40 per cent of Sichuan's exports were dynamic in world markets). In contrast, Shaanxi and Yunnan hardly specialized in dynamic world exports regardless of their technology composition. Shaanxi was slightly better-off than Yunnan but there was only a US$100 million difference in supplying these types of products when the manufactured export differential was US$270 million.

6.2 Shaanxi Manufacturing Competitiveness Profile

With a population of 37 million, this province has rich natural resources and a strong human capital base. The northern plateau contains oil, gas and coal resources, the central Guangzhong plane is home to its export-oriented fruit industry, and the Qinba Mountain in the south is rich in medicinal herbs. Besides its resource-based industries, this province was home to several medium and high-technology industries, including machinery and equipment, aircraft, electronic and heavy truck industries (box 6.2).

Box 6. 2 Shaanxi's Growth industries

Machinery and equipment. The machinery and equipment industry was very developed in the province. For instance, the state-owned *Xian Electrical Group* was located in a complex of 16 plants, including on-site component manufacturing, and produced a third of all high voltage transmission equipment in the country. It had forged several joint ventures and technology agreements with best-practice international firms such as ABB and Mitsubishi. Over 90 percent of all parts were manufactured in the province. This company was the main supplier to the Three Gorges Project. Export orders came from all around the world, particularly Southeast Asia, South Asia and Africa. The company, already working at full capacity, was not able to satisfy both domestic and export markets.

Aircraft Industry. There are three major plants in Shaanxi, *Xian Aircraft Manufacturing Corporation*, 300 km from Xian; and *Shaanxi Aircraft Manufacturing Corporation*, and *Aircraft Engine Manufacturing Corporation*, both in Xian, plus numerous parts producers. Small planes for passenger (50 passengers) and freight transport are produced at present. One plant produces aircraft tails for Boeing.

Electronics. The electronic sector developed as a result of substantial investment in military equipment to reduce dependence on Russia, the US and Europe. Sophisticated telecommunication equipment firms have now been established in the high-technology zone, and were growing rapidly. At the other end of the scale, colour monitors have been produced since the 1980s with Japanese firms for the local market.

Highway trucks. Due to heavy domestic demand, the province produced 250,000 units in 2002, specializing in heavier trucks above 15-tonne capacity. The *Shaanxi Heavy Truck Corporation* had a technology agreement with Austria's *Stern* engine manufacturer, the American firm *Eaton* for gear box production for export, and German firm *MAN* for cabin production. This company was listed in the stock exchange.

Competitive performance of Shaanxi's major exports

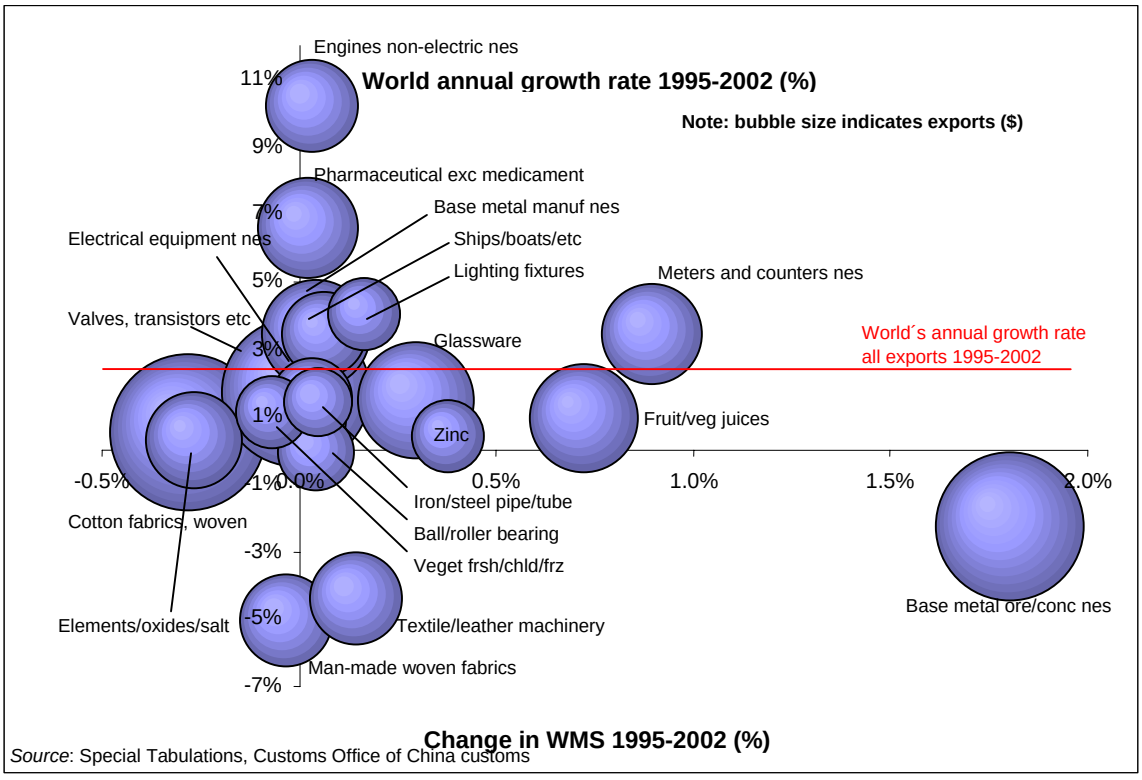
Among Shaanxi's 20 major exports, six were 'champions' in world markets, five were products 'in decline' and nine 'achievers in adversity'.

Champions. The meters and counters sector has been the best performing industry in Shaanxi between 1995 and 2002 – the province gained 0.9 per cent of world market share in this highly dynamic industry. Shaanxi's lighting fixtures industry also performed extremely well internationally with a 0.17 per cent market gain. Ships and boats and base metal manufactures were also champion industries for export, though their impact in world markets was relatively smaller. Shaanxi also exports non-electric engines and pharmaceutical products (excluding medicaments), which are highly dynamic sectors in world markets.

Achievers in adversity. Shaanxi has gained world market share between 1995 and 2002 for industries such as base metals and concentrates, fruit and vegetable juices, zinc, glassware, textile and leather machinery, iron and steel, electrical equipment 'not elsewhere specified' or *nes*, hand machine tools and ball and roller bearings. Yet all these sectors have grown below the world's average for all exports thus reflecting their lack of dynamism in world markets. Even for sectors such as base metals and concentrates and textile and leather machinery, world exports declined by 2.2 per cent and 4.4 per cent respectively between 1995 and 2002.

Decline. Despite being among the 20 major exports in the province, woven cotton fabrics, man-made woven fabrics, elements of oxide and salts, fresh and chilled vegetables and valves and transistors have showed a declining trend between 1995 and 2002. For instance, Shaanxi is starting to lose world market share in valves and transistors, which is the province's third most important export product with US$85 million. Also note the significant decline of the fabrics industry mainly due to its growth slowdown and oversupply in world markets.

Figure 6. 3 Competitive Performance of Shaanxi's 20 Major Exports



Source: Special Tabulations, Customs Office of China customs

Shaanxi's position in the world's fastest growing and largest exports

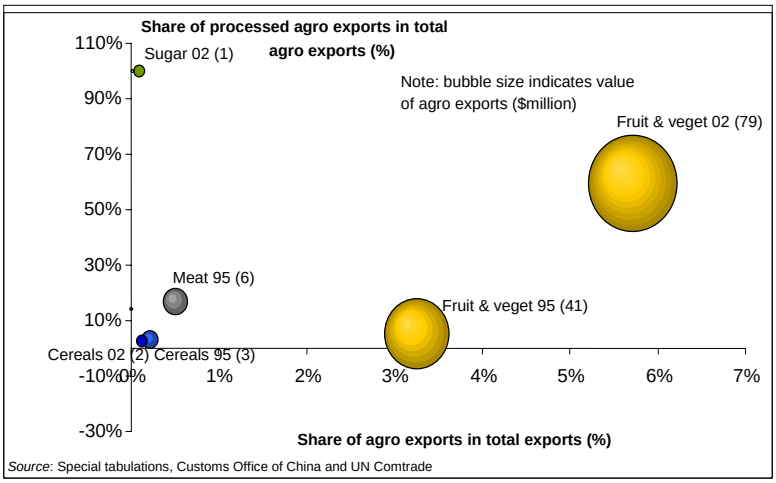
Some 14 export products of Shaanxi grew faster than the average for the world. Among them, excel glycosides and vaccines and electro-diag equipment grew at 82 and 80 percent per year respectively between 1995 and 2002.Yet most of these highly dynamic products were exported in small volumes, with very limited shares in the world markets. Only glycosides and vaccines, parts of reactor and turbine engines, and lamps and lighting fittings were significant export performers. The lamps and lighting fittings industry was particularly impressive, with Shaanxi accounting for 0.23 percent of world markets in 2002, and an increase of 0.19 percentage points between 1995 and 2002.

Shaanxi's performance was also notable in the ship and boat industry, iron and steel articles, and diodes and transistors. It exported around US$29 million of boats and ships, accounting for 0.08 percent of world markets in 2002. Of the world's most demanded exports, Shaanxi's iron and steel industry were best known internationally, accounting for 2.2 per cent of the province's total exports, and 0.17 percent of the world market.

Shaanxi's performance in the agro value chain

Shaanxi exported US$81 million of agro-industry products in 2002, or nearly 6 percent of the province's total exports. Agro exports grew at 1.2 per cent per annum between 1995 and 2002, well below the 4.4 per cent of average for Western China. Shaanxi agro-industries have moved up the technology ladder as processed agro exports accounted for 58 per cent of its total agro exports in 2002, up from 7 per cent in 1995.

Figure 6. 4 Shaanxi's performance in the main agro value chains, 1995-2002



Source: Special tabulations, Customs Office of China and UN Comtrade

The fruit and vegetable industry accounts for 97 per cent of Shaanxi's total agro exports. Shaanxi has not only increased its dependency on fruit and vegetable exports but has also managed to process most of them (nearly 70 per cent mainly in the form of juice, figure 6.4). Other agro sectors have had little impact in world markets – for instance, cereal and sugar exports only reached US$2 million and US$1 million respectively in 2002. The meat industry has lost its competitive edge as exports declined from US$6 million in 1995 to US$100 thousand in 2002. Further investigation is required to understand the big fall of the meat industry in only 7 years. The cereals sector needs serious restructuring if it is to compete in world markets – exports declined between 1995 and 2002 and the level of processing of its exports only reached 0.12 per cent in 2002.

Given the strength of its fruit and vegetable sector, Shaanxi has the potential to get into higher value-added products within the value chain, including jams and jellies, and preserved fruit and vegetables. Within cereals, Shaanxi has significant potential with the production of non-wheat flour, whose exports have grown by 29 per cent per annum between 1995 and 2002. Although the province is losing its competitive edge in cane and beet sugar, Shaanxi has strong potential in processing sugar products including sugar confectionary, syrups and fruit preserved with sugar.

Food, Machinery and Pharmaceutical Industries

Nearly half of all the enterprises in Shaanxi consisted of food, machinery or pharmaceutical industries. Their combined value added amounted to nearly 40 percent of the regional manufacturing value added in 2001 (table 6.2). The largest sub-sector was the machinery industry, followed by pharmaceutical and food industries (16, 13 and 9 percent respectively). At the request of the regional Development and Reform Commission, this policy study undertook a more detailed analysis of these three key sub-sectors, to identify their competitive strengths and weaknesses, particularly in relation to other regions and exports, and to suggest opportunities and strategies for growth in the national and international markets.

Table 6. 2 Food, Machinery and Pharmaceutical Industries in Shaanxi, 2001 (%Share)

	Enterprises	Employment	Output	MVA
Food industry	20.2	8.0	9.9	8.7
Food manufacturing	6.0	2.2	2.6	2.3
Food processing	10.7	3.5	4.2	3.2
Beverages	3.6	2.3	3.1	3.2
Machine industry	19.4	19.4	15.9	16.2
Ordinary machine	6.7	6.4	4.5	4.8
Special purpose equipment	7.3	7.6	5.0	5.7
Electric equipment and machine	5.3	5.3	6.4	5.7
Pharmaceutical industry	7.5	4.2	8.9	12.7
Sub-total	47.1	31.6	34.7	37.6

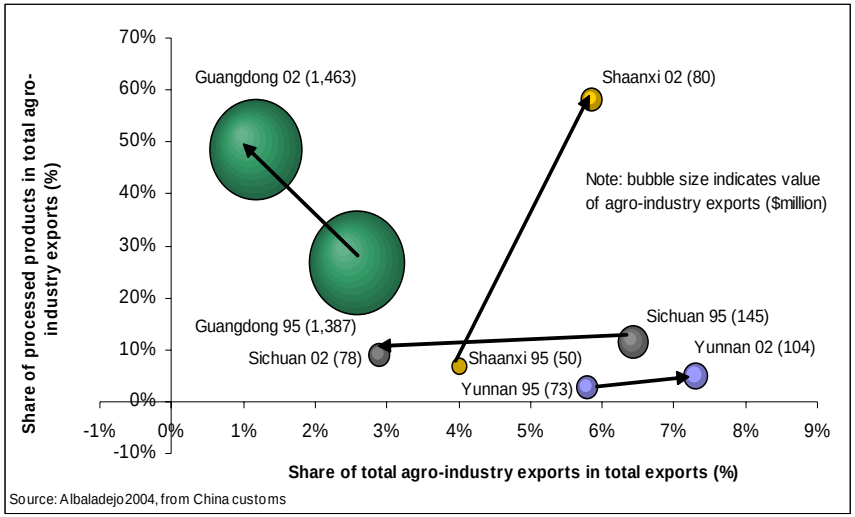
Source: 'Industrial Economics Statistics 2003', National Bureau of Statistics, China

Food industry. Shaanxi's export volumes of primary and processed agricultural products were relatively small, amounting to just US$81 million or 6 percent of its total exports in 2002 (figure 6.5). Nevertheless, they increased from US$ 50 to 80 million between 1995 and 2002. The share of processed products jumped from 7 to almost 60 percent of the total, dominated by the fruit juice industry, which accounted alone for 88 percent of total agricultural product exports. In contrast, cereal and meat exports declined sharply in that period from $2.7 to 1.6 million for cereals and $6.5 to 0.1 million for meat, due probably to a surge in domestic demand fuelled by higher incomes.

Since China has become a net importer of manufactured food products, western and central regions have a good opportunity to meet the country's rising domestic demand. For this to happen however, their food industries need to produce more processed products of the kinds that are being imported. For instance, China imports sugar, molasses and honey, while Shaanxi exported US$1 million worth of exports in the same category, the second most important food product export after fruit juice. Other products with good market potential within China include butter and cheese, curd, chocolate and cocoa preparations, and margarine and shortening. China faces a negative trade balance in all these products, while imports grew faster than exports (figure 6.4 and annex table A.6.6). A product-by-product assessment of the food products currently being imported by China is therefore required to study the feasibility of local producers being able to supply and replace imported items with domestically produced ones.

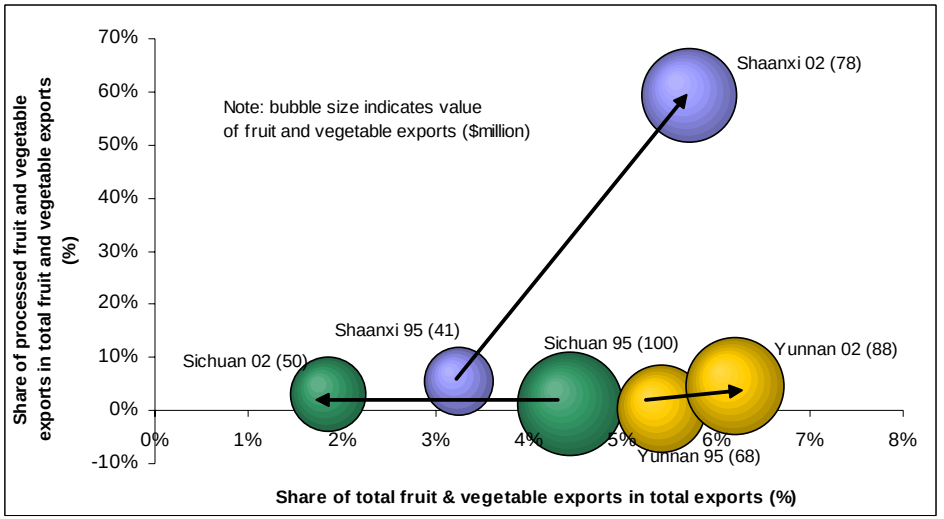
Figure 6. 5 Performance of Agro-industrial Products and Value Chain Analysis, Selected Regions (1995-2002)

(a) All Agro-industrial products

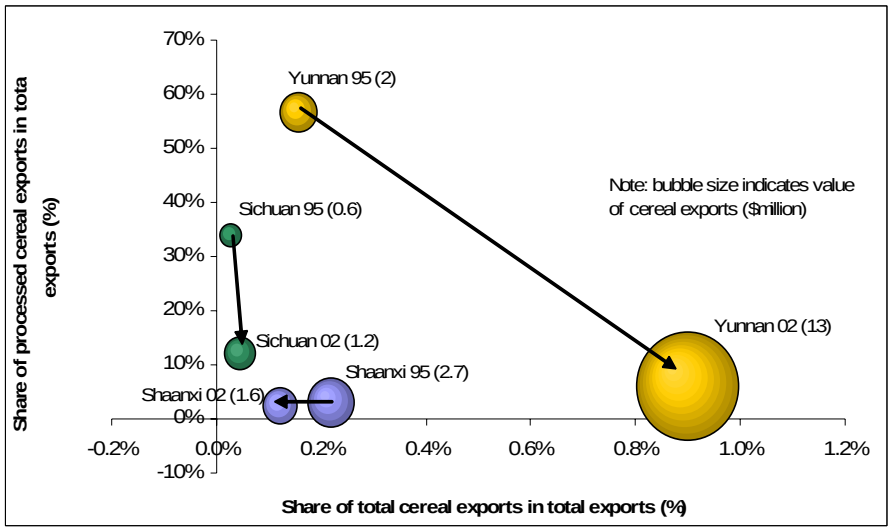


Source: Albaladejo 2004, from China customs

(b) Fruit and Vegetables



(d) Cereals products



(e) Meat products

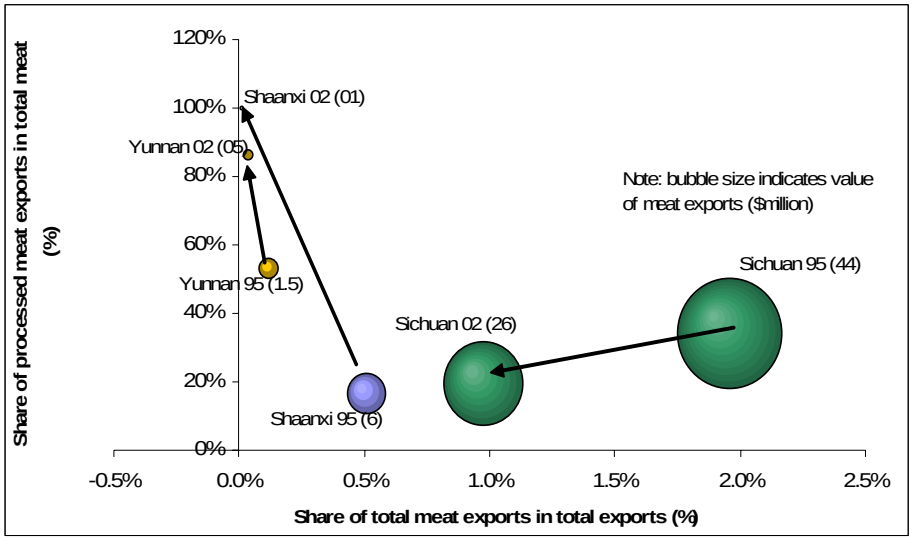
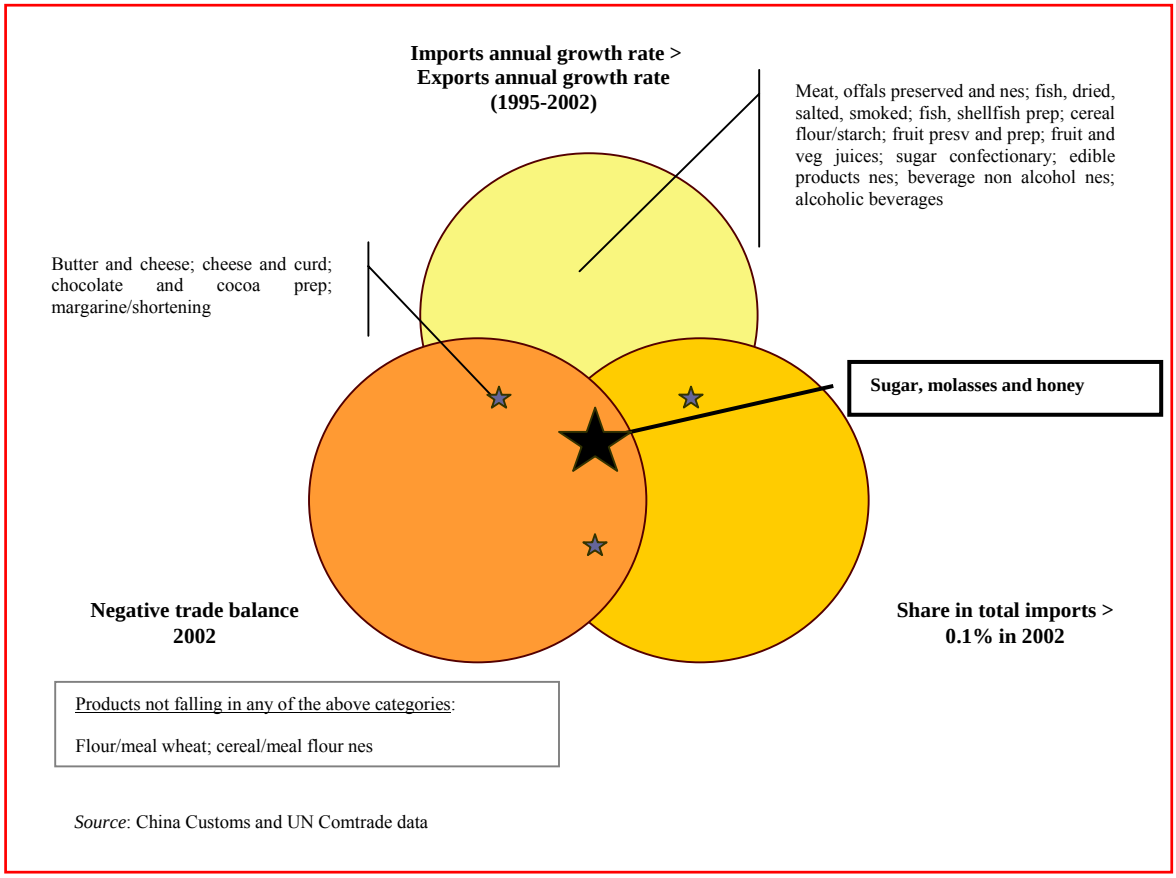


Figure 6. 6 Domestic Market Opportunities for agro-industrial products of Shaanxi



Shaanxi's food industry growth can also driven by international demands. Table 6.3 provides a list of agro-products that have lost their competitive edge, are already competitive and have a competitive potential for export growth in Shaanxi. Given the strength of its fruit and vegetable sector, Shaanxi has the potential to get into higher value-added products within the value chain, including jams and jellies, and preserved fruit and vegetables. Within cereals, Shaanxi has significant potential with the production of non-wheat flour, exports of which grew by 29 per cent per annum between 1995 and 2002. Although the province lost competitiveness in cane and beet sugar, it has strong potential in processing sugar products for export markets including sugar confectionary, syrups and fruit preserved with sugar.

Table 6. 3 Product performance and potential in main agro-industries for Shaanxi

Value chain	Losing competitiveness	Already competitive	With competitive potential
Fruit and vegetables	Fresh and dried vegetables	Fresh apples, fresh juices	Jams and jellies, preserved fruit, preserved and frozen vegetables
Cereals	Buckwheat, cereal and breakfast foods, flour of wheat		Non-wheat cereal flour
Meat	All meat product, including pork, beef and poultry		
Sugar and honey	Cane and beet sugar	Honey	Syrups, sugar confectionary, fruit preserved with sugar

Source: Chinese Customs and UN Comtrade data

With regard to the world's twenty most dynamic food-processed exports and analyses Shaanxi's performance (above US$1 billion, annex table 6.2), Shaanxi exported only nine of these in 2002, and only three products experienced a positive export growth rate between 1995 and 2002: sauce and condiments, sugars and syrups, and food preparations. Shaanxi had an international presence in sugars and syrups (0.082 per cent of the world market in 2002), which again confirms the potential of this industry not just to serve domestic markets but also international ones. In contrast, in cereals and breakfast foods, the fastest growing food sub-sector in world markets, Shaanxi's export performance was disappointing, probably due to surging domestic demand.

In sum, there appears to be both a domestic and international market for some of the food product categories currently being produced by Shaanxi. The next step is for more detailed technical assessments of the products and processes being used to produce them, and for the Shaanxi food producers to develop the technical and marketing capacity to supply these markets.

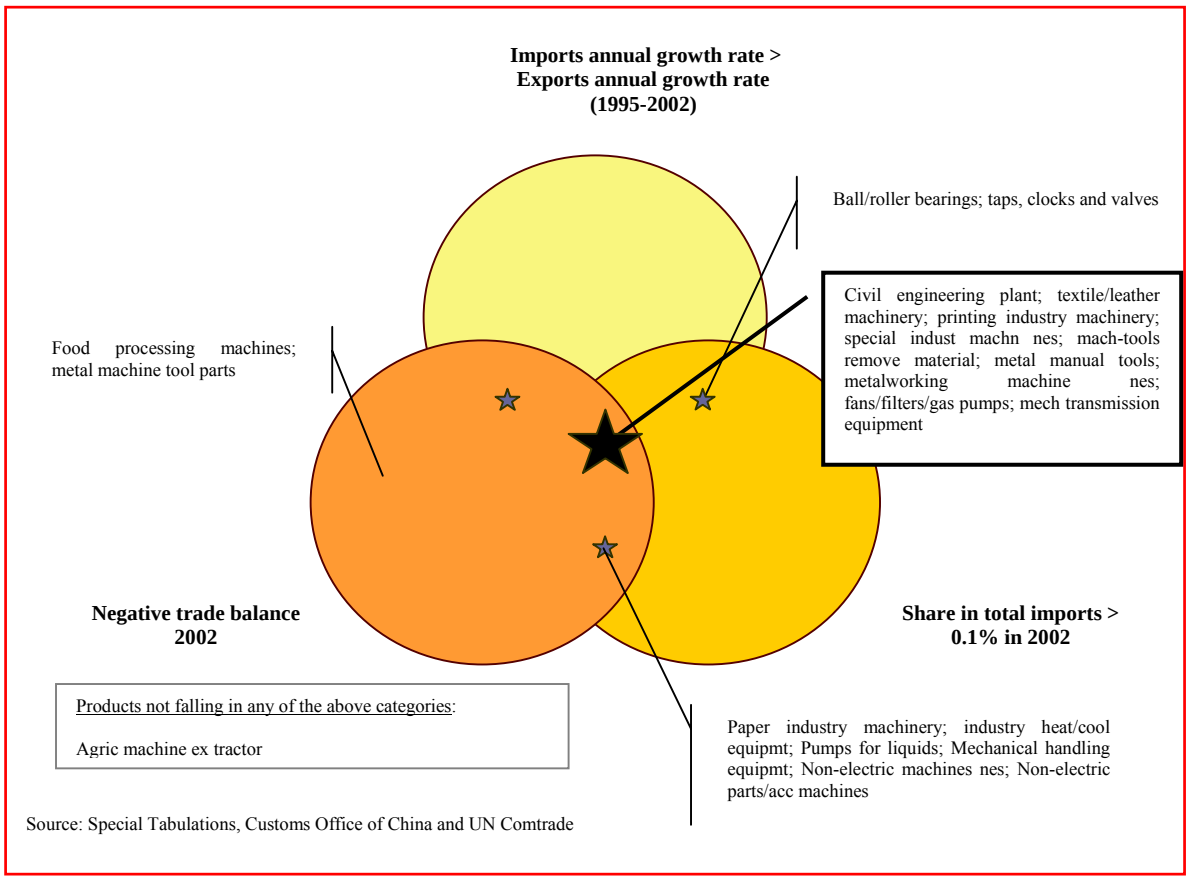
Machinery Industry. Shaanxi's exports of machinery-related products increased from US$62 million in 1995 to US$122 million in 2002, or by 10 percent per year, which by far outpaced the export growth average of the world, but still below that of China. The textile and leather machinery industry in Shaanxi exports grew by 16 percent per year between 1995 and 2002 to become the province's leading machinery export with US$35 million in 2002, followed by ball/roller bearings with US$23 million, and taps/cocks/valves with US$16 million.

As in the case of food products, China is a net importer of machinery, presenting a significant market opportunity for domestic industries, provided they can match the technical specifications of imported machinery. China imports civil engineering plants, textile/leather machinery, printing machinery, special industrial machinery, machine tools, manual tools, metalworking machine, fans/filters/gas pumps, and mechanical transmission equipment (figure 6.7, based on annex table A.6.7). Given its already strong competitive performance in textile and leather machinery, Shaanxi's industry can strengthen its competitive position through joint ventures with coastal enterprises or foreign investors interested in entering domestic markets.

Other products with good market potential within China include the paper industry machinery, industry heat/cool equipment, pumps for liquids mechanical handling equipment, non-electric machines, and non-electric parts/acc machines. China has a negative trade balance in all these products and the value of imports are above 0.1 per cent of China's total imports. It is interesting to note that the agricultural machinery is the only industry that does not fall in any of the import dependency categories.

Turning now to the world market, Shaanxi exported 19 out of the 20 largest and most dynamic products in world markets (above US$4 billion), though it lost market share in industrial refrigeration equipment, special parts of industrial machinery, and goods trucks and tractors (annex table A.6.4). Some 14 products grew above the world's average, with Shaanxi's strengths in three machinery products in particular: tap/cocks/valve parts, tap/cocks/valve nes, and gears and gearing. Tap/cocks/valve parts was the fastest growing machinery industry in world markets, with Shaanxi accounting for 0.15 per cent of the world's exports, starting from just US$60, 000 in 1995. Next, tap/cocks/valve nes exports grew at 27 percent between 1995 and 2002, from US$2 US$9 million, with Shaanxi having a 0.06 per cent of world exports in this category. Finally, gears and gearing exports grew at 42 per cent between 1995 and 2002, with Shaanxi taking 0.11 per cent of world markets. This impressive performance has been mainly driven by a joint venture with the US firm *Eaton* for gear box production for export.

Figure 6. 7 Market niches for machinery-related products within China



Pharmaceutical Industry. Shaanxi's production of pharmaceutical products grew by 1.5 percent per year in the 1990s, while exports grew at 8 percent per year from US$23 to US42 million between 1995 and 2002, faster than China as a whole (5 percent) but less than world exports (12 percent). In 2002 pharmaceutical exports from this province accounted for 3 per cent of the province's total exports, and 2 per cent of the country's total pharmaceutical exports. Shaanxi had a 0.03 percent share of the world market which, considering rapid world export growth, is unlikely to rise.

China is a net importer of western-type drugs, with a trade deficit of US$962 million in 2002, and imports growing at 30 per cent between 1998 and 2002 (annex table 6.8). Although Shaanxi specialises in herbal traditional Chinese medicine, a strategic shift towards supplying western-style medicines to domestic markets could trigger further growth in the province's industry. More detailed investigations are needed to probe into the technical and marketing capacity of Shaanxi enterprises to produce them either alone or in joint ventures with domestic or foreign investors.

6.3 Sichuan Manufacturing Competitiveness Profile

Sichuan had a population of 87 million people and one of the strongest manufacturing bases in the West. The pillar industries in the province were information technology, hydropower, pharmaceutical products, machine and metallurgy and food and beverages (see box 6.3).

Competitive performance of Sichuan's major exports

Sichuan presents an interesting performance mixture of its main exports: six champions, three in decline, one under-achiever, and ten achievers in adversity.

Champions. Sichuan's two main exports are champion products – TV receivers and sound and TV recorders. These are highly dynamic products in world markets where Sichuan has gained substantial market share, particularly in the TV receivers industry. Interestingly, Sichuan has done well in the fastest growing segments of the clothing industry, that is articles of apparel and knitted women and girl wear. The province also presents a strong export performance in the civil engineering plant industry and in alcoholic beverages.

Achievers in adversity. Fifty per cent of Sichuan's twenty major exports are considered achievers in adversity. This is indeed a cause of concern as it somehow reflects an industrial strategy that may not be fostering the right sectors for growth. Among all silk excels – Sichuan gained 6.7 per cent of world market share between 1995 and 2002, though world exports declined by 5.1 per cent for the same period. The other nine export products are man-made woven fabrics, textile yarn, footwear, elements of oxide and salts, headgear/non-textile clothing, metal salts of inorganic acid, valves and transistors, electric equipment not elsewhere specified (nes), and iron and steel.

Box 6. 3 Sichuan's Growth Industries

Electronics and information technology. Sichuan is home to one of the largest electronic appliance industries in China, including Chang Hang televisions and telephone sets sold by Wal-Mart in the US. This industry has developed as a result of substantial past and present investment in military equipment in the province. Motorola and Multi Crystal Manufacturing have located their electronic components plants here (semi-conductors for Motorola relocated from Malaysia). Intel recently built a $300 million integrated circuit manufacturing facility in the export-processing zone close to the airport. The government hopes that these key companies will attract other suppliers and form an effective IT cluster in the province. Software development has also been rapid, making the province the third largest base in the country.

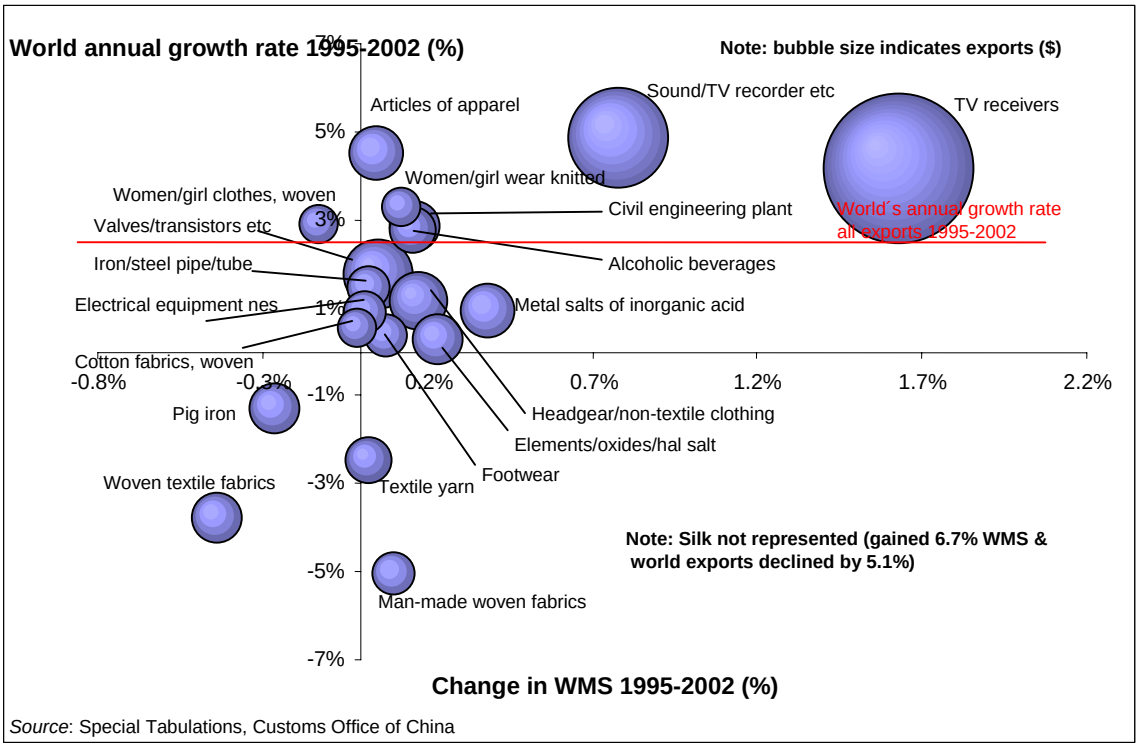
Machinery and equipment. A substantial cluster, including R&D, has developed in Doyan City, producing, among others, power generation equipment and heavy civil engineering equipment manufacturing and R&D. Exports include turnkey power generation sets, which have been customized for developing countries in Africa and the Middle East.

Steel Milling and Metallurgy. Located in Panzhihua city, the Panzhihua Group of four companies is the largest in this area, and has led the restructuring of the industry by acquiring two steel mills in Chengdu, and in the process of acquiring two more in the province. This industry benefits from iron ore mines nearby, which are also being further developed to meet demand for iron. Titanium and mobdium are also found in the iron ore mines, and represent the largest such reserves in China. To develop these resources, NDRC has issued state bonds of one million yuan, particularly in view of China's perceived vulnerability to large imports of some 120 million tonnes of iron ore and 300,000 tonnes of titanium from overseas. This is a key input into paints and dyeing (TiO_2). New materials including titanium, mobdium and rare earth elements will form the basis for a new industry with a niche market. Finally, a well-known export of Sichuan is heavy gauge rails.

Chemicals. Because there are no large-scale raw material facilities in Western China, the state government has agreed to support the manufacturing of polyethylene in Sichuan. A large facility, producing 600,000 tonnes per year, is planned using oil produced in Chinjiang via pipeline and also from oil fields in Kazakhstan. China Petroleum has acquired oil fields in that country for this purpose. This plant will in turn provide raw materials for the downstream chemical industry in the province. Fertilizer production, using phosphate, gas and coal, dominates the existing chemical industry. Salts, caustic soda, phosphate.

Agro-industries. The government is promoting agro-industries mainly to generate employment. Potential high-growth industries include cereal and oil processing (rape seed oil), meat processing, vegetable and horticultural processing, tea, traditional Chinese medicines (TCM), silk and products, and bamboo plantation and processing into paper and chips, particularly promising now that there is a national log ban. Because of pollution concerns, the bamboo processing facilities will be concentrated in one place. Two well established export industries are liquors and meat.

Figure 6. 8 The competitive performance of Sichuan's 20 major exports



Source: Special Tabulations, Customs Office of China

Underachievers. Among Sichuan's twenty major exports only woven women and girl clothes is an underachiever product. Like knitted women and girl wear, this is a highly dynamic export product, growing at 3 per cent in world markets. Yet Sichuan is facing strong pressures in the industry as it has lost 0.13 per cent of world market share between 1995 and 2002.

Decline. Sichuan has three declining products among its twenty major exports. These are woven textile fabrics, woven cotton fabrics and pig iron. As in the case of Shaanxi, Sichuan has strong competitive pressures in the fabrics industry, which shows that it may be a trend facing many western regions.

Sichuan's position in the world's fastest growing and largest exports

Sichuan's performance in the world's most dynamic exports is rather impressive. Out of the 50 fastest growing exports, Sichuan's export growth has been faster than the average for the world in nineteen products. Orthopaedic appliances grew at 131 per cent between 1995 and 2002, and navigation and survey appliances at 95 per cent. Yet the export base is still rather small in most products, including the two mentioned above. Four industries excel among all the others for their fast growth and impact in world markets: parts of reactor and turbine engines, lactams and lactones, sound and television recorders, and parts of earth moving machines. The performance of the sound and television recorders industry is remarkable – Sichuan accounted for 0.85 per cent of world markets in 2002, gaining most of it in the last 7 years. The components industry for earth moving machines has also shown an impressive growth trend in the last years – exports grew at 25 per cent between 1995 and 2002, which made Sichuan gain 0.06 per cent of world markets.

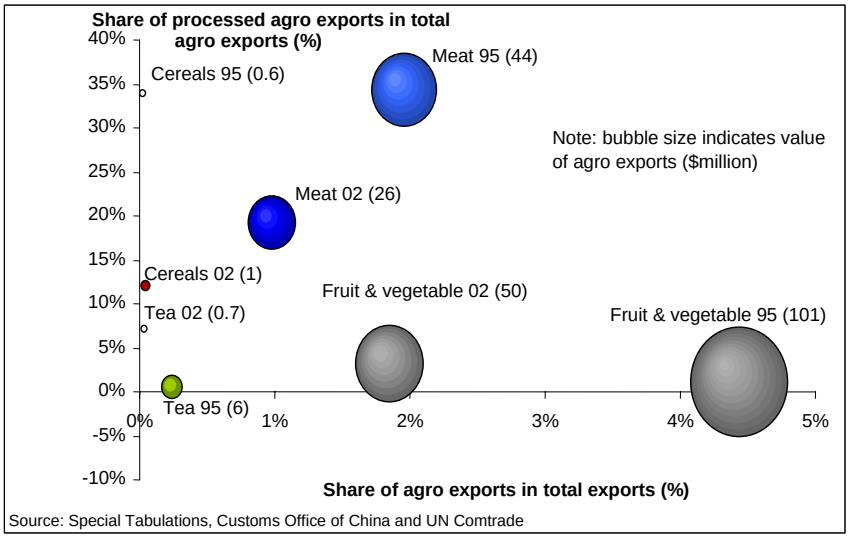
In the world's largest exports, Sichuan's performance has excelled in the following sectors: colour television receivers, parts of reactors and turbine engines, sound and tv

recorders, diodes and transistors, aluminium alloys, jerseys and pullovers, parts of earth moving machines and softwood simply worked. The colour television receivers industry presents the best performance by far – it accounts for 18 per cent of the province's total exports and has 1.7 per cent of world markets. Despite the industrial woes of the apparel industry, the Sichuan's jersey and pullover industry has bone particularly well, with exports reaching $20 million in 2002, the province accounts for 0.10 per cent of world market.

Sichuan's performance in the agro value chain

Sichuan exported US$78 million of agro-industry products in 2002, which accounted for nearly 3 per cent of the province's total exports. Agro exports grew at 2.6 per cent per annum between 1995 and 2002, well below the 4.4 per cent of average for west China. Sichuan's agro-industries have not moved up the technology ladder as processed agro exports as percentage of total agro exports have declined from 11.5 per cent in 1995 to 8.9 per cent in 2002. Sichuan's most important agro sectors for export are the fruit and vegetable (64 per cent of total agro exports) and the meat industry (33.3 per cent) in 2002. Yet both industries have lost competitive edge, with exports and the level of processing declining within the sector (figure 6.9).

Figure 6. 9 Sichuan's performance in the main agro value chains, 1995-2002



The cereals and the tea industries have also suffered competitive losses, with exports declining rapidly in the case of tea and with technological downgrading in the case of cereals. Although most of Sichuan's fruit and vegetable exports have declined, the province has a strong competitive position in frozen vegetables: exports accounted for 0.20 per cent of world markets in 2002. This impressive performance in this particular sub-sector shows that there is potential for similar export products higher up in the value chain, including preserved fruits and vegetables and nuts uncooked or boiled. The preserved fruit and vegetable industry, with exports reaching US$16 million but declining over, can be restructured to meet new global demands. Exports of fruits and nuts un-boiled have emerged recently, which implies that the local industry starts having competitive potential in world markets. The pork meat industry also needs to be rethought – although total exports plummeted the export base remains very strong with US$21 million in 2002. There is competitive potential if the sector restructures to serve world markets higher value added products within the chain such as meat preparations.

6.4 Yunnan Manufacturing Competitiveness Profile

Yunnan has a population of 43 million people and a large agricultural base. As already noted in previous sections, Yunnan manufactured exports declined between 1995 and 2002 due to severe deficiencies in its industrial base.

Competitive performance of Yunnan's major exports

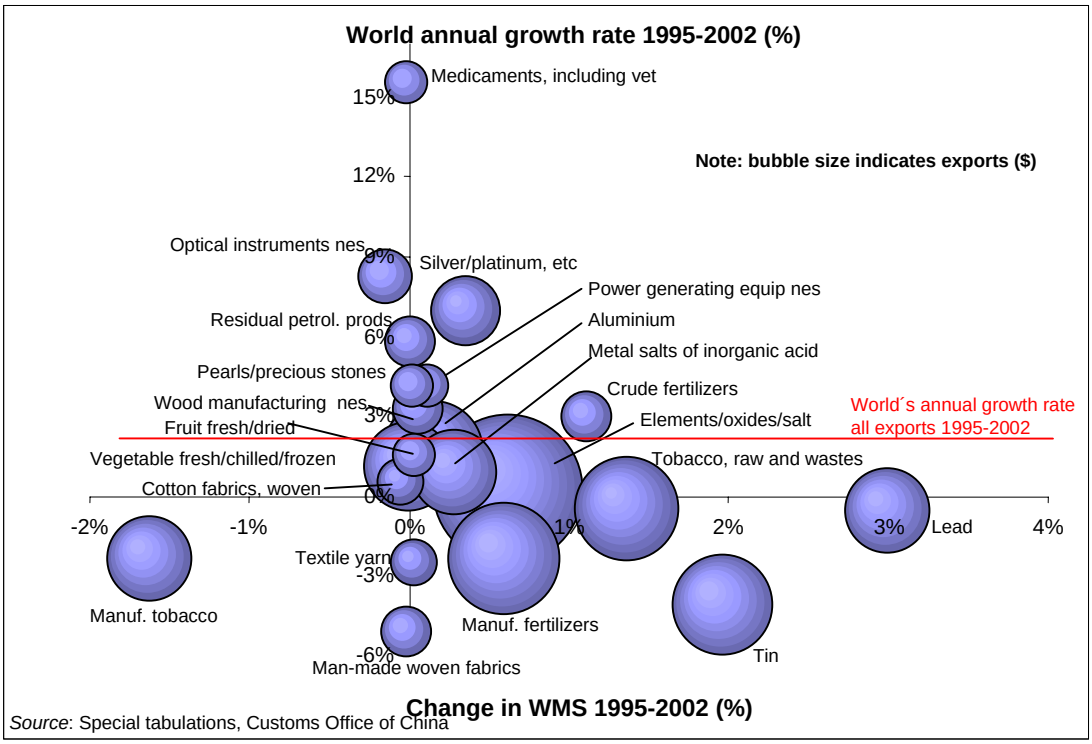
Among its twenty major exports, Yunnan has six 'champions', two 'under-achievers', four 'in decline' and eight 'achievers in adversity'.

Champions. Yunnan's champion export products are crude fertilizers, aluminium, silver and platinum, residual petroleum products, wood manufactures, and power generating equipment. It is important to emphasise that all these champion sectors, excluding power generating equipment, are resource-based with low technological content. Yunnan's crude fertilizer industry has gained more than 1 per cent of world market share between 1995 and 2002. The other five export products, though winners, have made little impact in world markets as their export base remains very small. The challenge for Yunnan would be to strengthen the export performance of these sectors while hoping that global demand keeps high.

Achievers in adversity. Most of Yunnan's major exports are achievers in adversity – that is, there is a world market gain in a slow growing product. Yet the most striking thing is that its major exports are all in this category: elements of oxide and salts, manufactured fertilizers, raw tobacco, tin, and aluminium. Other important exports such as lead, metal salts of inorganic acid, fresh and dried fruit, and textile yarn are also underachievers. The strong presence of primary commodities in Yunnan's export structure is worrying and so is the technological backwardness of the few manufactured goods exported.

Underachievers. In relative terms, Yunnan is strong in medicaments – mainly traditional Chinese medicine – and optical instruments. These two goods have rapidly grown in world markets, and thus present good market niches for export growth. Yet Yunnan's competitive edge in both industries has been eroded – between 1995 and 2002 Yunnan lost 0.15 and 0.02 per cent of world market share in optical instruments and medicaments respectively.

Figure 6.10 The competitive performance of Yunnan's 20 major exports



Decline. Yunnan has four sectors that need serious restructuring: manufactured tobacco, man-made woven fabrics, woven cotton fabrics, and fresh and chilled vegetables. Yunnan's manufactured tobacco industry has recently suffered from a competitiveness loss – the province reduced its world market participation by 1.6 per cent between 1995 and 2002. The fact that Yunnan is doing well in exporting raw tobacco shows severe deficiencies in the tobacco value chain as domestic industries are failing to process for export markets.

Yunnan's position in the world's fastest growing and largest exports

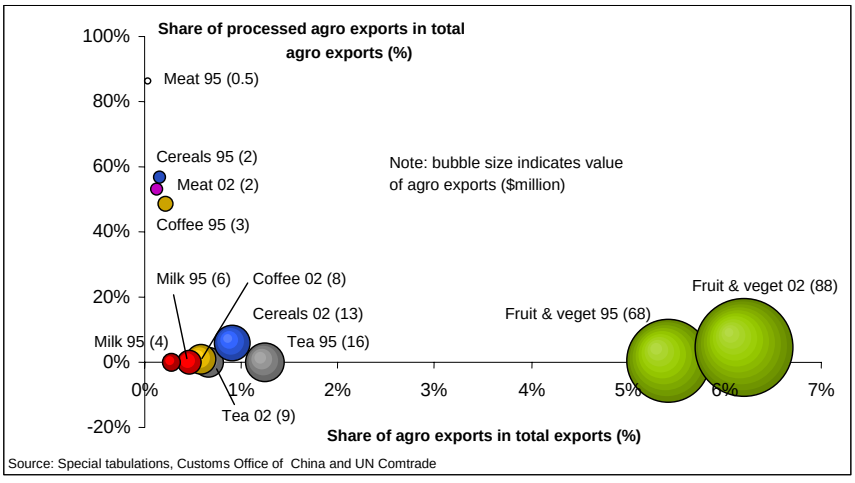
Yunnan is showing promising signs of export dynamism as it has nineteen export products growing faster in the province than the average for the world (in the world's 50 fastest growing exports). Yet this seems to respond to a mere statistical illusion caused by a small export base rather than a real sign of export success. This explains why, despite high growth rates, Yunnan's exports do not have an impact in world markets. As noted, none of the above exports participate 0.05 per cent or more in world markets, which show clear deficiencies to competing in international outlets.

Among the world's largest exports, Yunnan's only export competitive industry is aluminium. Yunnan accounted for 0.37 per cent of world markets in 2002, gaining 0.32 percentage points between 1995 and 2002. Exports grew at 5.3 per cent for the period, while the world only did at 0.38 per cent. Despite the world trade slowdown in the last years, aluminium is the thirty-fourth most demanded product internationally.

Yunnan's performance in the agro value chain

Yunnan exported US$104 million of agro-industry products in 2002, which accounted for 7.3 per cent of the province's total exports. Yet agro exports grew at 1.9 per cent per annum between 1995 and 2002, well below the average for west China. Yunnan's agro-industries have slightly moved the technology ladder as processed agro exports as a percentage of total agro exports increased from 2.9 per cent in 1995 to 5.1 per cent in 2002. However processing levels in Yunnan are much lower than the average for the west (13 per cent), which shows that despite the high dependency on the sector, little has been achieved in adding value.

Figure 6. 11 Yunnan's performance in the main agro value chains, 1995-2002



The fruit and vegetable industry is by far Yunnan's major export sector: total exports of fruit and vegetables accounted for 84 percent of the region's total agro-exports in 2002 (figure 6.10). Yet the level of value-added in the industry is very limited as processed fruit and vegetable exports only reached US$4 million in 2002, which is 4.5 percent of Yunnan's total fruit and vegetable exports. Other agro sectors face similar competitive barriers to adding manufactured value. For instance, the cereals increased exports from US$2 million in 1995 to US$13 million in 2002, though the level of processing within the industry plummeted from 60 percent in 1995 to 6 percent in 2002. The coffee and the meat sectors have

experienced a similar downgrading trend. The tea and dairy industries remain poorly positioned in the value chain. Table 13 provides a list of agro products that have lost competitive edge, are already competitive and have a competitive potential for growth in Yunnan province.

Yunnan has a strong competitive potential in the fruit and vegetable industries. It is already strong in low value-added commodities such as fresh and dried vegetables and fresh apples, which could spill-over to agro-industry sectors to produce fruit juice (it would compete directly with Shaanxi), jams and jellies, and preserved fruit and frozen vegetables. In cereals, Yunnan is already very competitive in rice in the husk – it had 4 per cent of world markets in 2002. Yet the province has severe constraints to compete internationally in processed rice-related products. An investigation is needed to find out whether the lack of exports is due to high domestic consumption of processed rice products or inability of domestic companies to process and export competitively in world markets. Either case, the province has further competitive potential in exporting breakfast foods or cereals made of rice, which would add much more value to the domestic industry.

Another interesting industry with growth potential is the coffee sector. Yunnan exported US$8 million of raw coffee in 2002. Although exports of roasted coffee have declined, there may be interesting market niches in other coffee-related products such as extracts, essence and substitutes. The dairy industry may also have the yogurt and buttermilk as possible 'winner' products given the increased domestic demand of dairy.

6.5 Conclusions

This chapter has provided competitiveness profiles of selected industries in three regions based on their export performance. The sub-sectoral focus here complements the overall analysis of the overall manufacturing sector provided in chapters 3 and 4. The analysis of the overall manufacturing sector requires less detailed information, and policy implementation necessitates somewhat lower capacity on the part of government agencies. At the same time, it also minimizes the risk that policy-makers would pursue capacity creation in non-competitive industries. Nevertheless, the practice of policy implementation shows that many policies need to address sub-sector issues in trade and commercial policies, export promotion programmes, industrial restructuring programmes and cluster support policies. Moreover, government-business sector networks are generally organized around sub-sectoral issues.

However, when regions target specific sub-sectors for promotion, they should identify a narrow group of industries and set out transparent policies to promote them, as well as clear-cut guidelines against which their success can be evaluated. The starting point would appear to be a thorough process of government-business consultations and deliberations, culminating in the joint formulation of a long-term vision for the selected industries. A broad coalition of public, private and academic players is needed to give direction to industrial strategy. Those business and industry associations which effectively represent their members must play a key role of dialogue partners of the government departments in charge of industrial development. Once industry-specific visions have been formulated, a stocktaking exercise can analyze the strengths and weaknesses of the selected industries, in order to reach government-business consensus on medium-term objectives for sub-sector development. Export competitiveness profiles, such as the ones shown in this chapter, can be useful in describing their current competitiveness situation and recent trends, as well as point out opportunities and challenges in the world market.

This can then be followed by the formulation of an operational programme, where industry associations and other government-business sector representatives define initiatives to enhance the competitiveness of all the firms in the selected sectors. Sources of funding for

industry-specific operational programmes can be identified, and agreement reached on cost-sharing arrangements between the private and public sectors. Finally, procedures and mechanisms can be formulated for implementing the industry-specific operational programmes, and for monitoring and evaluating the programmes.

CHAPTER 7. CONCLUSIONS AND POLICY IMPLICATIONS

7.1 Conclusions

At the request of the National Development and Reform Commission (NDRC), UNIDO undertook an assessment of the industrial competitiveness of all 31 Chinese regions to assist in the formulation of government measures to speed up the manufacturing development of western regions. NDRC was particularly interested in identifying policy measures that could be implemented at the central, regional and local levels to redress regional balance between the coast and the rest of the country, as well as policy implications which could be taken into consideration in parts of the eleventh Five-Year Plan (2006-2010) that address western region development.

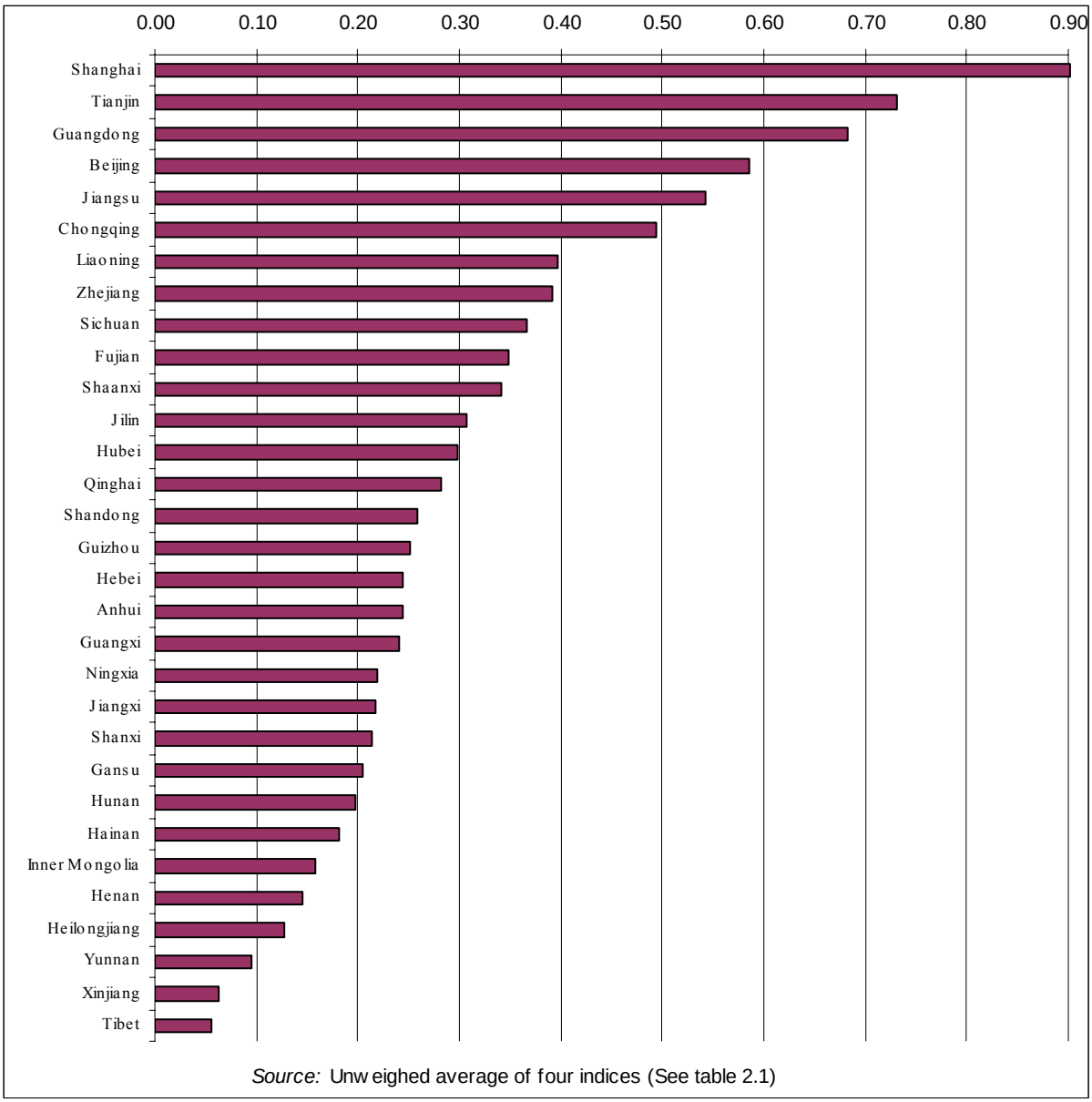
This industrial policy study has drawn extensively on international data sets and national information, much of it new or presented in a new way. In preparing the Competitive Industrial Performance index (CIP) and export competitiveness profiles, the study collected and compiled regional-level manufacturing and export data using international classification schemes, and matched this with world trade data from the UN Comtrade database. To identify and quantify the key structural determinants of manufacturing performance, the study made use of available regional-level statistics. But to determine the major business climate and regulatory constraints facing manufacturing enterprises, the study commissioned two manufacturing surveys in Shaanxi, one exclusively for 'below-scale' small and medium enterprises, which are almost totally ignored in current statistics. Finally, the study commissioned business costs surveys in three coastal and three western regions to provide preliminary information on the cost of doing business in Western China.

China's impressive performance in manufacturing production and manufacturing exports is by now well documented. In fact the Chinese development success is largely a manufacturing success: manufactured exports accounted for nearly 90 percent of total exports, confirming the potential of harnessing industrialization for sustained development. What is less well known however is that the Chinese success originated almost exclusively in the eastern regions. These regions not only took full advantage of their coastal location and preferential government treatment but, more importantly, succeeded in rapidly shifting their production structure towards technology-intensive manufactures, and finding an export market for them. They also gained an important foothold in dynamic products, those whose demand grew rapidly in world markets, and increased their world market share in low technology products. In contrast, the western and central regions appear to have focused on exporting more primary commodities and less processed manufactured products. Moreover, the share of technology-intensive products in the latter was negligible. They upgraded their production structure, but this did not translate into technology-intensive exports. As a result, the industrial divide between the coastal regions and the rest was substantial and widened over time.

The Competitive Industrial Performance index (CIP) described in this report, a composite of four indicators of manufacturing production and manufactured exports of all 31 regions, confirms the overall dominance of eastern regions and distinguishes five groups of regions (figure 7.1): Group A consisted of Shanghai, Tianjin and Guangdong, with a CIP index of around 0.7 and above, well above all other regions. Group B comprised three regions, Beijing, Jiangsu, and Chongqing, with a CIP of 0.50-0.60. With the exception of Chongqing municipality, all regions in groups A and B were from Eastern China. Group C consisted of five regions with a CIP index of 0.34-0.40, including three from Eastern China (Liaoning, Zhejiang, Fujian) and two from Western China (Sichuan and Shaanxi). Group D,

the largest, comprised eleven regions with a CIP of 0.21-0.31, half from Central China and the other half from Western China. Finally, group E comprised the remaining six regions, and all except one, Hainan, in Western China. In sum, and as expected, the eastern regions dominated the top half of the table, while central and western regions the bottom half.

Figure 7.1 Ranking of Chinese Regions in UNIDO (CIP) 2002/03
Competitive Industrial Performance Index



Source: Unweighed average of four indices (See table 2.1)

The CIP also found that the overall competitiveness ranking changed little between 1995/98 and 2002/03, supporting world evidence that performance is the outcome of slow and incremental processes. Large changes did however take place in at least ten regions, the main cause of which appears to be a shift in the share of technology-intensive products in exports, an important observation from a policy point of view.

Manufacturing performance is influenced by a range of factors, including the macroeconomic environment, the overall investment climate, the business environment, the

policy environment, foreign direct investment, political and social stability, supporting institutions, skills, technologies, infrastructure, and many other factors. This report, which focuses on the key structural influences which are directly relevant to building manufacturing and technological capabilities, confirms findings from around the world that the regions which performed best in the manufacturing competitiveness index were also those which upgraded their technological capabilities the most, and spent the most on research and development by manufacturing enterprises and royalties. They also possessed the best modern physical infrastructure, attracted the most FDI, and had the most skilled labour force.

No less important, by identifying and efficiently supplying dynamic exports for which the world market was growing above average, whether resource-based, low technology or technology-intensive products, the eastern regions were able to accelerate their learning of best practices due to frequent interactions with international buyers and other agents in the global supply chain. Thus the coastal regions increasingly targeted technology-intensive manufactures, without however ignoring less technologically sophisticated goods.

Western and central regions can draw important lessons from the experience of eastern regions. For sustained industrial development, reliance on static endowments such as primary resources and inexpensive labour is a good way to start, but this should be accompanied by building and enhancing technological capabilities to produce technology-intensive manufactures. The increasing production of more sophisticated goods can allow them to develop their design and development capabilities, and to develop extensive supplier and sub-contractor networks. For more advanced products, firms will need to increase R&D investment and forge close interactions with firms, universities and research institutions.

In the meantime, they can continue to identify and efficiently supply dynamic exports for which the world market is growing above average, whether resource-based, low technology, or medium and high-technology products. This way, they will be able to accelerate their learning of best practices due to regular interactions with international buyers and other agents in the global supply chain. In sum, while increasingly targeting the production of technology-intensive manufactures, they should by no means ignore or discriminate against labour-intensive and low technology manufactures.

Though the industrialized coast overshadowed the performance of the central and western regions, the latter nevertheless displayed some industrial and export dynamism. However, their specialization remained in primary commodities and resource-based manufactures. They had a relatively small impact in world markets, and added little value to their manufactured goods. Yet, Central and Western China's rich natural resources and abundant and inexpensive labour give these two regions great industrial potential. They may maintain a static comparative advantage in resource-based and labour-intensive manufactures over the east in the years to come. However, these regions have not exploited the full potential of their agro-industries. They both need to move up the value chain, and increase processing activities of their agro-industrial products. To complement this and bring about rapid changes in technology, innovation and learning processes, they also need to develop selected technology-intensive industries.

Finally, also not well documented is that the substantial manufacturing expansion taking place in the past ten years in China did not result in an overall increase in manufacturing employment. Employment rose in certain sectors and industries in the private sector, but this was overshadowed by the large-scale redundancies accompanying the rationalization and privatization of state-owned manufacturing enterprises throughout the country. Retrenchment further exacerbated the divide between the coastal regions and the rest, due to the relative scarcity of alternative sources of formal employment and income in western and central regions.

7.2 Policy Implications

The differences in manufacturing performance between eastern regions on the one hand, and western and central regions on the other, were matched by similar differences in total technological effort, of which R&D is a component, foreign direct investment, modern infrastructure, and education at the secondary and higher education level. In all these cases, the gap was not only substantial but widening.

Even in the context of a market economy, liberalized investment and trade flows, public policy can go a long way towards influencing the nature and direction of industrialization, without resorting to distortive pricing policies or firm-specific incentives. Government-business partnerships in the formulation and implementation of industrial strategy can provide the necessary framework for the coordinated action of various government agencies involved in industrial development. In addition, policy makers and institutions will need to be insulated from lobbying for special favours from interest groups. However, to guard against bureaucratic authoritarianism, technocratic independence would need to be accompanied by public accountability. There are many measures that the central government, regional governments and local governments can take to redress the balance in these key determinants of manufacturing performance. These are outlined in turn below.

Central government

Education. While the education level of the manufacturing workforce may not vary too much between regions, the education gap for the population as a whole was large and widening. The west and the centre fell behind the east in educational expenditures and student enrolment rates at the secondary and higher education level. The student enrolment rate at the higher education level in the west was only half that of the east. Educational funds per capita in the west and centre were also half of the level in the east. This is because the primary responsibility for the public school budget rests with the local governments, increasing the disparity between rich and poor regions, and between rural and urban areas. This means that the human resource gap will continue to widen in the future, unless the west and centre can somehow allocate more resources to education. Since the disparity in human resource development is undesirable on both equity and efficiency grounds, the central government has a crucial role to play in redressing the balance by allocating additional central funds to assist the regions left behind in education attainment.

SME promotion. Below-scale enterprises, which currently receive very little attention in the country statistics, in fact accounted for over 40 percent of total manufacturing employment and 68 percent of employment in manufacturing TVEs in 2003 in the country. Their average sizes were respectively 30 and 8 workers per enterprise. SME development can generate broad-based income and employment, as well as redress regional disparities. The central government can consider taking the following measures:

- *Target government funds*, preferential measures and other promotional efforts at below-scale small enterprises only, to avoid siphoning of most funds by economically more powerful and larger enterprises.

- *Ensure balanced regional development*, i.e., allocate more funding to lagging areas.

- *Increase the flexibility of interest rate ceilings* so that banks can charge commercial rates to cover higher operational costs of servicing smaller enterprises and make a profit.

Limited access to capital was the overriding constraint expressed by SMEs in the surveys commissioned by this policy study.

- *Limit the risks of credit guarantee schemes,* given international experience with credit guarantee funds, which have produced only limited impact on SME lending by the banking sector.

- *Channel SME development funds through commercial banks* to avoid the risk of funding decisions following non-commercial criteria.

- *Encourage the banks to increase the competency of their staff* to effectively deal with SMEs, including re-aligning the internal incentive system to remove SME bias.

- *Remove the high-technology bias in SME promotion* in the central government and the Ministry of Science and Technology in particular, and encourage the development of manufacturing and technological capabilities of ordinary firms.

- *Unify the government administration for urban and rural SMEs* to provide efficient services and avoid duplication and confusion, and provide more visibility to SME administration and development in general in the government as a whole.

- *Improve the SME Promotion Law* by developing specific guidelines for best practices in each promotional area, since many local governments still have not yet developed sufficient competency regarding SME promotion. Also the law needs to specify mechanisms for appeal and enforcement for SMEs whose rights have been violated.

- *Improve data and information on SMEs* using international size criteria (micro-enterprises, small, medium and large) and produce an annual SME report.

- *Monitor and evaluate SME promotion programmes* to evaluate the effectiveness and efficiency of SME promotion measures across the whole country.

- *Employ SME promotion to address global concerns* while furthering China's competitiveness. While SME promotion benefits the SMEs, the country may also benefit from SME promotion to disseminate good practices to the majority of the enterprises throughout the country, especially in the area of environmental protection and energy conservation.

Internationally comparable manufacturing statistics. In order to support benchmarking exercises such as the ones contained in this report, and to enable regions to assess and monitor their industrial development performance relative to other regions and even other countries with similar resources and industrial structure, the National Bureau of Statistics and the Customs of China should:

- Make available manufacturing production and export statistics using international classification schemes in addition to the current Chinese classification schemes (ISIC for production and SITC for exports)

- *Technology categories*. The statistical authorities should produce aggregate statistics in terms of well-defined and internationally accepted categories used in this report, namely resource-based, low-technology, medium-technology and high-technology, as already produced by some countries such as Thailand

- *Produce data on trade flows between regions*. This study based its competitiveness profiles on export data only, but it is equally important to assess domestic competitiveness by reviewing inter-regional trade data.

Environmental protection strategy

- *Dedicated Environmental Information and Management Systems*. The establishment of a national-level, dedicated Environmental Information and Management System (EIMS) can provide both support for maintenance of environmental quality and more rapid realization of sustainable development goals. EIMS involves a multi-sector, multidisciplinary approach to measuring, predicting and managing environmental responses to policy, economic, and natural change. The emphasis is on the integrated consideration of issues across ecosystems and industrial sectors in order to avoid the fragmented approached the decision making that faces programmes that formulate solutions after having considered only a narrow range of the industrial, environmental, technological, and social issues.

- *Valuation of ecosystem services*. The world's ecosystems are capital assets that, like other assets in a capital market, yield a flow of vital services if properly managed (Daily et al. 2000). Valuation of assets is critical to effective decision making concerning the use and allocation of resources.

- *Global cooperation to solve China's environmental problems*. The process of international economic integration can facilitate acquisition of solutions to environmental problems of local, regional and national concern. Environmental problems of today and tomorrow are increasingly global in importance. Participation in international environmental regulatory regimes provides an opportunity to acquire advanced technology necessary for Chinas continued industrial development. Furthermore, it will position China to take advantage of new industrial opportunities as demand grows for alternative ways to use and manage ecosystem services, for mitigating impacts, and for tracking and trading services.

Regional governments

Develop manufacturing and technological capabilities of all firms. The development of manufacturing and technological capability is necessary even at low levels of development, and takes many forms, not just R&D. It includes (i) technology acquisition (through the purchase of machinery, turn-key plants and new production processes), (ii) technology development (based on incremental design and engineering activities, including reverse-engineering and continuous improvements in logistics), and (iii) R&D for more advanced technologies (technology search at the international frontier, and design and engineering for new products and processes).

To step up the firms' efforts to acquire, adapt and develop industrial technology, the regional government can take several measures to improve institutional support for all firms, without favouring some firms or discriminating against others, in the following important areas (see also SME promotion below):

- Disseminate the knowledge to all officials concerned that technology upgrading is not just for high-technology industries, but can benefit firms at all technology levels to improve overall manufacturing competitiveness
- Reform or establish technology extension services oriented towards small and medium enterprises, not just high technology firms
- Reform the government and university research and technology institutes, metrology, standardization, testing and quality control (MSTQ) services, productivity centres and other serviced providers
- Encourage industry associations to increase their direct involvement in industrial technology development strategies, priorities and programmes.

Investment promotion services. Western and central regions need to step up their investment promotion services by learning from their eastern counterparts and by learning from successful examples abroad, such as Malaysia. The relatively small share of Western and Central China in FDI suggests that foreign investors lack knowledge of investment opportunities in these regions, due perhaps to misconceptions related to transport costs, skills availability, infrastructure availability and reliability, quality of life, labour cost advantages, and many other factors.

- Western and central regions possess adequate and reliable infrastructure and skills for the manufacturing sector, and offer substantial labour cost advantages to attract more FDI. However, foreign direct investment will not automatically flow in unless the regions devote sufficient resources to publicize business opportunities to prospective investors. Moreover, since domestic investments are of a much larger magnitude than FDI, western and central regions perhaps need to undertake additional efforts to attract investors from the eastern regions.

- *Attracting the right kind of foreign and domestic investment* requires a good deal more than simply establishing a good business and policy environment, and advertising labour cost advantages. It also requires dedicated effort in a wide range of activities ranging from the identification of suitable investment prospects, to the active servicing of the strategic needs of firms once established, including the development of skills, recruitment services and identification and upgrading of local suppliers. The promotion agency must have the authority to ensure meaningful cooperation among all entities whose activities must be coordinated to achieve a successful outcome. The agency must be subject to proper oversight at the highest level of government.

- *Labour costs represent 60-70 percent of the location-specific costs for manufacturing operations*, according to a recent international study. Facility costs, including financial costs, and transport costs are the second and third factors (12-24 percent and 1-17 percent respectively). Utility and tax costs are relatively unimportant. Business costs comparisons between selected western and eastern regions commissioned by this study indicate that western regions offered a solid cost advantage in labour costs, facility costs, utility costs and living costs. Western regions were only marginally more expensive in transport costs for exporters, because sea freight accounted for most of the transport costs. However, their higher road transport costs put them at a disadvantage for inter-regional trade, especially in the lucrative coastal markets. Since western regions offer generally lower business costs in most of these categories but especially for labour, regional governments

should advertise them aggressively to potential investors, both domestic and foreign, as part of their comprehensive investment promotion services.

- *Up-to-date and accurate business cost surveys*. To attract investors, the regional governments need to produce more complete, up-to-date accurate data on market prices, especially concerning wage rates for workers, technicians and engineers/scientists. Some regions, like Shaanxi and Sichuan, and some counties already do this, but only for high-tech zones, and the data is not always complete, up to date or readily available in booklets or websites.

SME promotion. Since the vast majority of SMEs do not regard the existing technological support institutions as important for raising their manufacturing capabilities and competitiveness, the regional governments can take the following measures:

- *Focus technology extension services on SMEs and revamp them to become proactive*. Extension agents, enterprise counsellors or advisers need to take the initiative and be proactive in approaching firms. There is no need to establish a cumbersome, stand-alone technology extension service. Regional authorities can establish a small but efficient unit to coordinate a network of advisers located in existing public and private research institutes, including universities, research institutes and technology centres, business and industrial associations, professional associations, business centres, and even regional and municipal agencies.

- *Encourage universities and private and public training institutions to become more proactive* in selling their services to the SMEs. Regional governments can undertake detailed assessments of these institutes to evaluate their mandate to provide technology services at the firm level. Some of them may be working below capacity precisely because of the low demand for technology services from the firms themselves. A major task of the technology institutes should be to raise awareness at the firm level, and raise their demand for technology services.

- *Business and industry associations as technology promoter*. The traditional role of business and industry associations has focused on lobbying government, and on providing their members with information about emerging government policies. However, as shown in chapter 4, associations can play a catalytic role in enabling the process of industrial upgrading and adopting global standards, in addition to sharpening their lobbying function. Thus, not only firms but also industry associations need upgrading. The regional authorities can encourage industry associations to provide technology services at the firm level. To start with, regional authorities should undertake detailed assessments of their capacity and willingness to do so, and formulate appropriate action plans for their upgrading.

- *Facilitate access to business development services (BDS).* The regional governments can promote the development of facilitator organizations, which in turn can enhance the development of local business development service (BDS) markets for SMEs. While most BDS can be provided based on commercial principles, targeted government financial support is required for facilitation organizations. The functions of facilitating organizations should not be confused with providers of BDS. As different levels of commercialization of BDS may be appropriate for different regions of the country, the

central government can assist regional governments in providing criteria and specific guidelines for the development of BDS markets under different economic conditions.

- *Tax deduction for R&D and training*. One inducement for SMEs to begin to invest in technology upgrading and training is to make R&D expenditures and training expenditure tax deductible or, if already the case, to widely publicize this fact.

- *MSTQ services, productivity centres and information technology centres*. Regional governments can also undertake detailed assessments of the capabilities, strengths and weaknesses of these institutions to reform them and make them effective. Ideally, such services should not be solely provided by the government. As quickly as possible, they should be supplied in government-business partnerships, or by private firms and industry or business associations, with subsidies if justified, and without if the market can supply the services.

- *Match central government funds with own resources*. The responsibility for developing SMEs is primarily a task of the regional and local governments. SME development is a key building block to achieve a solid economic foundation for the local socialist market economy. While the central government needs to lead on the regulatory side and therefore issue more documents, it cannot be responsible for generating and disbursing the majority of the funds required for promoting SMEs across the country. Regional governments need to take the lead and supplement their policy declarations with appropriate funding. Central government intervention will necessarily be limited to demonstration exercises and experiments.

Benchmarking manufacturing performance. Benchmarking has long been used by successful industrialized firms, first in industrialized countries, as a way to achieve best-practice levels of productivity, which can only be determined on the basis of comparative information for similar firms. Similarly, regional governments can use the composite industrial performance index introduced in this report to assess and monitor their industrial development performance relative to other regions and even other countries with similar resources and industrial structure.

- The *four benchmark indicators*, used to produce the composite CIP index for Chinese regions, can in turn be used individually to analyze why their overall performance has outpaced or lagged behind that of other regions, as the case may be.

- *Internationally comparable industrial statistics*. In order for them to continue monitoring their industrial performance, the statistical authorities at the regional level must begin to classify industrial activities and exports by technology level and world market share using international classification schemes.

- *Focus on key determinants of manufacturing competitiveness.* Once regions know where they stand in relation to other regions and countries in terms of overall competitiveness and in terms of individual benchmark indicators, they need to turn their attention to increasing their production and export of technology-intensive manufactures. Experience around the world and Eastern China suggests that western and central regions need to focus on the key structural determinants of industrial performance, namely technological effort, foreign direct investment, and modern infrastructure, and skills.

Sub-sectoral development strategies. The practice of policy implementation around the world shows that many policies need to address sub-sector issues in trade and commercial policies, export promotion programmes, industrial restructuring programmes and cluster support policies. Moreover many government-business sector networks are organized around sub-sectors. Nevertheless, the following should be kept in mind.

- *Selectivity*. When regions select specific sub-sectors for promotion, they should identify a narrow group of industries and set out transparent policies to promote them, as well as clear-cut guidelines against which their success can be evaluated.

- *Government-business vision and partnership*. The starting point would appear to be a thorough process of government-business consultations and deliberations, culminating in the joint formulation of a long-term vision for the selected industries. A broad coalition of public, private and academic players is needed to give direction to industrial strategy. Those business and industry associations which effectively represent their members must play a key role of dialogue partners of the government departments in charge of industrial development.

- *SWOT analysis*. Once industry-specific visions have been formulated, a stocktaking exercise can analyze the strengths and weaknesses of the selected industries, in order to reach government-business consensus on medium-term objectives for sub-sector development. This can also happen the other way round, i.e., the result of sectoral analyses and competitiveness profiles can serve as input for strategy formulation. Export competitiveness profiles, such as the ones shown in this report, are a useful starting point in describing their current competitiveness situation and recent trends, as well as point out opportunities and challenges in the world market. Data permitting, export competitiveness profiles need to be supplemented by domestic market competitiveness profiles. This descriptive analysis then need to be followed by more detailed and deeper analysis of the factors responsible for the observed trends and patterns, and the underlying causes behind these factors identified.

- *Joint government-business formulation of operational programmes*. The SWOT analysis can be followed by the formulation of operational programmes, where industry associations and other government-business sector representatives define initiatives to enhance the competitiveness of all the firms in the selected sectors. Sources of funding for industry-specific operational programmes can be identified, and agreement reached on cost-sharing arrangements between the private and public sectors.

- *Implementation mechanisms, monitoring and evaluation*. Finally, procedures and mechanisms can be formulated for implementing the industry-specific operational programmes, and for monitoring and evaluating the programmes.

- *ISO certification*. ISO certification is perhaps granted to readily in some regions. The whole ISO certification system needs to be reviewed, with the view to adopting more stringent guidelines, and to tightening up the process so as not dilute the value of such certification.

Local governments

Business registration, regulations and inspections. Though the two manufactured surveys commissioned by this study in Shaanxi did not rate business licensing and permits, and

government regulations and red-tape as serious obstacles, recent World Bank studies found that many local governments undertake too many non-productive, intrusive inspections of businesses. Firms in advanced regions appear to have lower regulatory burdens than less advanced ones, which is likely to create further divergence between rich and poor regions, with capital flowing to where it is less difficult to get things done.

- Local governments should make their staff and agents realize that business registration procedures are arduous, and inspections require much management time (up to 30-35 days per year) which businesses, especially SMEs, can ill afford.

- All local governments should request inputs and collect reliable information from businesses and, where necessary, review local practices to reduce inspections to the absolute minimum. The SME Promotion Law in fact prohibits improper administrative behaviour, which can only encourage rent-seeking and informal payments. There is an obvious role here for business and industry associations to cooperate with local governments, however local government must be proactive and make the effort to listen to them.

Contract enforcement. The importance of the judicial service rises with economic development. Firms gradually rely less on personal relationships to do business, and more on arms-length contracts with suppliers and contracts. Moreover, the need for transactions rises with increasing specialization and out-sourcing. This requires a strong and impartial court system to enforce such contracts and resolve commercial conflicts. Locations which have build up a strong reputation for an efficient and speedy court system will be favoured with increased investment flows. According to a recent study, the length of time for the local court system to resolve the latest commercial dispute of a firm varied substantially from city to city, ranging from six to thirteen months, and averaged ten months. This waiting time is clearly too long, and a deterrence for businesses to take their dispute to court for settlement. To improve the overall business climate, business and industry associations can work closely with the local government to achieve an efficient and speedy local court system.

Business and industry associations as technology promoters. Local and regional governments should promote and encourage the formation of local industry associations run by their own members. The associations should then be encouraged to promote manufacturing and technological upgrading of their members, and to invest in common facilities such as quality certification, information services, trade fairs and joint marketing.

SME promotion. Many changes have already been legislated for, and many biases against SMEs have been formally removed. Now the initiative is with local governments to become the focus for improving the enabling environment for SMEs. Local governments need to systematically reduce the cost of doing business in the areas under their jurisdiction, improve the attitude of staff regarding SMEs, and eliminate remaining extortionary practices. They should facilitate the provision of BDS for small businesses, and provide guidance to SMEs on how to operate within the law, and maintain social and environmental standards. In addition they can do the following:

- *Government agencies and public service units* (shiye danwei) should withdraw from business development services, such as accounting, legal, consulting, brokerage and other business intermediation activities, since private sector establishments are better able to

provide relevant services at competitive costs. This may necessitate selling off public units.

- *Information provision*. While local industry associations can take the lead in providing information services, particularly on business opportunities, local governments, as already initiated in some counties, can complement this effort by providing information not yet available, or difficult to provide by industry associations, using documentation centres as well as the internet.

- *Bridge the gap between universities and SMEs*. While universities and research institutes have generated many spin-offs in the area of technology-based SMEs, their interaction with other local SMEs is virtually non-existent. Thus a major opportunity for improving SME industrial performance on a permanent basis is being ignored. Local governments can actively foster contacts between universities and research institutes and the local SMEs through seminars, workshops, meetings and study tours.

- *Education and skills* are the most important resource sought by SME after finance. Local governments are in effect responsible for providing most of the educated and skilled labour needed by SMEs. While government supervision remains a necessary ingredient, local providers of education and training must develop an intimate relationship with the SMEs so that the qualified labour is produced in line with SME needs. Local governments can also effectively take the lead in encouraging SMEs to retrain their staff in line with market developments and new technologies to enhance competitiveness.

- *Encourage natural SME clusters*. Traditionally, local governments, and even regional governments, see themselves in rivalry with their neighbouring local or regional economies. Cluster management seeks to overcome administrative boundaries and encourage the development of natural clusters which cross county, district, city and regional boundaries. Cluster management also need a coherent overall administration for regional marketing, strengthening of institutional linkages, attracting qualified human resources, technology, and other inputs, and furthering the tacit knowledge available to the members of the cluster on product and process development. Cluster management seeks to organize a coordinated system of support to the cluster's enterprises to avoid the pitfalls of administrative fragmentation.

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ANNEX TABLES

ANNEX TABLES TO CHAPTER 2

Table A2. 1 Manufacturing Value-Added per Capita (yuan)

Ranking			Per capita (Yuan)				% Change	Difference
2003	1998	Province	1998	2003			per year	Ranking
21	20	Anhui	559	1,111	0.046	0.050	14.7%	0.004
3	3	Beijing	3,686	6,385	0.418	0.378	11.6%	-0.040
18	…	Chongqing	n.a.	1,233	n.a.	0.057	n.a.	n.a.
8	9	Fujian	1,539	3,657	0.163	0.208	18.9%	0.046
22	23	Gansu	495	1,095	0.039	0.049	17.2%	0.010
4	4	Guangdong	2,970	6,353	0.333	0.376	16.4%	0.043
29	25	Guangxi	479	744	0.037	0.027	9.2%	-0.010
30	29	Guizhou	418	657	0.030	0.022	9.5%	-0.008
25	22	Hainan	523	931	0.042	0.039	12.2%	-0.003
11	12	Hebei	1,008	2,025	0.100	0.107	15.0%	0.007
23	17	Heilongjiang	669	1,076	0.059	0.048	10.0%	-0.012
16	14	Henan	751	1,291	0.069	0.061	11.4%	-0.008
12	10	Hubei	1,338	1,965	0.139	0.103	8.0%	-0.036
20	21	Hunan	546	1,117	0.045	0.050	15.4%	0.005
15	19	Inner Mongolia	571	1,456	0.048	0.071	20.6%	0.024
6	5	Jiangsu	2,412	5,872	0.267	0.346	19.5%	0.080
26	26	Jiangxi	462	886	0.035	0.036	13.9%	0.001
10	13	Jilin	1,000	2,515	0.099	0.137	20.3%	0.039
9	8	Liaoning	1,546	3,056	0.164	0.171	14.6%	0.007
17	15	Ningxia	705	1,238	0.064	0.058	11.9%	-0.006
28	27	Qinghai	445	746	0.033	0.027	10.9%	-0.006
19	18	Shaanxi	615	1,120	0.053	0.050	12.7%	-0.003
7	7	Shandong	1,638	4,186	0.175	0.241	20.6%	0.067
1	1	Shanghai	8,580	16,362	1.000	1.000	13.8%	0.000
13	16	Shanxi	698	1,534	0.063	0.076	17.1%	0.013
24	28	Sichuan	419	1,063	0.030	0.047	20.4%	0.017
2	2	Tianjin	3,939	8,371	0.448	0.502	16.3%	0.054
31	30	Tibet	169	311	0.000	0.000	12.9%	0.000
27	24	Xinjiang	493	878	0.038	0.035	12.3%	-0.003
14	11	Yunnan	1,106	1,464	0.111	0.072	5.8%	-0.040
5	6	Zhejiang	2,240	6,032	0.246	0.356	21.9%	0.110

Source: National Bureau of Statistics (special tabulations).

Table A2. 2 Share of Medium and High-Technology MVA in Total MVA (%)

Ranking			MHT share (%)				Difference	
2003	1998	Province	1998	2003			Percent	Ranking
15	21	Anhui	44.1%	56.1%	0.497	0.589	11.99%	0.092
4	8	Beijing	60.4%	72.9%	0.771	0.899	12.51%	0.127
3	6	Chongqing	62.1%	74.1%	0.799	0.920	n.a.	n.a.
26	27	Fujian	38.2%	46.5%	0.398	0.413	8.27%	0.014
22	11	Gansu	57.4%	51.9%	0.721	0.511	-5.56%	-0.210
8	16	Guangdong	52.8%	63.8%	0.643	0.730	11.01%	0.088
17	22	Guangxi	43.6%	55.4%	0.489	0.575	11.73%	0.086
19	23	Guizhou	43.5%	54.7%	0.487	0.563	11.22%	0.077
18	19	Hainan	46.9%	55.1%	0.543	0.571	8.25%	0.028
13	15	Hebei	53.3%	60.0%	0.651	0.662	6.79%	0.011
28	28	Heilongjiang	37.9%	39.4%	0.392	0.283	1.58%	-0.109
27	25	Henan	42.2%	45.8%	0.465	0.400	3.63%	-0.065
12	14	Hubei	54.2%	60.1%	0.667	0.663	5.91%	-0.004
24	26	Hunan	39.1%	47.7%	0.414	0.435	8.57%	0.021
20	13	Inner Mongolia	54.7%	53.7%	0.675	0.545	-1.00%	-0.130
10	12	Jiangsu	56.8%	62.2%	0.710	0.701	5.38%	-0.009
16	18	Jiangxi	50.8%	55.4%	0.609	0.577	4.67%	-0.032
1	1	Jilin	74.0%	78.5%	1.000	1.000	4.41%	0.000
9	5	Liaoning	63.4%	63.8%	0.820	0.730	0.42%	-0.090
21	17	Ningxia	51.9%	53.4%	0.627	0.540	1.55%	-0.088
2	2	Qinghai	70.5%	74.9%	0.940	0.934	4.42%	-0.006
11	9	Shaanxi	60.3%	61.7%	0.769	0.692	1.40%	-0.077
25	24	Shandong	43.4%	46.7%	0.485	0.417	3.37%	-0.068
6	3	Shanghai	67.1%	69.1%	0.884	0.828	1.97%	-0.056
7	7	Shanxi	61.1%	65.8%	0.782	0.767	4.67%	-0.016
14	10	Sichuan	59.7%	57.0%	0.759	0.605	-2.72%	-0.154
5	4	Tianjin	66.2%	72.1%	0.869	0.883	5.85%	0.014
31	31	Tibet	14.5%	24.1%	0.000	0.000	9.54%	0.000
29	29	Xinjiang	29.9%	29.0%	0.259	0.091	-0.92%	-0.168
30	30	Yunnan	17.8%	25.4%	0.054	0.025	7.66%	-0.029
23	20	Zhejiang	46.6%	48.3%	0.539	0.446	1.73%	-0.093

Source: Same as A.2.1

Table A2. 3 Manufactured Exports per Capita (US dollars)

Ranking			Per capita (US$)				% Change	Difference
2002	1995	Province	1995	2002			per year	Ranking
16	23	Anhui	20.2	34.0	0.022	0.013	7.8%	-0.009
4	3	Beijing	683.4	735.7	0.784	0.377	1.1%	-0.406
19	…	Chongqing	n.a.	30.6	n.a.	0.012	n.a.	n.a.
7	5	Fujian	220.0	476.4	0.252	0.243	11.7%	-0.009
30	29	Gansu	9.9	9.6	0.010	0.001	-0.4%	-0.010
2	2	Guangdong	781.5	1,465.6	0.896	0.756	9.4%	-0.140
23	15	Guangxi	30.4	23.9	0.034	0.008	-3.3%	-0.026
31	28	Guizhou	10.0	8.1	0.011	0.000	-3.0%	-0.011
10	9	Hainan	106.8	57.4	0.122	0.026	-8.5%	-0.096
11	16	Hebei	27.6	50.2	0.031	0.022	8.9%	-0.009
13	20	Heilongjiang	22.9	41.9	0.025	0.018	9.0%	-0.008
28	27	Henan	12.2	17.0	0.013	0.005	4.9%	-0.008
18	12	Hubei	31.2	31.7	0.035	0.012	0.2%	-0.023
25	24	Hunan	18.8	21.9	0.021	0.007	2.2%	-0.014
27	25	Inner Mongolia	17.1	18.4	0.019	0.005	1.0%	-0.013
6	8	Jiangsu	131.6	509.7	0.150	0.260	21.3%	0.110
24	21	Jiangxi	22.7	22.3	0.025	0.007	-0.2%	-0.018
21	14	Jilin	30.5	28.1	0.034	0.010	-1.1%	-0.024
8	7	Liaoning	135.7	244.8	0.155	0.123	8.8%	-0.032
14	17	Ningxia	27.4	41.7	0.031	0.017	6.2%	-0.013
29	22	Qinghai	21.0	15.0	0.023	0.004	-4.7%	-0.020
15	11	Shaanxi	32.1	34.2	0.036	0.014	0.9%	-0.022
9	10	Shandong	74.4	196.7	0.084	0.098	14.9%	0.013
1	1	Shanghai	871.8	1,936.0	1.000	1.000	12.1%	0.000
17	13	Shanxi	31.0	32.7	0.035	0.013	0.8%	-0.022
20	26	Sichuan[1]	16.4	28.3	0.018	0.011	8.2%	-0.007
3	4	Tianjin	382.6	1,045.1	0.438	0.538	15.4%	0.100
22	30	Tibet	0.8	27.5	0.000	0.010	65.9%	0.010
12	18	Xinjiang	25.3	49.1	0.028	0.021	9.9%	-0.007
26	19	Yunnan	25.1	20.9	0.028	0.007	-2.6%	-0.021
5	6	Zhejiang	156.9	604.6	0.179	0.309	21.3%	0.130

Source: Customs Office of China (special tabulations).

Table A2. 4 Share of Medium and High-Technology Exports in Total Exports (%)

Ranking			Share				Difference	
2002	1995	Province	1995	2002			Percent	Ranking
15	22	Anhui	21.98%	26.78%	0.518	0.322	4.80%	-0.196
7	5	Beijing	33.96%	46.09%	0.848	0.687	12.13%	-0.161
2	…	Chongqing	n.a.	62.09%	n.a.	0.990	n.a.	n.a.
10	21	Fujian	22.80%	37.63%	0.540	0.527	14.83%	-0.013
20	9	Gansu	29.21%	23.45%	0.717	0.259	-5.76%	-0.458
3	1	Guangdong	39.48%	55.44%	1.000	0.864	15.96%	-0.136
14	13	Guangxi	26.52%	28.55%	0.643	0.355	2.03%	-0.288
12	4	Guizhou	35.38%	32.02%	0.887	0.421	-3.37%	-0.466
28	19	Hainan	24.12%	14.64%	0.577	0.092	-9.48%	-0.485
23	28	Hebei	17.90%	19.59%	0.405	0.186	1.69%	-0.220
24	17	Heilongjiang	24.25%	18.52%	0.580	0.165	-5.73%	-0.415
26	29	Henan	16.76%	16.09%	0.374	0.119	-0.68%	-0.255
13	18	Hubei	24.15%	31.82%	0.577	0.417	7.67%	-0.160
16	23	Hunan	21.81%	25.57%	0.513	0.299	3.75%	-0.214
30	11	Inner Mongolia	27.08%	10.43%	0.658	0.012	-16.65%	-0.646
4	10	Jiangsu	27.98%	55.30%	0.683	0.862	27.32%	0.179
21	14	Jiangxi	25.02%	22.83%	0.602	0.247	-2.19%	-0.355
29	20	Jilin	23.50%	13.91%	0.560	0.078	-9.59%	-0.482
9	12	Liaoning	26.78%	39.55%	0.650	0.564	12.78%	-0.086
19	16	Ningxia	24.32%	23.62%	0.582	0.262	-0.70%	-0.320
25	7	Qinghai	32.12%	18.42%	0.797	0.163	-13.70%	-0.634
8	3	Shaanxi	36.17%	41.96%	0.909	0.609	5.78%	-0.300
17	27	Shandong	18.99%	24.35%	0.435	0.276	5.36%	-0.160
6	8	Shanghai	30.04%	51.14%	0.740	0.783	21.10%	0.043
31	25	Shanxi	20.06%	9.79%	0.465	0.000	-10.27%	-0.465
5	6	Sichuan[1]	32.96%	52.18%	0.820	0.803	19.22%	-0.018
1	2	Tianjin	39.02%	62.60%	0.987	1.000	23.58%	0.013
22	30	Tibet	3.19%	21.00%	0.000	0.212	17.81%	0.212
27	26	Xinjiang	19.56%	15.14%	0.451	0.101	-4.43%	-0.350
18	15	Yunnan	24.92%	24.30%	0.599	0.275	-0.63%	-0.324
11	24	Zhejiang	20.73%	33.71%	0.483	0.453	12.98%	-0.030

Source: Same as A.2.3

Table A2. 5 Share of manufactured exports in total exports (%)

Ranking			Share				Difference	
2002	1995	Province	1995	2002			Percent	Ranking
12	10	Anhui	87.04%	87.86%	0.889	0.814	0.82%	-0.075
16	13	Beijing	83.41%	82.99%	0.840	0.726	-0.42%	-0.114
13	…	Chongqing	n.a.	87.01%	n.a.	0.799	n.a.	n.a.
5	5	Fujian	90.04%	95.06%	0.930	0.944	5.02%	0.014
30	28	Gansu	66.78%	45.40%	0.612	0.045	-21.38%	-0.568
3	3	Guangdong	94.88%	97.23%	0.996	0.984	2.35%	-0.013
20	18	Guangxi	81.09%	76.57%	0.808	0.609	-4.52%	-0.199
24	19	Guizhou	79.97%	70.28%	0.793	0.496	-9.69%	-0.297
27	11	Hainan	83.75%	56.22%	0.844	0.241	-27.52%	-0.603
21	29	Hebei	61.93%	73.56%	0.546	0.555	11.63%	0.009
18	24	Heilongjiang	72.60%	80.34%	0.692	0.678	7.75%	-0.014
19	15	Henan	81.80%	77.28%	0.818	0.622	-4.52%	-0.195
9	4	Hubei	90.97%	90.46%	0.943	0.861	-0.51%	-0.082
17	16	Hunan	81.79%	81.02%	0.817	0.690	-0.77%	-0.127
28	22	Inner Mongolia	78.29%	54.30%	0.770	0.206	-24.00%	-0.564
2	2	Jiangsu	94.97%	97.81%	0.997	0.994	2.85%	-0.003
11	8	Jiangxi	88.60%	89.67%	0.910	0.847	1.07%	-0.064
31	25	Jilin	72.02%	42.92%	0.684	0.000	-29.10%	-0.684
15	27	Liaoning	67.36%	83.21%	0.620	0.730	15.85%	0.109
22	14	Ningxia	83.30%	72.66%	0.838	0.539	-10.65%	-0.300
29	23	Qinghai	77.72%	52.72%	0.762	0.177	-25.01%	-0.584
6	6	Shaanxi	88.99%	91.32%	0.916	0.877	2.33%	-0.039
14	21	Shandong	79.36%	84.64%	0.784	0.755	5.28%	-0.029
1	1	Shanghai	95.16%	98.14%	1.000	1.000	2.98%	0.000
25	12	Shanxi	83.48%	64.91%	0.840	0.398	-18.57%	-0.442
7	17	Sichuan[1]	81.69%	90.65%	0.816	0.864	8.97%	0.048
8	7	Tianjin	88.68%	90.48%	0.912	0.861	1.80%	-0.050
10	30	Tibet	21.92%	90.37%	0.000	0.859	68.45%	0.859
23	26	Xinjiang	71.04%	71.43%	0.671	0.516	0.39%	-0.154
26	20	Yunnan	79.52%	63.38%	0.786	0.371	-16.14%	-0.416
4	9	Zhejiang	88.07%	95.53%	0.903	0.953	7.46%	0.050

Source: Same as A.2.3

Table A2. 6 Medium and High Technology MVA per capita (yuan)

Ranking			Per capita (Yuan)				% Change	Difference
2003	1998	Province	1998	2003			per year	Ranking
18	22	Anhui	247	623	0.039	0.049	20.4%	0.010
3	3	Beijing	2,228	4,658	0.384	0.408	15.9%	0.024
14	…	Chongqing	n.a.	914	n.a.	0.075	n.a.	n.a.
10	11	Fujian	589	1,701	0.098	0.145	23.6%	0.046
21	19	Gansu	284	568	0.045	0.044	14.8%	-0.001
4	4	Guangdong	1,568	4,053	0.269	0.354	20.9%	0.085
27	26	Guangxi	209	412	0.032	0.030	14.5%	-0.002
29	28	Guizhou	182	359	0.027	0.025	14.6%	-0.002
24	23	Hainan	245	513	0.038	0.039	15.9%	0.001
11	12	Hebei	537	1,216	0.089	0.102	17.8%	0.012
26	20	Heilongjiang	253	425	0.040	0.031	10.9%	-0.009
20	16	Henan	317	591	0.051	0.046	13.3%	-0.005
12	9	Hubei	725	1,182	0.122	0.099	10.2%	-0.024
23	25	Hunan	214	533	0.033	0.041	20.1%	0.008
15	18	Inner Mongolia	312	782	0.050	0.063	20.1%	0.013
5	5	Jiangsu	1,370	3,652	0.235	0.319	21.7%	0.084
25	24	Jiangxi	234	491	0.037	0.037	15.9%	0.000
7	8	Jilin	740	1,973	0.125	0.169	21.7%	0.044
9	7	Liaoning	979	1,949	0.167	0.167	14.8%	0.000
17	15	Ningxia	366	661	0.059	0.052	12.6%	-0.007
22	17	Qinghai	313	559	0.050	0.043	12.3%	-0.007
16	14	Shaanxi	371	691	0.060	0.055	13.2%	-0.006
8	10	Shandong	710	1,957	0.120	0.168	22.5%	0.048
1	1	Shanghai	5,759	11,304	1.000	1.000	14.4%	0.000
13	13	Shanxi	426	1,009	0.070	0.083	18.8%	0.013
19	21	Sichuan	250	605	0.039	0.047	19.3%	0.008
2	2	Tianjin	2,610	6,035	0.451	0.531	18.3%	0.080
31	30	Tibet	25	75	0.000	0.000	24.9%	0.000
30	29	Xinjiang	148	255	0.021	0.016	11.6%	-0.005
28	27	Yunnan	196	372	0.030	0.026	13.6%	-0.003
6	6	Zhejiang	1,044	2,916	0.178	0.253	22.8%	0.075

Source: Same as A.2.1

Table A2. 7 Percent Share in China's Total MVA

Ranking			MHT share (%)				Difference	
2003	1998	Province	1998	2003			Percent	Ranking
15	16	Anhui	2.2%	2.1%	0.163	0.140	-0.16%	-0.023
12	12	Beijing	3.1%	2.7%	0.225	0.181	-0.38%	-0.044
21	23	Chongqing	1.0%	1.1%	0.075	0.075	n.a.	n.a.
8	10	Fujian	3.3%	3.7%	0.243	0.253	0.42%	0.010
25	26	Gansu	0.8%	0.8%	0.057	0.055	0.03%	-0.002
1	1	Guangdong	13.5%	14.7%	1.000	1.000	1.16%	0.000
23	19	Guangxi	1.4%	1.1%	0.105	0.070	-0.39%	-0.035
26	24	Guizhou	1.0%	0.7%	0.070	0.049	-0.24%	-0.022
28	28	Hainan	0.3%	0.2%	0.017	0.013	-0.03%	-0.003
6	8	Hebei	4.3%	4.0%	0.317	0.272	-0.29%	-0.045
20	18	Heilongjiang	1.6%	1.2%	0.120	0.081	-0.43%	-0.039
9	7	Henan	4.5%	3.6%	0.334	0.247	-0.88%	-0.087
10	6	Hubei	5.1%	3.5%	0.377	0.234	-1.66%	-0.143
14	15	Hunan	2.3%	2.2%	0.169	0.147	-0.13%	-0.022
24	25	Inner Mongolia	0.9%	1.0%	0.062	0.068	0.15%	0.006
22	22	Jiangxi	1.2%	1.1%	0.090	0.073	-0.14%	-0.017
2	2	Jiangsu	11.3%	12.7%	0.835	0.868	1.44%	0.032
16	17	Jilin	1.7%	2.0%	0.125	0.134	0.28%	0.009
7	9	Liaoning	4.2%	3.8%	0.309	0.256	-0.42%	-0.053
29	29	Ningxia	0.2%	0.2%	0.016	0.013	-0.03%	-0.003
30	30	Qinghai	0.1%	0.1%	0.009	0.006	-0.03%	-0.002
19	20	Shaanxi	1.4%	1.2%	0.104	0.081	-0.22%	-0.023
3	3	Shandong	9.4%	11.2%	0.698	0.761	1.73%	0.063
5	4	Shanghai	8.0%	7.8%	0.594	0.531	-0.23%	-0.063
18	21	Shanxi	1.4%	1.5%	0.103	0.100	0.06%	-0.004
11	11	Sichuan	3.1%	2.7%	0.231	0.183	-0.44%	-0.048
13	14	Tianjin	2.5%	2.5%	0.180	0.167	0.02%	-0.013
31	31	Tibet	0.0%	0.0%	0.000	0.000	0.00%	0.000
27	27	Xinjiang	0.5%	0.5%	0.038	0.032	-0.05%	-0.006
17	13	Yunnan	2.9%	1.9%	0.215	0.126	-1.06%	-0.089
4	5	Zhejiang	6.4%	8.2%	0.473	0.561	1.83%	0.087

Source: Same as A.2.1

Table A2. 8 World Market Share in Manufactured Exports (%)

Ranking			WMS (%)				Difference	
2002	1995	Province	1995	2002			Percent	Ranking
12	14	Anhui	0.031%	0.046%	0.023	0.018	0.01%	-0.004
8	4	Beijing	0.219%	0.221%	0.159	0.090	0.00%	-0.069
20	…	Chongqing	n.a.	0.020%	n.a.	0.008	n.a.	n.a.
6	5	Fujian	0.182%	0.349%	0.133	0.143	0.17%	0.010
28	27	Gansu	0.006%	0.005%	0.004	0.002	0.00%	-0.003
1	1	Guangdong	1.375%	2.434%	1.000	1.000	1.06%	0.000
18	13	Guangxi	0.035%	0.024%	0.026	0.009	-0.01%	-0.016
27	26	Guizhou	0.009%	0.007%	0.007	0.002	0.00%	-0.004
25	23	Hainan	0.020%	0.010%	0.014	0.003	-0.01%	-0.011
10	12	Hebei	0.045%	0.071%	0.033	0.029	0.03%	-0.004
15	21	Helongjiang	0.022%	0.034%	0.016	0.013	0.01%	-0.003
14	17	Henan	0.028%	0.035%	0.021	0.014	0.01%	-0.007
13	11	Hubei	0.046%	0.040%	0.034	0.016	-0.01%	-0.018
16	15	Hunan	0.031%	0.031%	0.022	0.012	0.00%	-0.010
26	25	Inner Mongolia	0.010%	0.009%	0.007	0.003	0.00%	-0.004
2	3	Jiangsu	0.238%	0.795%	0.173	0.326	0.56%	0.153
21	20	Jiangxi	0.024%	0.020%	0.017	0.008	0.00%	-0.010
24	22	Jilin	0.020%	0.016%	0.015	0.006	0.00%	-0.009
9	8	Liaoning	0.142%	0.217%	0.103	0.089	0.08%	-0.015
29	28	Ningxia	0.004%	0.005%	0.003	0.001	0.00%	-0.001
30	29	Qinghai	0.003%	0.002%	0.002	0.000	0.00%	-0.002
17	16	Shaanxi	0.029%	0.027%	0.021	0.010	0.00%	-0.011
5	7	Shandong	0.166%	0.378%	0.121	0.155	0.21%	0.034
3	2	Shanghai	0.316%	0.664%	0.230	0.273	0.35%	0.043
19	19	Shanxi	0.024%	0.023%	0.018	0.009	0.00%	-0.009
11	10	Sichuan[1]	0.047%	0.052%	0.035	0.021	0.00%	-0.014
7	9	Tianjin	0.092%	0.222%	0.067	0.091	0.13%	0.024
31	30	Tibet	0.000%	0.002%	0.000	0.000	0.00%	0.000
22	24	Xinjiang	0.011%	0.020%	0.008	0.007	0.01%	0.000
23	18	Yunnan	0.026%	0.019%	0.019	0.007	-0.01%	-0.011
4	6	Zhejiang	0.174%	0.594%	0.126	0.243	0.42%	0.117

Source: Customs Office of China (special tabulations); UN Comtrade database.

Table A2. 9 World Market Share in medium and high tech exports (%)

Ranking			WMS (%)				Difference	
2002	1995	Province	1995	2002			Percent	Ranking
14	17	Anhui	0.013%	0.022%	0.014	0.010	0.01%	-0.004
7	3	Beijing	0.144%	0.191%	0.156	0.088	0.05%	-0.068
12	…	Chongqing	n.a.	0.022%	n.a.	0.010	n.a.	n.a.
6	6	Fujian	0.075%	0.215%	0.081	0.099	0.14%	0.019
26	27	Gansu	0.004%	0.004%	0.005	0.002	0.00%	-0.003
1	1	Guangdong	0.925%	2.161%	1.000	1.000	1.24%	0.000
17	14	Guangxi	0.019%	0.014%	0.020	0.006	0.00%	-0.014
25	24	Guizhou	0.006%	0.005%	0.007	0.002	0.00%	-0.005
27	23	Hainan	0.009%	0.004%	0.010	0.002	-0.01%	-0.008
11	11	Hebei	0.021%	0.030%	0.023	0.013	0.01%	-0.010
18	18	Heilongjiang	0.012%	0.012%	0.013	0.005	0.00%	-0.007
20	22	Henan	0.009%	0.011%	0.010	0.005	0.00%	-0.005
13	12	Hubei	0.020%	0.022%	0.021	0.010	0.00%	-0.011
16	15	Hunan	0.013%	0.015%	0.014	0.007	0.00%	-0.008
28	25	Inner Mongolia	0.006%	0.003%	0.006	0.001	0.00%	-0.005
2	4	Jiangsu	0.113%	0.700%	0.123	0.324	0.59%	0.201
22	19	Jiangxi	0.011%	0.008%	0.012	0.003	0.00%	-0.008
21	20	Jilin	0.011%	0.008%	0.012	0.003	0.00%	-0.008
9	5	Liaoning	0.091%	0.161%	0.099	0.074	0.07%	-0.025
29	29	Ningxia	0.002%	0.003%	0.002	0.001	0.00%	-0.001
30	28	Qinghai	0.002%	0.001%	0.002	0.000	0.00%	-0.002
15	13	Shaanxi	0.019%	0.019%	0.021	0.009	0.00%	-0.012
8	9	Shandong	0.064%	0.169%	0.069	0.078	0.11%	0.009
3	2	Shanghai	0.161%	0.539%	0.174	0.249	0.38%	0.075
24	21	Shanxi	0.009%	0.005%	0.010	0.002	0.00%	-0.008
10	10	Sichuan[1]	0.031%	0.047%	0.033	0.021	0.02%	-0.012
5	8	Tianjin	0.066%	0.240%	0.071	0.111	0.17%	0.040
31	30	Tibet	0.000%	0.001%	0.000	0.000	0.00%	0.000
23	26	Xinjiang	0.005%	0.007%	0.005	0.003	0.00%	-0.002
19	16	Yunnan	0.013%	0.011%	0.014	0.005	0.00%	-0.009
4	7	Zhejiang	0.066%	0.326%	0.071	0.151	0.26%	0.079

Source: Same as A.2.8

Table A2. 10 Medium and High Technology Manufactured Exports per Capita (US$)

Ranking			Per capita (US$)				% Change	Difference
2002	1995	Province	1995	2002			per year	Ranking
18	25	Anhui	5.1	10.4	0.015	0.007	10.7%	-0.009
4	2	Beijing	278.2	408.5	0.856	0.403	5.6%	-0.453
10	…	Chongqing	n.a.	21.8	n.a.	0.018	n.a.	n.a.
7	5	Fujian	55.7	188.6	0.171	0.184	19.0%	0.013
27	28	Gansu	4.3	5.0	0.013	0.001	2.0%	-0.012
2	1	Guangdong	325.2	835.6	1.000	0.828	14.4%	-0.172
21	13	Guangxi	9.9	8.9	0.030	0.005	-1.5%	-0.025
29	27	Guizhou	4.4	3.7	0.013	0.000	-2.6%	-0.013
13	9	Hainan	30.8	14.9	0.094	0.011	-9.8%	-0.083
15	17	Hebei	8.0	13.4	0.024	0.010	7.7%	-0.014
19	19	Heilongjiang	7.6	9.6	0.023	0.006	3.4%	-0.017
30	29	Henan	2.5	3.5	0.007	0.000	5.1%	-0.007
16	15	Hubei	8.3	11.2	0.025	0.008	4.3%	-0.018
23	26	Hunan	5.0	6.9	0.015	0.003	4.7%	-0.012
31	24	Inner Mongolia	5.9	3.5	0.018	0.000	-7.1%	-0.018
5	7	Jiangsu	38.8	288.2	0.119	0.283	33.2%	0.164
25	23	Jiangxi	6.4	5.7	0.019	0.002	-1.7%	-0.017
20	12	Jilin	9.9	9.1	0.030	0.006	-1.2%	-0.025
8	6	Liaoning	53.9	116.4	0.166	0.112	11.6%	-0.053
14	16	Ningxia	8.0	13.6	0.024	0.010	7.8%	-0.014
26	14	Qinghai	8.7	5.3	0.026	0.002	-6.9%	-0.025
12	11	Shaanxi	13.1	15.7	0.040	0.012	2.7%	-0.028
9	10	Shandong	17.8	56.6	0.054	0.053	18.0%	-0.002
1	3	Shanghai	275.2	1,008.8	0.846	1.000	20.4%	0.154
28	20	Shanxi	7.5	4.9	0.023	0.001	-5.7%	-0.021
11	22	Sichuan[1]	6.6	16.3	0.020	0.013	13.8%	-0.007
3	4	Tianjin	168.3	723.0	0.517	0.716	23.1%	0.198
24	30	Tibet	0.1	6.4	0.000	0.003	77.4%	0.003
17	21	Xinjiang	7.0	10.4	0.021	0.007	5.9%	-0.014
22	18	Yunnan	7.9	8.0	0.024	0.004	0.3%	-0.019
6	8	Zhejiang	36.9	213.4	0.113	0.209	28.5%	0.095

Source: Same as A.2.3

Table A2. 11 Share of Resource-based and Low Technology Exports in Total Exports (%)

Ranking		Province	Share (%)	
2002	1995		1995	2002
1	30	Tibet	18.73	69.37
2	8	Jiangxi	63.58	66.85
3	24	Heilongjiang	48.35	61.83
4	1	Zhejiang	67.34	61.82
5	7	Henan	65.04	61.19
6	6	Anhui	65.05	61.08
7	10	Shandong	60.37	60.28
8	4	Hubei	66.82	58.64
9	2	Fujian	67.24	57.43
10	18	Xinjiang	51.48	56.29
11	11	Hunan	59.98	55.45
12	9	Shanxi	63.41	55.12
13	27	Hebei	44.03	53.97
14	17	Shaanxi	52.82	49.36
15	13	Ningxia	58.99	49.03
16	16	Guangxi	54.57	48.02
17	5	Shanghai	65.12	47.00
18	19	Inner Mongolia	51.21	43.86
19	28	Liaoning	40.58	43.66
20	3	Jiangsu	66.99	42.52
21	14	Guangdong	55.40	41.79
22	12	Hainan	59.62	41.58
23	15	Yunnan	54.60	39.09
24	22	Sichuan[1]	48.72	38.47
25	26	Guizhou	44.59	38.27
26	21	Beijing	49.45	36.90
27	25	Qinghai	45.61	34.30
28	23	Jilin	48.51	29.01
29	20	Tianjin	49.66	27.88
30	…	Chongqing	n.a	24.92
31	29	Gansu	37.57	21.95
		China	57.09	46.45

Source: Same as table A.2.3
[1] Includes Chongqing in 1995

Table A2. 12 Resource-based and Low Technology Exports per Capita (US$)

Ranking		Province	Per capita (US$)	
2002	1995		1995	2002
1	1	Shanghai	596.63	927.24
2	2	Guangdong	456.36	629.99
3	6	Zhejiang	119.94	391.27
4	3	Beijing	405.19	327.11
5	4	Tianjin	214.27	322.08
6	5	Fujian	164.28	287.84
7	7	Jiangsu	92.81	221.57
8	10	Shandong	56.59	140.11
9	8	Liaoning	81.75	128.45
10	9	Hainan	76.02	42.42
11	18	Xinjiang	18.35	38.67
12	15	Hebei	19.60	36.81
13	21	Heilongjiang	15.24	32.21
14	16	Ningxia	19.37	28.13
15	11	Shanxi	23.55	27.81
16	22	Anhui	15.07	23.64
17	30	Tibet	0.68	21.08
18	12	Hubei	22.92	20.55
19	13	Jilin	20.53	19.01
20	17	Shaanxi	19.07	18.49
21	20	Jiangxi	16.31	16.66
22	23	Hunan	13.79	15.02
23	14	Guangxi	20.44	15.01
24	25	Inn. Mongolia	11.20	14.87
25	27	Henan	9.70	13.49
26	19	Yunnan	17.21	12.90
27	26	Sichuan[1]	9.76	12.03
28	24	Qinghai	12.32	9.79
29	…	Chongqing	N.a	8.75
30	29	Gansu	5.55	4.65
31	28	Guizhou	5.59	4.41
		China	70.61	118.60

Source: Same as table A.2.3
[1] Includes Chongqing in 1995

Table A2. 13 Share of world's 100 most dynamic exports in regions' total exports 2002

Ranking	Province	Share (%)
1	Chongqing	44.09
2	Hainan	43.85
3	Tianjin	41.59
4	Sichuan[1]	38.39
5	Guangdong	35.23
6	Beijing	28.10
7	Shanghai	26.43
8	Jiangsu	26.32
9	Liaoning	26.26
10	Tibet	25.83
11	Fujian	25.37
12	Hubei	23.09
13	Jiangxi	22.85
14	Zhejiang	21.39
15	Shandong	19.42
16	Xinjiang	18.21
17	Anhui	17.61
18	Shaanxi	17.34
19	Inner Mongolia	16.73
20	Hebei	16.66
21	Ningxia	15.81
22	Heilongjiang	15.11
23	Guangxi	14.90
24	Henan	13.64
25	Hunan	12.38
26	Jilin	12.33
27	Yunnan	9.09
28	Guizhou	8.74
29	Shanxi	5.76
30	Gansu	5.58
31	Qinghai	5.43
	China (average)	28.45

Source: Same as table A.2.8

Note: Most dynamic exports above US$5 billion in 2002

Table A2. 14 World Market Share in Resource-based and Low Exports

Ranking 2002	Ranking 1995	Province	WMS (%) 1995	WMS (%) 2002
1	1	Guangdong	2.106	2.924
2	5	Zhejiang	0.348	1.074
3	3	Jiangsu	0.441	0.966
4	2	Shanghai	0.567	0.889
5	7	Shandong	0.331	0.752
6	4	Fujian	0.357	0.589
7	8	Liaoning	0.225	0.319
8	6	Beijing	0.341	0.275
9	9	Tianjin	0.136	0.192
10	11	Hebei	0.085	0.146
11	14	Anhui	0.061	0.088
12	15	Henan	0.059	0.077
13	10	Hubei	0.089	0.073
14	21	Heilongjiang	0.038	0.073
15	12	Sichuan[1]	0.074	0.062
16	16	Hunan	0.059	0.059
17	17	Shanxi	0.049	0.054
18	24	Xinjiang	0.020	0.044
19	13	Guangxi	0.062	0.043
20	20	Jiangxi	0.045	0.042
21	19	Shaanxi	0.045	0.040
22	18	Yunnan	0.046	0.033
23	23	Jilin	0.036	0.030
24	25	Inn.Mongolia	0.017	0.021
25	22	Hainan	0.037	0.020
26	…	Chongqing	n.a	0.016
27	26	Guizhou	0.013	0.010
28	28	Ningxia	0.007	0.010
29	27	Gansu	0.009	0.007
30	30	Tibet	0.000	0.003
31	29	Qinghai	0.004	0.003
		China (total)	5.706	8.933

Source: Same as A.2.8
[1] Includes Chongqing in 1995

Table A2. 15 World Market Share in World's 100 Most Dynamic Exports 2002

Ranking	Province	WMS 2002
1	Guangdong	1.769
2	Jiangsu	0.429
3	Shanghai	0.358
4	Zhejiang	0.267
5	Tianjin	0.205
6	Fujian	0.187
7	Shandong	0.174
8	Beijing	0.143
9	Liaoning	0.137
10	Sichuan	0.044
11	Hebei	0.032
12	Hubei	0.021
13	Chongqing	0.020
14	Anhui	0.018
15	Hainan	0.015
16	Heilongjiang	0.013
17	Henan	0.012
18	Jiangxi	0.010
19	Shaanxi	0.010
20	Xinjiang	0.010
21	Guangxi	0.009
22	Hunan	0.009
23	Jilin	0.009
24	Inn. Mongolia	0.006
25	Yunnan	0.006
26	Shanxi	0.004
27	Ningxia	0.002
28	Guizhou	0.002
29	Gansu	0.001
30	Tibet	0.001
31	Qinghai	0.000
	China (total)	3.905

Source: Same as A.2.8
Note: [1] Most dynamic exports above US$5 billion in 2002 (see table A.2.20)

Table A2. 16 World's 100 most dynamic exports above US$5 billion1995-2002 (SITC revision 3, four-digit level), UN Comtrade Data

Rank	Product	World exports $bn	95-02 (% p.a.)	Rank	Product	World exports $bn	95-02 (% p.a.)
1	Radio/tv transmit equip.	74.0	19.4%	51	Colour television receivers	29.1	4.4%
2	Natural gas, gaseous	38.9	18.3%	52	Ethers/peroxides/derivs	5.7	4.3%
3	Medicaments n.e.s.	99.8	17.4%	53	Electro-thermic equipment	15.2	4.2%
4	Optical fibre/elements	8.1	13.3%	54	Self-adhesive plastic	5.7	4.2%
5	Reaction engines	15.5	13.0%	55	Radio-isotopes/compounds	5.0	4.2%
6	Orthopaedic appliances	12.0	12.5%	56	Locksmiths wares	15.3	4.2%
7	Platinum etc	5.8	12.5%	57	Organic detergents nes	11.2	4.2%
8	Nucleic acids etc	38.4	12.2%	58	Special use el equip nes	13.4	4.1%
9	Natural gas, liquefied	16.5	12.2%	59	Motor veh. i/c piston eng	33.4	4.1%
10	Women/g trousers woven	14.7	11.7%	60	Jerseys/pullovers/etc	20.2	4.1%
11	Glycosides/glands/vaccin	15.8	11.6%	61	Automatic control instr.	13.1	4.1%
12	Hormones	11.2	11.2%	62	Spraying etc equipment	7.1	4.1%
13	Optical appliances nes	6.9	10.7%	63	Fluid gauges/instruments	5.8	4.0%
14	Odiferous mixtures	8.4	10.2%	64	Hardened rubber articles	8.5	4.0%
15	Parts react/gas turb eng	27.7	9.7%	65	Goods transport vehicles	53.6	3.9%
16	Aircrft nes over 15000kg	56.6	9.3%	66	Domestic laundry equip.	5.6	3.9%
17	Lactams/lactones	7.4	8.8%	67	Parts nes int-c engines	26.4	3.8%
18	Petrol./bitum. oil,crude	233.8	8.7%	68	Bed/table/toilet linen	7.5	3.8%
19	Insulin medicaments bulk	10.4	8.6%	69	Iron/steel articles nes	17.0	3.8%
20	Adp equipment nes	18.0	8.1%	70	Perfumes/toilet waters	5.9	3.8%
21	Medical.surg/vet instrum	24.2	8.0%	71	Motor veh part/acces nes	149.5	3.8%
22	Org chem products nes	9.6	7.9%	72	Piezo-elect crystals mtd	11.9	3.7%
23	Aircrft nes 2001-15000kg	11.5	7.5%	73	Office equip parts nes	109.2	3.7%
24	Yachts/pleasure vessels	6.0	7.4%	74	Iron ore,conc,not agglom	6.4	3.6%
25	Gas turbines nes	6.9	7.2%	75	Insulated wire/opt fibre	32.6	3.6%
26	Games equipment	10.1	7.1%	76	Aluminoids/modif starch	7.9	3.6%
27	Chairs and seats	24.8	6.8%	77	Parts for fans/gas pumps	5.1	3.6%
28	Skin care/manicure preps	10.2	6.7%	78	Bread/pastry/cakes/etc.	9.3	3.6%
29	Electro-diag eq ex xray	8.5	6.7%	79	Paints/varnishes	10.2	3.6%
30	T-shirts/singlets knit/c	14.1	6.3%	80	Paper products nes	11.1	3.6%
31	Elec switch boards etc	11.6	6.2%	81	Oxy-func amino-compnds	5.9	3.6%
32	Digital computers	25.2	6.1%	82	Dom refrigerator/freezer	7.4	3.5%
33	Physic/chem analysis equ	12.1	6.0%	83	Motorcycles/mopeds	9.7	3.5%
34	Aircraft etc parts	39.1	5.9%	84	Domestic electric machns	6.1	3.5%
35	Pass motor veh exc buses	336.9	5.6%	85	Pts nes motors/generator	6.1	3.5%
36	Plastic boxes/lids/etc	17.9	5.6%	86	Oil cake by-products	9.3	3.5%
37	Soya beans	10.7	5.5%	87	Antibiotics, non-medical	7.8	3.4%
38	Sound/tv recorders etc	27.1	5.4%	88	Elec switch etc parts	11.1	3.4%
39	Beverage non alcohol nes	6.3	5.3%	89	Batteries/accumulators	14.1	3.4%
40	Electrical energy	10.0	5.1%	90	Vehicle electric eqt nes	14.5	3.4%
41	Pharm. goods, non-medic.	7.3	5.0%	91	Ac motor(>37w)/generator	8.6	3.3%
42	Non-mag recorded media	17.3	5.0%	92	Plastic articles nes	21.6	3.3%
43	Lamps/lighting fittings	9.6	4.9%	93	Harvesting machinery	7.0	3.2%
44	Diamonds unset	43.5	4.9%	94	Semi-fin iron/stel<.25%c	7.2	3.2%
45	Filter/purify equipment	12.8	4.8%	95	Builders wood materials	7.1	3.1%
46	Earth moving mach parts	16.3	4.7%	96	Elect power eq nes/parts	19.0	3.1%
47	Drafting/len meas instr	13.6	4.7%	97	Palm oil	6.2	3.0%
48	Photo equipment nes	6.9	4.6%	98	Furniture nes, wood	20.2	3.0%
49	Navigation/survey/et app	7.2	4.5%	99	Knives/blades/tool tips	12.5	3.0%
50	Wine of fresh grapes	14.5	4.5%	100	Beer/ale/stout/porter	5.9	3.0%

Source: Same as table A.2.8

ANNEX TABLES TO CHAPTER 3

Table A.3. 1 R&D Expenditure per Capita of Large and Medium Enterprises By Region , 1995 and 2002

Ranking		Province	Per Capita Expenditure (Yuan)	
2002	1995		1995	2002
1	1	Shanghai	64.0	307.2
2	2	Beijing	38.2	200.1
3	3	Tianjin	22.7	150.3
4	12	Guangdong	7.0	129.5
5	5	Liaoning	16.0	90.2
6	15	Shandong	5.9	76.8
7	9	Jiangsu	10.3	76.3
8	6	Shaanxi	14.5	48.6
9	13	Zhejiang	7.0	40.0
10	27	Fujian	2.1	37.9
11	26	Heilongjiang	2.5	35.5
12	14	Jilin	6.5	33.8
13	7	Hubei	13.2	27.7
14	8	Qinghai	13.2	26.5
15	28	Shanxi	1.1	23.7
16	30	Chongqing		22.7
17	22	Hebei	3.6	21.8
18	11	Sichuan	7.2	19.3
19	25	Anhui	2.6	17.0
20	23	Ningxia	3.5	16.8
21	19	Jiangxi	3.8	15.9
22	20	Henan	3.7	15.6
23	16	Hunan	4.9	14.7
24	10	Gansu	8.7	12.5
25	17	Guangxi	4.3	12.1
26	24	Inner Mongolia	3.2	10.2
27	21	Guizhou	3.7	10.1
28	4	Xinjiang	17.6	9.9
29	29	Hainan	1.0	8.8
30	18	Yunnan	3.9	7.6
31	31	Tibet	-	-

Source: China Statistical Yearbook of Science and Technology 1996 (table 3-14) and 2003 (table 1-16)
China Statistical Yearbook 1996 (table 3-3) and 2003 (table 4-3)
Note: Chongqing included in Sichuan in 1995.

Table A.3. 2 R&D Expenditure as Share of Sales of Large and Medium Enterprises by Region, 1995 and 2002

Ranking 2002	Ranking 1995	Province	1995	2002
1	1	Shaanxi	1.02%	1.50%
2	8	Beijing	0.46%	1.34%
3	25	Guangdong	0.17%	1.12%
4	13	Liaoning	0.31%	1.03%
5	23	Shandong	0.19%	0.96%
6	11	Jiangxi	0.35%	0.96%
7	5	Sichuan	0.55%	0.91%
8	12	Shanghai	0.32%	0.86%
9	7	Guizhou	0.49%	0.82%
10	29	Shanxi	0.06%	0.82%
11	9	Hunan	0.42%	0.81%
12	31	Chongqing		0.76%
13	16	Jiangsu	0.24%	0.75%
14	4	Hubei	0.64%	0.74%
15	3	Qinghai	0.70%	0.73%
16	10	Guangxi	0.38%	0.70%
17	14	Henan	0.26%	0.69%
18	21	Anhui	0.19%	0.66%
19	20	Tianjin	0.19%	0.64%
20	28	Heilongjiang	0.07%	0.64%
21	26	Fujian	0.14%	0.64%
22	22	Hebei	0.19%	0.59%
23	19	Zhejiang	0.20%	0.54%
24	6	Gansu	0.51%	0.52%
25	17	Jilin	0.22%	0.52%
26	27	Hainan	0.09%	0.44%
27	24	Ningxia	0.18%	0.41%
28	18	Inner Mongolia	0.20%	0.35%
29	15	Yunnan	0.25%	0.31%
30	2	Xinjiang	0.84%	0.28%
31	30	Tibet	0.00%	

Source: China Statistical Yearbook of Science and Technology 1996 (table 3-14, 3-2) and 2003 (table 1-16, 3-5)
Note: Chongqing included in Sichuan in 1995

Table A.3. 3 R&D personnel in Large and Medium Enterprises by Region, 2002

Ranking	Province	Share in total employment %	R&D personnel	Number of employees
1	Shaanxi	3.76	27736	737,596
2	Sichuan	2.50	28130	1,124,658
3	Guangdong	2.44	45938	1,880,987
4	Jiangsu	2.15	48636	2,257,002
5	Hunan	1.97	13448	683,052
6	Gansu	1.88	8425	448,129
7	Tianjin	1.87	10059	538,664
8	Beijing	1.81	10161	560,131
9	Liaoning	1.75	26952	1,544,121
10	Jiangxi	1.57	7200	458,169
11	Hubei	1.52	16969	1,114,537
12	Shanghai	1.44	15757	1,092,787
13	Henan	1.37	21790	1,586,280
14	Guizhou	1.36	4649	341,182
15	Fujian	1.35	8767	648,902
16	Shandong	1.30	40321	3,095,465
17	Zhejiang	1.30	12368	950,502
18	Heilongjiang	1.28	18358	1,428,700
19	Hebei	1.12	15642	1,392,560
20	Chongqing	1.09	6688	612,659
21	Guangxi	1.09	4741	434,471
22	Anhui	0.95	8908	938,335
23	Qinghai	0.94	894	95,059
24	Shanxi	0.89	8472	946,627
25	Yunnan	0.82	3697	450,757
26	Xinjiang	0.70	1707	242,978
27	Inner Mongolia	0.65	3478	531,266
28	Ningxia	0.62	1002	161,012
29	Hainan	0.58	331	57,481
30	Jilin	0.41	3035	747,709
31	Tibet			

Source: China Statistical Yearbook on Science and Technology 2003 (tables 1-15, 3-5)

Table A.3. 4 Science and Technology Personnel in Large and Medium Enterprises by Province, 1995 and 2002

Ranking		Province	S&T personnel as % of total employment		S&T Personnel	
2002	1995		1995	2002	1995	2002
1	1	Shaanxi	5.93%	7.40%	66,482	54,594
2	4	Sichuan	4.62%	7.35%	123,075	82,623
3	8	Jiangsu	3.92%	7.00%	114,820	158,063
4	7	Gansu	4.29%	6.67%	30,078	29,875
5	10	Hunan	3.47%	6.66%	44,201	45,496
6	11	Jiangxi	3.46%	6.50%	29,227	29,783
7	3	Shanghai	4.70%	5.98%	80,413	65,347
8	6	Beijing	4.36%	5.70%	42,197	31,912
9	20	Guangdong	2.34%	5.53%	35,986	104,104
10	5	Guizhou	4.47%	5.51%	24,361	18,791
11	9	Hubei	3.63%	5.49%	63,340	61,212
12	12	Liaoning	3.29%	5.39%	106,179	83,239
13	17	Zhejiang	2.63%	4.73%	35,834	44,975
14	18	Guangxi	2.54%	4.70%	18,190	20,439
15	19	Anhui	2.39%	4.65%	30,217	43,647
16	15	Henan	2.90%	4.63%	63,280	73,489
17	16	Shandong	2.67%	4.52%	91,941	139,772
18	30	Chongqing		4.39%		26,880
19	13	Tianjin	3.06%	4.30%	29,228	23,160
20	23	Shanxi	2.23%	4.04%	28,236	38,207
21	14	Fujian	2.95%	3.95%	11,291	25,623
22	2	Qinghai	5.09%	3.82%	7,940	3,630
23	25	Hebei	2.11%	3.67%	42,029	51,142
24	28	Heilongjiang	1.80%	3.46%	43,439	49,368
25	22	Xinjiang	2.33%	3.36%	11,051	8,158
26	21	Yunnan	2.33%	2.93%	12,374	13,223
27	26	Inner Mongolia	2.00%	2.88%	17,018	15,307
28	24	Ningxia	2.18%	2.67%	3,809	4,306
29	27	Jilin	1.87%	2.63%	26,600	19,699
30	29	Hainan	1.79%	1.08%	1,308	618
31	31	Tibet				

Source: China Statistical Yearbook of Science and Technology 1996 (table 1-5) and 2003 (tables 3-10, 3-5)
Note: Chongqing is included in Sichuan in 1995.

Table A.3. 5 Scientists and Engineers in S&T personnel of Large and Medium Enterprises by Province, 1995 and 2002

Ranking		Province	Shares of scientists and engineers in S & T personnel (%)		Scientists and engineers (person)	
2002	1995		1995	2002	1995	2002
1	15	Hainan	36.70%	86.08%	480	532
2	17	Xinjiang	36.19%	69.85%	3,999	5,698
3	5	Guangdong	42.31%	69.44%	15,224	72,289
4	4	Beijing	42.72%	68.38%	18,028	21,823
5	9	Jilin	40.21%	68.10%	10,696	13,415
6	7	Shanghai	41.46%	66.16%	33,340	43,235
7	13	Shanxi	37.73%	63.70%	10,654	24,337
8	1	Ningxia	44.08%	63.42%	1,679	2,731
9	2	Heilongjiang	43.27%	62.39%	18,795	30,803
10	8	Hubei	40.42%	62.30%	25,602	38,138
11	19	Gansu	34.41%	61.26%	10,349	18,300
12	11	Liaoning	38.66%	61.22%	41,044	50,957
13	21	Shandong	34.16%	60.85%	31,409	85,055
14	30	Chongqing		60.40%		16,236
15	3	Tianjin	43.21%	60.22%	12,630	13,948
16	23	Anhui	33.93%	59.77%	10,252	26,089
17	14	Fujian	37.54%	59.51%	4,239	15,247
18	10	Hebei	38.95%	58.99%	16,371	30,170
19	24	Zhejiang	32.95%	58.90%	11,807	26,491
20	16	Henan	36.48%	58.46%	23,083	42,962
21	20	Guangxi	34.35%	57.52%	6,249	11,756
22	6	Inner Mongolia	42.10%	57.37%	7,165	8,782
23	12	Yunnan	37.99%	56.21%	4,701	7,432
24	18	Sichuan	34.92%	55.95%	42,979	46,228
25	22	Hunan	33.93%	55.75%	14,998	25,366
26	29	Qinghai	25.06%	54.02%	1,990	1,961
27	25	Jiangsu	31.96%	53.17%	36,702	84,048
28	28	Guizhou	30.25%	49.99%	7,368	9,393
29	27	Shaanxi	31.42%	48.94%	20,888	26,721
30	26	Jiangxi	31.44%	44.09%	9,190	13,131
31	31	Tibet				

Source: China Statistical Yearbook on Science and Technology (1996, table 1-5) and 2003 (table 3-10)
China Statistical Yearbook 1996 (table 3-3) and 2003 (table 4-3)
Note: Chongqing included in Sichuan in 1995.

Table A.3. 6 Contractual inflows to domestic technical markets per capita by Province, 1995 and 2002

Ranking		Province	Yuan	
2002	1995		1995	2002
1	1	Beijing	241.0	858.4
2	2	Shanghai	138.4	634.9
3	3	Tianjin	116.9	325.5
4	31	Chongqing		106.8
5	4	Liaoning	50.3	100.4
6	6	Zhejiang	27.7	95.0
7	5	Guangdong	28.0	91.9
8	10	Xinjiang	21.4	71.6
9	8	Jiangsu	26.7	71.6
10	9	Shandong	22.4	52.9
11	12	Hubei	17.0	52.8
12	20	Yunnan	12.6	47.8
13	23	Qinghai	10.9	46.3
14	19	Fujian	13.1	45.8
15	24	Inner Mongolia	10.7	43.3
16	13	Hunan	16.8	43.0
17	22	Ningxia	11.4	42.5
18	18	Shaanxi	13.7	38.9
19	14	Jilin	15.2	38.7
20	7	Heilongjiang	27.6	33.2
21	17	Shanxi	14.0	32.7
22	15	Gansu	14.6	30.7
23	26	Hainan	9.3	29.5
24	27	Tibet	9.3	24.1
25	21	Henan	11.7	21.6
26	16	Hebei	14.1	20.8
27	25	Jiangxi	10.2	19.0
28	11	Sichuan	18.2	14.8
29	29	Anhui	5.9	14.3
30	28	Guangxi	6.5	13.8
31	30	Guizhou	5.3	10.0

Source: China Statistical Yearbook of Science and Technology 2003 (table 6-24)
China Statistical Year Book 1996 (table 3-3) and 2003 (table 4-3)
Note: Chongqing is included in Sichuan in 1995.

Table A.3. 7 Imported Technology Contracts per Capita by Province, 2002

Ranking	Province	USD
1	Tianjin	516.0
2	Shanghai	213.5
3	Beijing	78.0
4	Jiangsu	35.9
5	Guangdong	16.2
6	Zhejiang	7.8
7	Fujian	6.0
8	Liaoning	4.4
9	Anhui	3.2
10	Jilin	2.4
11	Hunan	2.2
12	Hainan	2.0
13	Chongqing	2.0
14	Shandong	1.9
15	Sichuan	1.6
16	Ningxia	1.1
17	Jiangxi	0.9
18	Hebei	0.8
19	Heilongjiang	0.8
20	Shaanxi	0.7
21	Guangxi	0.6
22	Hubei	0.4
23	Yunnan	0.4
24	Inner Mongolia	0.3
25	Xinjiang	0.3
26	Gansu	0.3
27	Henan	0.2
28	Shanxi	0.1
29	Guizhou	0.0
30	Tibet	-
31	Qinghai	-

Source: China Statistical Yearbook on Science and Technology 2003 (table 6-27)
China Statistical Year Book 1996 (table 3-3) and 2003 (4-3)
Note: Chongqing is included in Sichuan in 1995.

Table A.3. 8 Investment in fixed assets per capita by Province, 1995 and 2002

Ranking		Province	Total investment in fixed assets per capita (yuan)	
2002	1995		1995	2002
1	1	Shanghai	11,292.5	13,622.9
2	2	Beijing	6,913.3	12,622.2
3	3	Tianjin	4,209.7	8,019.0
4	4	Zhejiang	3,432.8	7,483.3
5	5	Guangdong	3,371.9	4,899.8
6	7	Jiangsu	2,497.5	4,674.3
7	18	Qinghai	1,104.2	4,392.2
8	10	Xinjiang	1,998.6	4,199.9
9	12	Tibet	1,463.8	3,991.8
10	17	Ningxia	1,211.9	3,968.2
11	11	Shandong	1,503.3	3,835.4
12	8	Liaoning	2,115.1	3,820.0
13	9	Fujian	2,110.0	3,615.3
14	16	Jilin	1,235.6	3,090.9
15	13	Hebei	1,410.2	2,999.8
16	19	Inner Mongolia	1,100.4	2,975.7
17	31	Chongqing	-	2,894.3
18	6	Hainan	2,514.9	2,807.1
19	14	Heilongjiang	1,398.6	2,743.7
20	15	Hubei	1,360.2	2,680.5
21	22	Shaanxi	882.7	2,491.4
22	23	Shanxi	879.6	2,469.2
23	26	Sichuan	796.0	2,193.8
24	28	Jiangxi	695.4	2,105.7
25	25	Hunan	818.2	2,033.4
26	29	Gansu	597.9	2,029.3
27	20	Yunnan	978.6	1,880.0
28	24	Henan	860.6	1,795.4
29	27	Anhui	791.8	1,695.3
30	30	Guizhou	461.2	1,649.6
31	21	Guangxi	887.4	1,556.1

Source: China Statistical Yearbook 1996 (tables 5-2, 3-3) and 2003 (tables 6-4, 4-3)
Note: Chongqing included in Sichuan in 1995.

Table A.3. 9 FDI per capita by Province (Actually used), 1995 and 2002 (US$)

Ranking		Province	Actually used FDI per capita (USD)	
2002	1995		1995	2002
1	1	Shanghai	204.4	262.9
2	2	Tianjin	161.5	157.1
3	3	Guangdong	149.4	144.2
4	7	Jiangsu	73.5	138.1
5	6	Beijing	86.3	121.2
6	5	Fujian	124.9	110.7
7	8	Liaoning	34.8	81.2
8	10	Zhejiang	29.1	66.2
9	4	Hainan	146.7	63.8
10	9	Shandong	30.9	52.1
11	19	Jiangxi	7.1	25.6
12	14	Hubei	10.8	23.8
13	18	Hunan	7.9	13.6
14	16	Hebei	8.5	11.6
15	15	Shaanxi	9.2	9.8
16	13	Heilongjiang	14.0	9.3
17	11	Jilin	15.7	9.1
18	29	Qinghai	0.3	8.9
19	12	Guangxi	14.8	8.7
20	24	Inner Mongolia	2.5	7.4
21	26	Shanxi	2.1	6.4
22	21	Sichuan	4.8	6.4
23	31	Chongqing		6.3
24	17	Anhui	8.0	6.1
25	20	Henan	5.3	4.2
26	28	Ningxia	0.8	3.8
27	25	Yunnan	2.4	2.6
28	23	Gansu	2.6	2.4
29	22	Xinjiang	3.3	1.0
30	27	Guizhou	1.6	1.0
31	30	Tibet	-	-

Source: China Statistical Yearbook 1996 (table 16-16, 3-3) and 2003 (tables 17-16, 4-3)
Note: Chongqing included in Sichuan in 1995.

Table A.3. 10 Length of Railways in Operation by Province 1995 and 2002 (km)

Ranking		Province	Length of railways per 1 million persons		Length of railways per 1000 km^2	
2002	1995		1995	2002	1995	2002
1	3	Inner Mongolia	222	260	461	563
2	2	Qinghai	228	206	152	152
3	10	Xinjiang	81	146	84	173
4	6	Heilongjiang	134	144	1075	1196
5	4	Ningxia	139	138	1082	1192
6	5	Jilin	134	132	1933	1979
7	11	Shanxi	79	93	1623	2034
8	8	Liaoning	87	90	2379	2533
9	7	Gansu	95	89	595	594
10	9	Beijing	82	80	6071	6774
11	12	Shaanxi	56	79	1030	1518
12	14	Hebei	50	68	1699	2414
13	13	Tianjin	53	68	4573	6196
14	29	Guangxi	5	57	95	1194
15	17	Jiangxi	39	56	988	1480
16	16	Yunnan	40	55	419	624
17	15	Guizhou	41	49	837	1113
18	19	Fujian	32	42	853	1212
19	18	Hunan	36	42	1091	1313
20	20	Hubei	29	40	941	1327
21	24	Henan	23	37	1335	2246
22	21	Anhui	29	35	1349	1707
23	22	Sichuan	25	34	600	613
24	23	Shandong	24	31	1365	1904
25	25	Zhejiang	22	28	938	1300
26	28	Guangdong	10	27	380	1171
27	1	Hainan	231	27	4912	629
28	30	Chongqing	0	23	0	873
29	27	Jiangsu	11	18	747	1340
30	26	Shanghai	18	16	4414	4422
31	31	Tibet	0	0	0	0

Source: China Statistical Yearbook 1996 (tables 3-3,14-3) and 2003 (tables 4-3,15-3)
http://www.xzqh.org/quhua/index.htm

Note: Chongqing is included in Sichuan in 1995.

Table A.3. 11 Length of Highways by Province, 1995 and 2002

Ranking		Province	Length of highways per 1 million persons		Length of highways per 1000 km^2	
2002	1995		1995	2002	1995	2002
1	1	Tibet	9330	14891	1866	3313
2	2	Qinghai	3581	4537	2392	3334
3	5	Xinjiang	1824	4353	1894	5183
4	6	Yunnan	1710	3805	17957	43382
5	4	Inner Mongolia	1959	3055	4068	6607
6	3	Hainan	2045	2600	43553	61400
7	7	Ningxia	1667	1966	12961	17038
8	14	Shanxi	1093	1810	22429	39741
9	10	Heilongjiang	1319	1653	10613	13706
10	9	Fujian	1439	1562	38812	45129
11	8	Gansu	1444	1551	9024	10314
12	12	Jilin	1208	1523	17401	22831
13	22	Hubei	844	1438	27071	47832
14	21	Jiangxi	859	1438	21822	37935
15	11	Guangdong	1231	1381	46982	60299
16	20	Sichuan	889	1290	20984	23312
17	18	Hunan	925	1279	28155	40385
18	13	Shaanxi	1127	1267	20853	24507
19	19	Guangxi	900	1168	17784	24477
20	17	Guizhou	926	1152	19110	26012
21	15	Liaoning	1061	1143	28956	32034
22	26	Anhui	585	1066	27060	51959
23	16	Beijing	944	1009	70304	85470
24	31	Chongqing	0	1000	0	37740
25	24	Zhejiang	790	982	34121	45646
26	28	Tianjin	450	963	38573	88145
27	23	Hebei	802	937	27174	33199
28	25	Shandong	623	815	36162	49353
29	29	Jiangsu	368	815	25970	60141
30	27	Henan	546	746	31067	44838
31	30	Shanghai	268	387	65293	108379

Source: China Statistical Yearbook 1996 (tables 3-3,14-3) and 2003 (table 4-3,15-3)
http://www.xzqh.org/quhua/index.htm

Note: Chongqing is included in Sichuan in 1995.

Table A.3. 12 Navigable Inland Waterways by Province, 1995 and 2002

Ranking		Province	Length of waterways per 1 million persons		Length of waterways per 1000 km^2	
2002	1995		1995	2002	1995	2002
1	1	Jiangsu	337	324	23803	23899
2	2	Zhejiang	245	224	10592	10408
3	3	Guangdong	157	174	6004	7604
4	4	Hunan	157	151	4786	4781
5	7	Heilongjiang	137	133	1099	1099
6	8	Jiangxi	122	131	3086	3461
7	5	Shanghai	148	125	36207	35121
8	6	Hubei	137	121	4398	4039
9	10	Guangxi	100	116	1966	2427
10	9	Fujian	120	107	3240	3084
11	11	Anhui	93	89	4317	4316
12	13	Sichuan	70	85	1647	1533
13	27	Chongqing	0	75	0	2824
14	12	Ningxia	77	71	602	617
15	28	Qinghai	0	70	0	52
16	15	Jilin	44	66	630	993
17	14	Guizhou	51	56	1043	1254
18	16	Hainan	38	52	812	1218
19	24	Gansu	9	50	56	335
20	19	Inner Mongolia	26	50	55	108
21	23	Tianjin	10	44	818	4027
22	17	Yunnan	33	42	348	480
23	18	Shaanxi	28	28	525	544
24	20	Shandong	22	28	1261	1701
25	21	Liaoning	12	19	339	542
26	22	Henan	12	17	690	992
27	25	Shanxi	6	9	113	203
28	26	Hebei	1	1	39	39
29	29	Beijing	0	0	0	0
30	30	Tibet	0	0	0	0
31	31	Xinjiang	0	0	0	0

Source: China Statistical Yearbook 1996 (tables 3-3,14-3) and 2003 (table 4-3,15-3)
http://www.xzqh.org/quhua/index.htm

Note: Chongqing is included in Sichuan in 1995

Table A.3. 13 Telephone lines, Mobile Phones and Internet by Province, 2003

Telephone fixed lines			Mobile phones			Internet connections		
Rank	Province	Lines/ 100 persons	Rank	Province	Users/ 100 persons	Rank	Province	Users / 100 persons
1	Beijing	46.94	1	Beijing	75.71	1	Shanghai	15.20
2	Shanghai	42.86	2	Shanghai	64.03	2	Tianjin	14.79
3	Tianjin	35.61	3	Guangdong	50.38	3	Beijing	13.71
4	Zhejiang	35.40	4	Zhejiang	41.69	4	Guangdong	8.96
5	Guangdong	32.27	5	Tianjin	37.62	5	Liaoning	8.68
6	Fujian	32.19	6	Fujian	27.01	6	Zhejiang	7.74
7	Liaoning	30.37	7	Jiangsu	25.89	7	Fujian	7.48
8	Jiangsu	27.60	8	Liaoning	25.59	8	Jilin	5.20
9	Heilongjiang	22.96	9	Jilin	23.28	9	Jiangsu	4.81
10	Shandong	22.92	10	Heilongjiang	22.24	10	Shanxi	4.80
11	Jilin	22.05	11	Xinjiang	21.55	11	Hebei	4.47
12	Xinjiang	21.31	12	Ningxia	20.92	12	Ningxia	4.19
13	Shanxi	20.40	13	Inn. Mongolia	19.81	13	Heilongjiang	3.89
14	Hainan	20.09	14	Chongqing	19.58	14	Shaanxi	3.71
15	Hebei	19.81	15	Hebei	18.47	15	Jiangxi	3.20
16	Shaanxi	18.22	16	Qinghai	18.45	16	Guangxi	3.09
17	Inn. Mongolia	18.05	17	Shanxi	17.91	17	Hainan	2.80
18	Ningxia	17.28	18	Hainan	16.79	18	Xinjiang	2.78
19	Chongqing	17.04	19	Shaanxi	16.72	19	Hubei	2.75
20	Anhui	15.58	20	Shandong	16.51	20	Yunnan	2.73
21	Gansu	15.45	21	Hubei	14.45	21	Hunan	2.69
22	Jiangxi	14.83	22	Yunnan	14.18	22	Shandong	2.37
23	Hubei	14.83	23	Sichuan	13.67	23	Inn. Mongolia	2.29
24	Hunan	14.77	24	Guangxi	13.16	24	Chongqing	2.25
25	Qinghai	14.31	25	Hunan	12.61	25	Anhui	2.14
26	Henan	14.09	26	Jiangxi	12.51	26	Henan	2.08
27	Guangxi	13.15	27	Tibet	11.88	27	Tibet	2.00
28	Sichuan	12.97	28	Henan	11.08	28	Sichuan	1.95
29	Yunnan	11.02	29	Anhui	10.88	29	Gansu	1.63
30	Tibet	10.14	30	Gansu	10.53	30	Guizhou	1.44
31	Guizhou	8.60	31	Guizhou	8.52	31	Qinghai	1.26

Source: http://www.mii.gov.cn, Ministry of Information Industry; China Statistical Yearbook 1996 (table 13-3) and 2004 (table 4-3).

Table A.3. 14 Secondary School Enrolment as Percent of Total Population By Province, 1995 and 2002

Ranking		Province	Enrolment	
2002	1995		1995	2002
1	12	Hebei	4.8%	7.8%
2	17	Henan	4.6%	7.6%
3	1	Shandong	5.4%	7.6%
4	24	Shaanxi	4.1%	7.6%
5	20	Hunan	4.5%	7.0%
6	8	Shanxi	4.9%	7.0%
7	18	Xinjiang	4.5%	7.0%
8	22	Hubei	4.3%	7.0%
9	13	Fujian	4.8%	6.9%
10	15	Jiangxi	4.8%	6.9%
11	11	Heilongjiang	4.8%	6.7%
12	6	Guangdong	4.9%	6.5%
13	16	Anhui	4.7%	6.3%
14	14	Inner Mongolia	4.8%	6.3%
15	2	Ningxia	5.3%	6.3%
16	19	Jiangsu	4.5%	6.2%
17	26	Gansu	3.8%	6.2%
18	23	Guangxi	4.3%	6.2%
19	10	Tianjin	4.8%	6.0%
20	21	Hainan	4.4%	5.9%
21	9	Zhejiang	4.9%	5.8%
22	5	Jilin	5.0%	5.8%
23	7	Liaoning	4.9%	5.7%
24	29	Guizhou	3.1%	5.5%
25	27	Sichuan	3.3%	5.3%
26	4	Beijing	5.0%	5.1%
27	31	Chongqing		5.1%
28	25	Qinghai	4.0%	5.1%
29	28	Yunnan	3.2%	5.0%
30	3	Shanghai	5.2%	4.9%
31	30	Tibet	1.4%	3.4%

Source: China Statistical Yearbook 1997 (tables 18-5, 3-3) and 2003 (table 20-5, 4-3)
Note: Chongqing is included in Sichuan in 1995.

Table A.3. 15 Higher Education Enrolment as Percent of Total Population By Province, 1995 and 2002

Ranking 2002	Ranking 1995	Province	Student Enrolment as % of Population 1995	Student Enrolment as % of Population 2002
1	1	Beijing	1.5%	2.8%
2	2	Shanghai	1.0%	2.0%
3	3	Tianjin	0.7%	2.0%
4	6	Shaanxi	0.4%	1.1%
5	4	Liaoning	0.4%	1.1%
6	5	Jilin	0.4%	1.0%
7	7	Hubei	0.3%	1.0%
8	9	Jiangsu	0.3%	0.9%
9	8	Heilongjiang	0.3%	0.9%
10	14	Zhejiang	0.2%	0.8%
11	18	Hebei	0.2%	0.7%
12	10	Xinjiang	0.3%	0.7%
13	31	Chongqing		0.6%
14	20	Shandong	0.2%	0.6%
15	16	Hunan	0.2%	0.6%
16	13	Shanxi	0.2%	0.6%
17	17	Jiangxi	0.2%	0.6%
18	12	Guangdong	0.2%	0.6%
19	11	Fujian	0.2%	0.6%
20	19	Gansu	0.2%	0.6%
21	26	Anhui	0.1%	0.5%
22	15	Ningxia	0.2%	0.5%
23	24	Inner Mongolia	0.2%	0.5%
24	27	Henan	0.1%	0.5%
25	21	Sichuan	0.2%	0.5%
26	22	Hainan	0.2%	0.4%
27	25	Qinghai	0.2%	0.4%
28	28	Guangxi	0.1%	0.4%
29	29	Yunnan	0.1%	0.3%
30	30	Guizhou	0.1%	0.3%
31	23	Tibet	0.2%	0.3%

Source: China Statistical Yearbook 1997 (tables 18-26, 3-3) and 2003 (tables 20-26, 4-3)
Note: Chongqing is included in Sichuan in 1995.

Table A.3. 16 Number of Institutes of Higher Education by Province, 1995 and 2002

Ranking		Province	Higher institutes	
2002	1995		1995	2002
1	1	Jiangsu	67	93
2	8	Hebei	47	75
3	7	Shandong	48	75
4	5	Hubei	56	73
5	13	Guangdong	42	71
6	4	Liaoning	61	67
7	6	Henan	50	65
8	2	Beijing	65	62
10	16	Anhui	35	61
9	15	Zhejiang	37	61
11	9	Hunan	47	60
12	3	Sichuan	64	57
13	10	Shaanxi	46	52
14	11	Shanghai	45	50
15	14	Heilongjiang	38	47
16	17	Jiangxi	31	47
17	12	Jilin	43	40
18	20	Shanxi	26	39
19	23	Tianjin	21	37
20	19	Guangxi	27	36
21	18	Fujian	30	33
22	22	Guizhou	22	32
23	21	Yunnan	26	31
24	31	Chongqing		29
25	26	Gansu	17	25
26	24	Xinjiang	21	22
27	25	Inner Mongolia	19	21
28	28	Ningxia	7	12
29	27	Qinghai	7	11
30	29	Hainan	5	9
31	30	Tibet	4	3

Source: China Statistical Yearbook 1997 (table 18-22) and 2003 (table 20-22)
Note: Chongqing is included in Sichuan in 1995.

Table A.3. 17 Higher Education Enrolment by Province

1995 and 2002

Ranking		Province	Student Enrolment	
2002	1995		1995	2002
1	1	Jiangsu	208,620	700,210
2	3	Hubei	182,703	585,023
3	6	Shandong	160,398	583,601
4	11	Hebei	126,290	472,966
5	12	Henan	122,388	467,963
6	7	Guangdong	151,788	467,807
7	5	Liaoning	179,412	450,536
8	9	Hunan	130,363	419,437
9	2	Sichuan	200,862	412,357
10	10	Shaanxi	128,285	411,619
11	4	Beijing	182,173	395,713
12	15	Zhejiang	92,857	393,145
13	13	Heilongjiang	113,523	334,627
14	8	Shanghai	144,082	331,649
15	16	Anhui	86,039	330,112
16	17	Jiangxi	81,999	266,251
17	14	Jilin	100,785	264,672
18	20	Shanxi	67,420	208,350
19	31	Chongqing		200,111
20	18	Fujian	71,686	197,330
21	19	Tianjin	68,080	196,892
22	21	Guangxi	60,032	186,324
23	22	Yunnan	51,427	143,419
24	23	Gansu	45,480	143,009
25	24	Xinjiang	44,409	132,336
26	26	Guizhou	34,676	122,742
27	25	Inner Mongolia	36,715	120,782
28	27	Hainan	12,041	34,711
29	28	Ningxia	10,686	29,301
30	29	Qinghai	7,332	22,198
31	30	Tibet	3,878	8,438

Source: China Statistical Yearbook 1997 (table 18-26) and 2003 (table 20-26)
Note: Chongqing is included in Sichuan in 1995

Table A.3. 18 Educational Funds per Capita by Province, 1996 and 2001

Ranking		Province	Yuan	
2001	1996		1996	2001
1	1	Beijing	749.1	2308.2
2	3	Tianjin	381.3	1437.7
3	20	Hebei	156.2	855.8
4	13	Shanxi	180.9	613.4
5	17	Inner Mongolia	172.3	541.4
6	10	Liaoning	216.3	500.0
7	11	Jilin	212.9	458.3
8	14	Heilongjiang	180.3	421.8
9	2	Shanghai	694.4	406.3
10	8	Jiangsu	233.3	391.8
11	6	Zhejiang	239.0	390.8
12	28	Anhui	117.5	374.3
13	7	Fujian	236.6	370.1
14	29	Jiangxi	103.6	346.5
15	16	Shandong	173.8	333.2
16	24	Henan	140.6	322.4
17	15	Hubei	175.0	318.6
18	22	Hunan	154.0	314.6
19	4	Guangdong	324.1	302.6
20	25	Guangxi	140.1	299.2
21	9	Hainan	219.6	280.2
22	31	Chongqing	-	270.0
23	27	Sichuan	117.9	268.6
24	30	Guizhou	71.4	266.7
25	18	Yunnan	163.5	265.6
26	12	Tibet	205.3	235.9
27	21	Shaanxi	155.4	234.8
28	26	Gansu	122.9	234.6
29	19	Qinghai	156.9	212.1
30	23	Ningxia	152.7	205.0
31	5	Xinjiang	258.1	177.1

Source: China Statistical Yearbook 1997 (tables 18-36, 3-3, 2-11) and 2003 (tables 20-35, 4-3, 3-8)
Note: Chongqing is included in Sichuan in 1996.

Table A.3. 19 Profile of Surveyed Manufacturing Enterprises, 2004

	Total	Percent			
		All	Food	Machinery	Pharmaceutical
General					
Located in X'ian and surroundings	32	35.6	36.7	16.7	53.3
Located in prefecture-level city	54	60	56.7	76.7	46.7
Located in urban areas	86	95.6	93.3	93.3	100
Established since 1994 (⩽10 yrs)	50	56.2	63.3	24.1	80
Established since 1984 (11-20 yrs)	13	14.6	13.3	20.7	10
Established since 1974 (21-30 yrs)	1	1.1	0	3.4	0
Established before 1974(>30 yrs)	25	28.1	23.3	51.7	10
Ownership and Legal Status					
Not part of other companies	58	64.4	60	63.3	70
Publicly listed company	1	0	3.3	0	0
Private held, limited company	40	56.7	30	46.7	56.7
Partnership	1	0	3.3	0	0
Sole proprietorship	13	13.3	23.3	6.7	13.3
Cooperative	3	6.7	3.3	0	6.7
Other	32	23.3	36.7	46.7	23.3
Foreign participation [b]	13	44	46.3	0	42.9
State participation [c]	40	66	71.1	72.9	46
Originally state-owned	39	43.3	33.3	60	36.7
Principal owner also manager/director	77	85.6	86.7	90	80
Percent owned by principal owner	88	77.1	79.8	82.8	69.1
Export-oriented, 2003	22	22.4	13.3	43.3	16.7
Operating or parent in other country	12	13.3	10	10	20
Products					
Just one product	25	27.8	50	20	13.3
More than 4 products	5	5.6	16.7	0	0
Manufacturing intermediate products		16.5	16.6	20.6	12.2
Manufacturing final products		83.5	83.4	79.4	87.8
Manufacturing final product by size					
0- 49		76.4	74.2	75.7	100.0
50- 99		87.3	75.0	100.0	90.0
100-199		85.6	94.3	70.0	85.7
200-499		80.6	80.0	78.0	82.9
500+		86.1	100.0	79.0	98.8
Distribution by employment size, 2003					
0- 49	14	15.5	33.3	10.0	3.3
50- 99	11	12.2	13.3	10.0	13.3
100-199	25	27.8	23.3	13.3	46.7
200-499	17	18.9	16.7	16.7	23.3
500+	23	25.5	13.3	50.0	13.3
Average employment/enterprise, 2003		412	197	612	428
Total enterprises	90	100.0	30	30	30
0- 49	14	15.5	10	3	1
50- 99	11	12.2	4	3	4
100-199	25	27.8	7	4	14
200-499	17	18.9	5	5	7
500+	23	25.5	4	15	4

Source: NDRC/UNIDO Shaanxi Enterprise Survey 2004.

Table A.3. 20 Performance of Surveyed Manufacturing Enterprises, 2004

	Total	Average	Percent			
			All	Food	Machinery	Pharmaceutical
a. Sales (million yuan) & growth rate						
2001	2529.7	36.1				
2002	2757	35.8	14.8	20.6	16.3	8.6
2003	3660.3	42.6	11.3	9.3	7.2	16.9
Average growth rate, 2001-03			13.1	15	11.8	12.8
2001-2003 Growth rate p.a. by size		(2003, 000)				
0- 49		767	12.6			
50- 99		7,774	48.7			
100-199		18,605	16.2			
200-499		49,364	20.6			
500+		88,825	22.2			
b. Employment & growth rate						
2001	34835	420				
2002	35563	404	4.2	7.2	1.5	7.1
2003	37076	412	5.4	7.4	2	6.8
Average growth rate, 2001-03			4.9	7.3	1.8	7
2001-2003 Growth rate p.a. by size		(2003)				
0- 49		20	9.6			
50- 99		80	23.3			
100-199		128	17.0			
200-499		321	2.4			
500+		1,186	4.9			
c. Labour productivity growth rate (b-a)						
2001						
2002			11.3	16.8	15.3	3.1
2003			5.1	2.7	3.3	8.9
Average growth rate, 2001-03			8.2	9.8	9.3	6
d. Exports (million yuan) & growth rate						
2001 (17 firms)	51.6	3				
2002 (21firms)	58.0	2.8	63.2	17.6	67.3	64.6
2003 (22 firms)	96.6	4.4	-3.6	89.1	8.5	-38.1
Average growth rate, 2001-03			29.8	53.3	37.9	13.2
2001-2003 Growth rate p.a. by size		(2003, 000)				
0- 49		2,502	n.a.			
50- 99		4,172	n.a.			
100-199		1,108	34.2			
200-499		12,533	79.4			
500+		4,509	61.2			
e. Exports as % of sales						
Total number of enterprises	90		100	33.3	33.3	33.3

Source: same as annex table A.3.19

Table A.3. 21 Inputs and Product Market of Surveyed Manufacturing Enterprises, 2004

	Total	Percent			
		All	Food	Machinery	Pharmaceutical
Share sold in different markets, 2003		100	100	100	100
This province		36.5	65.1	20.2	24.1
Other provinces		55.2	22.6	75.5	67.6
Exported		8.3	12.3	4.3	8.3
Export Destination, 2003 (%)		100	100	100	100
Industrialized countries		33.4	75.7	16.5	52.5
East Asia/Southeast Asia		45.8	7	55	48.3
Developing countries		27.8	17.3	33.1	20
(Number of reporting enterprises)		-21	-3	-13	-5
% Inputs & Supplies from Province					
Raw materials/intermediate inputs		64.8	76.8	55.2	62.5
Equipment & machinery		34.8	38.3	34.7	31.3
Services		67.7	65.9	74.8	62.5
Labour		92.4	95.4	89.5	92.1
Working capital		94.5	96.6	96.7	90.2
% Inputs & Supplies from other Provinces					
Raw materials/intermediate inputs		32.4	22.9	39	35.2
Equipment & machinery		57	47.5	59.5	64.1
Services		30.6	30.8	24.2	36.7
Labour		7.5	4.6	10.5	7.5
Working capital		3.6	1	3.3	6.5
Total number of enterprises	90	100	33.3	33.3	33.3

Source: same as annex table A.3.19

Table A.3. 22 Technological Features of Surveyed Es in Shaanxi Province

	Total	Percent			
		All	Food	Machinery	Pharmaceutical
New products/models in last 3 years	43	47.8	33.3	43.3	66.7
Share of top 3 enterprises: New products		24.9			
Average number of new products/enterprise	6.4		3.1	4.7	9.3
% Firms with no new products/technology	47	52.2	66.7	56.7	33.3
Firms with patents or trademarks	80	88.9	83.3	86.7	96.7
Licensing agreements with foreign firms	9	10	0	13.3	16.7
Technology level of Machinery					
Manually operated		44.6	44.8	63.3	25.5
Automatic/computer controlled equipment		55.4	55.2	36.7	74.5
Enterprises using Internet					
Email	71	78.9	66.7	76.7	93.3
Website, Chinese language	60	66.7	43.3	73.3	83.3
Website, English language	22	24.4	16.7	26.7	30
International standards					
ISO 9000 (quality standards)	67	74.4	56.7	80	86.7
ISO 14000 (environmental standards)	23	25.6	13.3	26.7	36.7
Research and Development					
Average personnel	37.2		5.2	51.9	54.4
Eng./science degree staff (%R&D staff)	20		4.4	33.4	34.4
Average expenditure (1000Yuan), % sales	2120.8	3.9	1.3	4.3	6.3
Total number of enterprises	90		30	30	30

Source: same as annex table A.3.19

Table A.3. 23 Technology Acquisition Channels of Surveyed SMEs in Shanxi Province

	Total	Percent		
		Food	Machinery	Pharmaceutical
Number				
1. New machinery and equipment	68	22	21	25
2. Hiring key technical personnel	53	10	20	23
3. Licensing/turnkey, international sources	2	0	2	0
4. Licensing/turnkey, domestic sources	14	1	6	7
5. Developed or adapted locally	62	16	26	20
6. Transferred from parent company	10	6	1	3
7. Developed in cooperation with clients	17	2	9	6
8. Developed with equipment suppliers	10	6	1	3
9. Cooperated with similar firms	14	6	3	5
10. Business or industry association	12	4	5	3
11. Trade fairs	17	3	9	5
12. Study tours	17	3	9	5
13. Consultants, private technical services	9	1	3	5
14. Universities and research institutes	26	3	8	15
15. Publications, technical literature	4	0	1	3
16. Other	0	0	0	0
By size (Percent)	Univ.	Priv. Cslts.	Ind. Assoc.	Trade Fair
0- 49	7.0	-	7.0	7.0
50- 99	27.2	-	-	0.9
100-199	24.0	20.0	8.0	16.0
200-499	41.1	11.0	11.0	29.0
500+	39.1	8.7	30.0	26.1
Percent				
1. New machinery and equipment	75.6	73.3	70	83.3
2. Hiring key technical personnel	58.9	33.3	66.7	76.7
3. Licensing/turnkey, international sources	2.2	0	6.7	0
4. Licensing/turnkey, domestic sources	15.6	3.3	20	23.3
5. Developed or adapted locally	68.9	53.3	86.7	66.7
6. Transferred from parent company	11.1	20	3.3	10
7. Developed in cooperation with clients	18.9	6.7	30	20
8. Developed with equipment suppliers	11.1	20	3.3	10
9. Cooperated with similar firms	15.6	20	10	16.7
10. Business or industry association	13.3	13.3	16.7	10
11. Trade fairs	18.9	10	30	16.7
12. Study tours	18.9	10	30	16.7
13. Consultants, private technical services	10	3.3	10	16.7
14. Universities and research institutes	28.9	10	26.7	50
15. Publications, technical literature	4.4	0	3.3	10
16. Other	0	0	0	0
Total number of enterprises	90	30	30	30

Source: same as annex table A.3.19

Table A.3. 24 Education Level and Training in Surveyed Es in Shaanxi Province

	Average	Percent			
		All	Food	Machinery	Pharmaceutical
Education level	403	100	100	100	100
Only primary school	7	1.7	5.6	3.3	1.4
Secondary school	228	56.6	67.5	69.7	39.8
University or tertiary education	168	41.7	26.9	27	58.8
Formal training of employees		100	100	100	100
Classroom, workshop, laboratory		55.2	51.9	41	72.7
Training outside enterprise		8.9	10.5	3.8	12.3
No formal training		36	37.6	55.3	15
Training expenditure(1000 yuan)	322				
% of sales (2003)		0.8	0.5	0.7	1.0
Education level of top manager					
Secondary school		14.4	26.7	13.3	3.3
University degree		85.6	73.3	86.7	96.7
Founders' previous experience					
Family business		18.9	10	20	26.7
Other Enterprises		43.3	50	40	40
Large national enterprise		37.8	23.3	43.3	46.7
Foreign enterprise		8.9	6.7	10	10
Government employment		12.2	13.3	13.3	10
University or research institute		15.6	10	10	26.7
(Responding firms)		-90	-30	-30	-30
Importance of founders' previous exp.					
Family business		14.7	4.2	14.2	22.5
Other Enterprises		30.3	34.2	26.7	27.5
Large national enterprise		28.6	11.7	34.2	35
Foreign enterprise		5.8	0.8	7.5	7.5
Government employment		7.8	10	7.5	5.8
University or research institute		12.5	6.7	8.3	22.5
(Responding firms)		-90	-30	-30	-30
Total number of enterprises	90		30	30	30

Source: same as annex table A.3.19

Table A.3. 25 Institutional Support and Linkages

	Total	Percent			
		All	Food	Machinery	Pharmaceutical
Firms receiving institutional support	63	70.0	56.7	76.7	76.7
Firms not receiving institutional support	27	30.0			
0- 49	9	64.3	60.0	66.7	100.0
50- 99	2	18.2	50.0	-	-
100-199	8	32.0	42.9	50.0	21.4
200-499	4	23.5	-	20.0	42.9
500+	4	17.4	50.0	13.3	-
Reasons for not receiving support	26	100			
All Sizes					
No support exists for business	13	45.5	66.7	57.1	14.3
Tried but did not work	8	18.2	16.7	14.3	71.4
Too time consuming	3	18.2	8.3	14.3	14.3
Too bureaucratic	2	9.1	8.3	14.3	
(Responding firms)	26				
0-49	9				
No support exists for business	6	66.7	83.3	-	100.0
Tried but did not work	2	2.2	16.7	50.0	-
Too time consuming	1	11.1	-	50.0	-
Too bureaucratic	-	-	-	-	-
50-99					
No support exists for business	1				
Tried but did not work					
Too time consuming					
Too bureaucratic					
100-199					
No support exists for business	3	37.5	33.3	100.0	66.7
Tried but did not work	2	25.0	-	-	33.3
Too time consuming	3	37.5	66.7	-	-
Too bureaucratic	-	-	-	-	-
200-499					
No support exists for business	1	25.0	-	100.0	-
Tried but did not work	3	75.0	-	-	100.0
Too time consuming		-	-	-	-
Too bureaucratic		-	-	-	-
500+					
No support exists for business	2	50.0	50.0	50.0	-
Tried but did not work	1	25.0	50.0	-	-
Too time consuming		-	-	-	-
Too bureaucratic		25.0	-	50.0	-
Total number of enterprises	90		30	30	30

Source: same as annex table A.3.19

Table A.3. 26 Interaction with Other Firms, Agencies and Institutions

	Total	Percent			
		All	Food	Machinery	Pharma.
Regular contact					
Customers	43	47.8	46.7	63.3	33.3
Suppliers	32	35.6	33.3	46.7	26.7
Public finance institutions	15	16.7	3.3	13.3	33.3
Government agencies	15	16.7	10.0	16.7	23.3
Industry or business associations	9	10.0	6.7	13.3	10.0
Local institutions	6	6.7	3.3	3.3	13.3
Government Laboratories	5	5.6		6.7	10.0
Universities or research institutes	4	4.4	3.3		10.0
Competitors	3	3.3	3.3	6.7	
Private finance institutions	1	1.1		3.3	
Public training institutions	1	1.1	3.3		
Private training institutions	1	1.1	3.3		
Frequent contact					
Suppliers	46	51.1	46.7	46.7	60.0
Customers	41	45.6	53.3	30.0	53.3
Government agencies	41	45.6	40.0	43.3	53.3
Public finance institutions	33	36.7	40.0	40.0	30.0
Competitors	19	21.1	26.7	20.0	16.7
Industry or business associations	15	16.7	10.0	26.7	13.3
Universities or research institutes	15	16.7	6.7	20.0	23.3
Local institutions	12	13.3	6.7	10.0	23.3
Public training institutions	6	6.7	3.3	3.3	13.3
Government Laboratories	5	5.6	3.3	3.3	10.0
Private training institutions	4	4.4		3.3	10.0
Private finance institutions	3	3.3		6.7	3.3
Private technical services/consultants	3	3.3		6.7	3.3
Order of Importance (scale 0 to 100)					
Customers		83.9	86.7	87.5	77.5
Suppliers		79.2	77.5	83.3	76.7
Government agencies		60.8	53.3	58.3	70.8
Public finance institutions		55.8	45.0	54.2	68.3
Competitors		43.9	46.7	48.3	36.7
Industry or business associations		43.1	30.8	52.5	45.8
Universities or research institutes		35.8	20.0	36.7	50.8
Local institutions		31.4	17.5	27.5	49.2
Public training institutions		23.9	15.8	19.2	36.7
Private technical services/consultants		19.2	14.2	20.0	23.3
Government Laboratories		16.7	6.7	12.5	30.8
Private training institutions		15.0	8.3	11.7	25.0
Private finance institutions		11.7	8.3	14.2	12.5

Source: same as annex table A.3.19

Table A.3. 27 Interaction with Other Firms, Agencies and Institutions by Firm Size (Order of Importance, Scale 0 to 100)

	0-49	50-99	100-199	200-499	500+	All
Customers	76.8	84.1	83.0	88.2	85.9	83.9
Suppliers	80.4	70.5	81.0	79.4	80.4	79.2
Government agencies	46.4	50.0	41.0	44.1	42.4	60.8
Public finance institutions	33.9	45.5	61.0	63.2	63.0	55.8
Competitors	12.5	11.4	10.0	19.1	7.6	43.9
Industry or business associations	1.8	29.5	31.0	42.6	42.4	43.1
Universities or research institutes	25.0	65.9	66.0	67.6	69.6	35.8
Local institutions		20.5	20.0	23.5	16.3	31.4
Public training institutions	25.0	45.5	36.0	41.2	62.0	23.9
Private technical services/consultants	3.6	22.7	29.0	25.0	30.4	19.2
Government Laboratories	3.6	18.2	15.0	17.6	18.5	16.7
Private training institutions	3.6	36.4	38.0	33.8	54.3	15.0
Private finance institutions	16.1	20.5	18.0	26.5	16.3	11.7

Source: same as annex table A.3.19

ANNEX TABLES TO CHAPTER 4

Table A.4. 1 Business Costs in Selected Eastern and Western Regions of China, June 2004 (yuan)

Cost item	Unit	Shanghai	Jiangsu	Zhejiang	Average 3 regions		Shaanxi	Sichuan	Yunnan	Average 3 prov.		% West
					Yuan	US$				Yuan	US$	East
US$ 1 = yuan	***8.3***											
1 Total Labour Costs												
1.1 Base wage & salaries (5 years' exp., market rate)												
1.1.1 Official minimum wage	Per mth	635	550	570	585	70	320	360	320	333	40	57
1.1.2 Unskilled worker	"	900	575	610	695	84	500	550	400	483	58	70
1.1.3 Assembler/Operator	"	1,200	650	700	850	102	700	675	525	633	76	75
1.1.4 Tradesmen (electrician, welder, carpenter)	"	1,500	850	900	1,083	131	900	800	750	817	98	75
1.1.5 Technician (diploma-level)	"	1,700	1,050	1,150	1,300	157	1,100	1,050	1,000	1,050	127	81
1.1.6 Production Supervisor/Team Leader	"	1,900	1,250	1,300	1,483	179	1,350	1,400	1,500	1,417	171	96
1.1.7 Senior Production Supervisor, Floor manager	"	2,200	1,425	1,475	1,700	205	1,650	1,700	1,800	1,717	207	101
1.1.8 Professional (scientist, engineer, accountant)	"	2,600	1,650	1,700	1,983	239	1,950	2,025	2,200	2,058	248	104
1.1.9 Senior Manager (Production, finance, admin)	"	2,900	1,900	1,930	2,243	270	2,250	2,350	2,500	2,367	285	105
1.1.10 Factory Manager / General Manager	"	3,850	2,500	2,650	3,000	361	2,700	2,750	2,800	2,750	331	92
1.2 Other labour costs												
1.2.1 Official working hours per week	Hours	40	40	40	40		40	40	40	40		100
1.2.2 Overtime (multiple of basic wage per hour)	Number	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		100
1.2.3 Compulsory benefits (health, acc. ins., unemployment benefits)	% payroll	3.0	3.0	3.8	3.3		3.5	3.2	3.4	3.4		104
1.2.4 Number of holidays per year	Days	10	10	10	10		10	10	10	10		100
1.2.5 Annual vacation	"	10	10	10	10		7	7	7	7		70
1.2.6 Cost of dismissal, fixed workers	Mth/yr	1	1	1	1		1	1	1	1		100
2 Facility Costs												
2.1 Start-up costs												
2.1.1 Company registration (legal fees)		0.8	0.8	0.8	0.8	0.1	0.8	0.8	0.8	0.8	0.1	100
2.1.2 Industrial license fees		7,000	3,000	3,500	4,500	542	/	/	/			

Table A.4. 1 Business Costs in Selected Eastern and Western Regions of China, June 2004 (yuan)

	Cost item	Unit	Shanghai	Jiangsu	Zhejiang	Average 3 regions		Shaanxi	Sichuan	Yunnan	Average 3 prov.		% West
						Yuan	US$				Yuan	US$	East
	US$ 1 = yuan	***8.3***											
2.2	Industrial land (suburban area, incl. tax, ind. site)	Per ha	2,400,000	965,000	1,050,000	1,471,667	177,309	685,000	700,000	600,000	661,667	79,719	45
2.3	Industrial construction (built-to-suit, single-level, turnkey, 10% fin. office space)	Per m2	1,300	1,200	1,200	1,233	149	858	850	1,010	906	109	
2.4	Office lease (suburban office park, incl. op. costs, plus ins. passed on to tenant)	m2/d	4.7	n.a.	2.7	3.7	0.44	3.0	2.7	2.7	2.8	0.34	76
2.5	Warehouse space	m2/d	3.15	1.75	2.00	2.30	0.28	1.50	1.25	1.20	1.32	0.16	57
3	Transport Costs (full load delivery logistics)												
3.1	Road freight per 20 ton container, nearest international port		650	1,900	1,950	1,500	181	2,262	5,280	1,767	3,103	374	207
3.2	Sea freight per container, California	"	20,500	20,500	20,500	20,500	2,470	20,500	20,500	20,500	20,500	2,470	100
3.3	Total transp. costs to LA (road, sea, ins., handl.)	"	22,400	24,000	24,500	23,633	2,847	24,355	27,585	23,826	25,255	3,043	107
3.4	Air freight per kg, California	Per kg	28	32	32	30	4	48	56	50	51	6	169
3.5	Passenger return flight to Beijing	Return	1,700	850	1,600	1,383	167	2,100	2,880	3,620	2,867	345	207
4	Utility Costs												
4.1	Electricity, industrial use	Kwh	0.56	0.62	0.65	0.61	0.07	0.34	0.44	0.30	0.36	0.04	59
4.2	Water, industrial use	Per ton	1.35	1.10	1.20	1.22	0.15	1.86	1.40	2.50	1.92	0.23	158
4.3	Natural gas, industrial use	Per m3	7.40	2.98	3.10	4.49	0.54	0.95	1.02	0.89	0.95	0.11	21
4.4	Kerosene or industrial fuel	Per litre		3.08	3.25	3.17	0.38	3.00	3.22	3.43	3.22	0.39	102
4.5	Telephone (business hours, off-peak)												
4.5.1	Local call	Per min	0.11	0.10	0.10	0.10	0.01	0.1	0.1	0.1	0.10	0.01	97
4.5.2	Inter-city	Per min	0.70	0.70	0.80	0.73	0.09	0.7	0.7	0.7	0.70	0.08	95
4.5.3	International (USA)	Per min	8.00	8.00	8.00	8.00	0.96	8.0	8.0	8.0	8.00	0.96	100
5	Financing Costs												
5.1	Cash deposit rate	% p.a.	1.98	1.98	1.98	1.98		1.71	1.71	1.71	1.71		86
5.2	Secured commercial borrowing rate	"	5.31	5.31	5.31	5.31		5.26	5.26	5.26	5.26		99

Table A.4. 1 Business Costs in Selected Eastern and Western Regions of China, June 2004 (yuan)

Cost item	Unit	Shanghai	Jiangsu	Zhejiang	Average 3 regions		Shaanxi	Sichuan	Yunnan	Average 3 prov.		% West
					Yuan	US$				Yuan	US$	East
US$ 1 = yuan	***8.3***											
6 Non Income-based Taxes												
6.1 Annual Property Tax												
6.1.1 Tax on land	Per ha	/	/	/			2.3	3.1	1.7	2.4		
6.1.2 Tax on building (owned facilities)	Per m2	/	/	/			0.8	0.8	0.8	0.8		
6.1.3 Leased facilities (if not included in rent)	Per m2	/	/	/			/	/	/			
6.2 Capital and Transaction Taxes												
6.2.1 Capital tax (if applicable)	%		/	/			/	/	/			
6.2.2 Non-refundable sales tax (if not exempted)	"		/	/			/	/	/			
6.2.3 Refundable tax (VAT or GST)	"	17	17	17	17		17	17	17	17		100
6.2.4 Local business taxes (if any, give estimates)	"	11	5	6	7		/	/	/			
7 Income Taxes												
7.1 Corporate income tax												
7.1.1 National, basic rate	%	33	33	33	33		33	33	33	33		100
7.1.2 Below 30,000	"	18	18	18	18		18	18	18	18		100
7.1.3 30,000-100,000	"	27	27	27	27		27	27	27	27		100
7.1.4 Industrial parks							20	22	20	21		
8 Personal Costs												
8.1 House or apartment rental (2-bedroom furnished, expatriate staff)	per mth	6,500	3,900	4,050	4,816.7	580	3,000	2,600	2,000	2,533.3	305	53
8.2 International schools												
8.2.1 Primary school (annual fee/student)	per year	100,000	40,000	41,500	60,500	7,289	33,000	35,000	34,000	34,000	4,096	56
8.2.2 Junior secondary school (annual fee/student)	"	130,000	47,500	32,650	70,050	8,440	37,000	40,000	38,000	38,333	4,618	55
8.2.3 Senior secondary school (annual fee/student)	"	150,000	57,500	60,500	89,333	10,763	/	45,000	43,000	44,000	5,301	49

Source: Business costs surveys commissioned by NDRC/UNIDO and implemented by Business School, Renmin University of China, for western regions (Shaanxi, Sichuan and Yunnan) and Mark Yu, Consultant, for eastern regions (Shanghai, Jiangsu and Zhejiang), July 2004.

Table A.4. 2 Factors Constituting Severe or Major Obstacle to Operation and Growth

	Total	Percent			
		All	Food	Machinery	Pharmaceutical
Severe Obstacle (Enterprises)					
1.Access to financing	25	27.8	13.3	53.3	16.7
2.Cost of financing	9	10.0	3.3	16.7	10.0
3.Economic policy uncertainty	8	8.9	3.3	16.7	6.7
4.Access to land	6	6.7		13.3	6.7
5. Tax rates	6	6.7		13.3	6.7
6.Corruption	6	6.7	3.3	3.3	13.3
7.Transportation	5	5.6	3.3	10.0	3.3
8.Macroeconomic instability	5	5.6		13.3	3.3
9.Tax administration	4	4.4		3.3	10.0
10.Electricity	3	3.3	3.3	3.3	3.3
11.Business licensing and operating permits	3	3.3			10.0
12.Crime, theft and disorder	3	3.3		3.3	6.7
13.Anti-competitive practices	3	3.3		6.7	3.3
14.Customs and trade regulations	2	2.2			6.7
15.International standard housing/education facilities	2	2.2		6.7	
16.Telecommunications	1	1.1	3.3		
17.Labour regulations	1	1.1		3.3	
18.Skills and education	1	1.1	3.3		
Major Obstacle (number)					
1.Access to financing	19	21.1	30.0	20.0	13.3
2. Tax rates	15	16.7	20.0	16.7	13.3
3.Cost of financing	15	16.7	16.7	23.3	10.0
4.Macroeconomic instability	13	14.4	10.0	20.0	13.3
5.Economic policy uncertainty	12	13.3	10.0	20.0	10.0
6.Skills and education	11	12.2	6.7	13.3	16.7
7.Transportation	10	11.1	10.0	16.7	6.7
8.Corruption	9	10.0	6.7	10.0	13.3
9.Tax administration	5	5.6		13.3	3.3
10.Crime, theft and disorder	5	5.6	6.7	3.3	6.7
11.Anti-competitive practices	5	5.6	10.0	3.3	3.3
12.Business licensing and operating permits	4	4.4	6.7	3.3	3.3
13.Electricity	3	3.3	3.3	3.3	3.3
14.Access to land	3	3.3	3.3	3.3	3.3
15.Labour regulations	3	3.3		6.7	3.3
16.Customs and trade regulations	2	2.2	6.7		
17.International standard housing/education facilities	2	2.2	3.3		3.3
18.Telecommunications	1	1.1		3.3	
Importance (Scale 0 to 100) [a]					
1.Access to financing		57.2	51.7	75.0	45.0
2.Cost of financing		38.9	34.2	45.8	36.7
3.Economic policy uncertainty		36.9	32.5	45.8	32.5
4.Macroeconomic instability		36.1	29.2	45.8	33.3
5. Tax rates		33.9	29.2	38.3	34.2
6.Corruption		31.1	27.5	27.5	38.3
7.Transportation		30.8	27.5	40.8	24.2
8.Skills and education		28.6	25.0	32.5	28.3
9.Electricity		24.4	25.0	25.8	22.5
10.Tax administration		23.6	17.5	30.0	23.3
11.Crime, theft and disorder		22.5	20.0	20.8	26.7
12.Telecommunications		22.2	27.5	15.8	23.3
13.Anti-competitive practices		20.8	17.5	21.7	23.3
14.Access to land		20.6	17.5	21.7	22.5
15.Business licensing and operating permits		14.4	13.3	9.2	20.8
16.Labour regulations		12.5	5.0	22.5	10.0
17.Customs and trade regulations		7.5	6.7	5.0	10.8
18.International standard housing/education facilities		5.3	3.3	7.5	5.0
Total number of enterprises	90		30	30	30

Source: NDR/UNIDO Shaanxi Enterprise Survey 2004.
Note:
a. Scale of 0 to 4 (0= no value, 1=minor value, 2= moderate value, 3= major value and 4= critical value) converted to scale of 0 to 100.

Table A.4. 3 Obstacles to Operation and Growth by Firm Size (Order of Importance, Scale 0 to 100)

	0-49	50-99	100-199	200-499	500+	All
Telecommunications	19.6	18.2	25.0	29.4	17.4	22.2
Electricity	14.3	20.5	33.0	25.0	22.8	24.4
Transportation	14.3	22.7	27.0	42.6	40.2	30.8
Access to land	14.3	6.8	27.0	22.1	22.8	20.6
Tax rates	23.2	31.8	33.0	35.3	41.3	33.9
Tax administration	14.3	29.5	23.0	20.6	29.3	23.6
Customs and trade regulations	0.0	13.6	4.0	14.7	7.6	7.5
Labour regulations	0.0	13.6	12.0	16.2	17.4	12.5
Skills and education	10.7	36.4	32.0	29.4	31.5	28.6
Business licensing and operating permits	17.9	29.5	12.0	22.1	2.2	14.4
Access to financing	55.4	56.8	56.0	55.9	60.9	57.2
Cost of financing	39.3	38.6	39.0	44.1	34.8	38.9
Economic policy uncertainty	23.2	38.6	34.0	45.6	41.3	36.9
Macroeconomic instability	19.6	38.6	42.0	32.4	41.3	36.1
Corruption	17.9	40.9	41.0	29.4	25.0	31.1
Crime, theft and disorder	16.1	27.3	23.0	20.6	25.0	22.5
Anti-competitive practices	7.1	20.5	25.0	25.0	21.7	20.8
International standard housing/ education facilities	0.0	15.9	0.0	7.4	7.6	5.3

Source: NDR/UNIDO Shaanxi Enterprise Survey 2004

Table A.4. 4 Role of Business and Industry Associations in Shaanxi, 2004

	Total	Percent			
		All	Food	Machinery	Pharmaceutical
Membership of industry associations by size	65	72.2	60.0	80.0	76.7
0-49 workers	5	35.7	40.0	33.3	n.a.
50-99 workers	9	81.8	75.0	66.7	100.0
100-199 workers	18	72.0	57.1	75.0	78.6
200-499 workers	13	76.5	60.0	100.0	71.4
500+ workers	20	87.0	100.0	86.7	75.0
Share of firms considering service valuable[1]					
Domestic products and input markets		31.6	36.1	31.5	28.3
Accrediting standards or quality		37.1	33.3	40.3	37.5
Information on govt policy, regulation		35.1	33.3	44.0	28.3
International products and markets		25.8	26.4	32.9	19.8
Lobbying government		28.7	23.6	41.3	21.7
Resolution of disputes		19.5	16.7	27.8	15.2
Order of Importance of service (Scale 0-100) [2]					
Accrediting standards or quality		37.1	33.3	40.3	37.5
Information on govt policy, regulation		35.1	33.3	44.0	28.3
Domestic products and input markets		31.6	36.1	31.5	28.3
Lobbying government		28.7	23.6	41.3	21.7
International products and markets		25.8	26.4	32.9	19.8
Resolution of disputes		19.5	16.7	27.8	15.2
Total number of enterprises	90		30	30	30

Source: NDR/UNIDO Shaanxi Enterprise Survey 2004

Note:

1. Services rated either of major value or of critical value.
2. Scale of 0 to 4 (0= no value, 1=minor value, 2= moderate value, 3= major value and 4= critical value) converted to scale of 0 to 100.

ANNEX TABLES TO CHAPTER 5

Table A.5. 1 Trends in Manufacturing Enterprises China & Shaanxi, 1998, 2002 & 2003

	China				Shaanxi			
	1998	2002	2003	98-02	1998	2002	2003	98-02
Enterprises	1,309,299	1,259,474	1,298,870	-1.0	36,110	23,384	23,343	-10.3
Large								
Medium								
Small		157,097	***157,097***		1,724	1,674	1,705	-0.7
Above scale	230,798	177,528	177,528	-6.3	2,144	2,031	2,038	-1.3
Below scale	1,078,501	1,081,946	***1,121,342***	0.1	33,966	21,353	21,305	-11.0
L+M	0	20,431	***20,431***		420	357	333	-4.0
Employment	83,190,000	83,070,000	***83,070,000***	0.0	1,810,000	1,700,000	1,705,000	-1.6
Large								
Medium								
Small			23,003,700		367,070	105,365	178,011	-26.8
Above scale			48,824,500		1,159,117	677,947	749,658	-12.5
Below scale			***34,245,500***		650,883	1,022,053	955,342	11.9
L+M			25,820,800		792,047	572,582	571,647	-7.8
Value added	***26,979***	36,123	***38,433***	10.2				
Large								
Medium								
Small			11,345		8,590	11,476	10,341	7.5
Above scale			34,078		21,782	34,609	41,198	12.3
Below scale			***4,355***					
L+M		15,242	22,733		13,192	23,133	30,857	15.1
Worker/Enterprise	64	66	***64***	0.9	50	73	73	9.7
Large								
Medium								
Small			***146***		213	63	104	-26.3
Above scale			***275***		541	334	368	-11.4
Below scale			***31***		19	48	45	25.7
L+M			***1,264***		1,886	1,604	1,717	-4.0
VA/Worker	32	43	***46***	10.3	`			
Large								
Medium								
Small			49		23	109	58	46.9
Above scale			70		19	51	55	28.4
Below scale			***13***					
L+M			88		17	40	54	24.8

Source: China Statistical Yearbooks 1999 (pp. 421-433), 2003 (pp.459-469) and 2004 (pp. 513-524, p. 127).
Shaanxi Statistical Yearbook 1999 (pp. 317-336), 2003 (pp.393-340) and 2004 (pp.299-330).

Note: Change in definition in 2003:

1. Large: above 2,000 employees, annual sales revenue above 300 million yuan, gross assets above 400 million yuan;
2. Medium: employment 300-2,000, annual sales 30-300 million yuan, gross assets 40-400 million yuan.
3. Small: employment below 300; annual sales below 30 million yuan, gross assets below 40 million yuan.

Table A.5. 2 Trends in Industrial Enterprises, China and Shaanxi, 1998, 2002 & 2003

	China				Shaanxi			
	1998	2002	2003	98-02	1998	2002	2003	98-02
Enterprises	7,974,565	***7,974,565***	***7,974,565***		141,900	111,900	110,976	-5.8
Large	7,558	8,752	1,984	3.7	189	190	64	0.1
Medium	15,850	14,571	21,647	-2.1	280	228	356	-5.0
Small	141,672	158,234	172,591	2.8	2,216	2,043	2,073	-2.0
Above scale	165,080	181,557	196,222	2.4	2,685	2,461	2,493	-2.2
Below scale	7,809,485	***7,793,008***	***7,778,343***		139,215	109,439	108,483	-5.8
L+M	23,408	23,323	23,631	-0.1	469	418	420	-2.8
Employment	93,230,000	91,550,000	***91,550,000***	-0.5	2,071,000	1,979,000	2,469,000	-1.1
Large		19,060,000	13,070,000		708,062	572,495	353,266	-5.2
Medium		8,050,000	19,180,000		258,232	161,307	408,146	-11.1
Small		28,100,000	25,240,000		462,312	404,905	359,824	-3.3
Above scale		55,210,000	57,490,000		1,428,606	1,138,707	1,121,236	-5.5
Below scale		34,065,000	***34,060,000***		642,394	840,293	1,347,764	6.9
L+M		27,110,000	32,250,000		966,294	733,802	761,412	-6.6
Value added	33,430	46,536	53,093	8.6	44,535	69,107	83,476	11.6
Large	9,167	16,732	15,138	16.2	14,350	33,355	34,286	23.5
Medium	2,599	4,109	13,936	12.1	2,341	6,012	21,258	26.6
Small	7,656	12,154	12,917	12.2	11,126	14,000	11,891	5.9
Above scale	19,422	32,995	41,991	14.2	27,817	53,367	67,435	17.7
Below scale	14,008	13,541	11,102	-0.8	16,718	15,740	16,041	-1.5
L+M	11,766	20,841	29,074	15.4	16,691	39,367	55,544	23.9
Worker/Enterprise	12				15	18	22	4.9
Large		2,178	6,588		3,746	3,013	5,520	-5.3
Medium		552	886		922	707	1,146	-6.4
Small		178	146		209	198	174	-1.3
Above scale		304	293		532	463	450	-3.4
Below scale		***4***	***4***		5	8	12	13.6
L+M		1,162	1,365		2,060	1,756	1,813	-3.9
VA/Worker	36	51	58	9.1	22	35	34	12.9
Large		88	116	100.0	20	58	97	30.2
Medium		51	73	62.7	9	37	52	42.4
Small		43	51	44.2	24	35	33	9.5
Above scale		60	73	63.1	19	47	60	24.6
Below scale		40	***33***	28.1	26	19	12	-7.9
L+M		77	90	77.8	17	54	73	32.8

Source: same as table A.5.1.

Table A.5. 3 Profile of Surveyed SMEs in Baoji City Prefecture, 2004

	Total	Percent			
		All	Food	Machinery	Pharmaceutical
General					
Located in Baoji city & county cities	25[a]	70.5	69.3	58.3	90
Established since 1994 (10 years)	18	51.4	61.5	33.3	60.0
Ownership and legal Status					
Not part of other companies	29	82.9	92.3	83.3	70.0
Private ownership	35	100.0	100.0	100.0	100.0
Limited companies	17	48.6			
Partnerships	2	5.7			
Sole proprietors	7	20.0			
Cooperatives	6	17.1			
Other	3	8.6			
Foreign participation [b]	1	-	(33.0)	-	-
State participation [c]	3		-	(41.0)	(33.3)
Originally state-owned	12	34.3	46.2	25.0	30.0
Principal owner also manager/director	31	88.6	80.0	83.3	110.0
Percent owned by principal owner		54.0			
Export-oriented	7	20.0	0.0	25.0	50.0
Operating or parent in other country	2	5.7	0.0	8.3	10.0
Products					
Just one product	7	20.0	35.0	15.0	10.0
More than 4 products	12	35.0	10.0	40.0	80.0
Manufacturing final products	20	55.3	72.6	58.9	25.6
Manufacturing intermediate products	15	44.7	27.4	41.1	74.4
Distribution by employment size		100.0	100.0	100.0	100.0
0 - 49	11	31.4	30.8	25.0	40.0
50 - 99	10	28.6	38.5	25.0	20.0
100-199	7	20.0	23.1	16.7	20.0
200+	7	20.0	7.7	33.3	20.0
Average employment/enterprise, 2003		(125)	(107)	(137)	(133)
Total enterprises	(35)		(13)	(12)	(10)

Source: 'NDRC/UNIDO Baoji SME Survey 2004', specially commissioned and implemented by IID/NDRC and Baoji City Municipal Development and Reform Committee in October 2004.

Note:

a. Remaining 10 enterprises in rural town and village

b. Foreign shares in one enterprise only (yoghurt and cream producer, 33%)

c. Sate shares in two machinery enterprises (33% and 49%) and one pharmaceutical firm (33%)

Table A.5. 4 Sales and Employment Performance of Surveyed SMEs, 2001-2003

	Total	Average	Percent			
			All	Food	Machinery	Pharmaceutical
a. Sales (million yuan) & growth rate						
2001	410	12	-	-	-	-
2002	582	17	44.4	13.9	52.3	78.5
2003	758	22	33.7	25.2	61.5	4.7
Average growth rate, 2001-03			43.5	19.6	56.9	41.6
b. Employment & growth rate						
2001	3,401	110				
2002	3,882	114	14.5	8.7	22.4	12.0
2003	4,369	125	14.6	6.8	26.4	4.8
Average growth rate, 2001-03			14.6	7.8	24.4	8.4
c. Labour productivity growth rate (a-b)						
2001						
2002			29.9	5.2	29.9	66.5
2003			19.1	18.4	35.1	-0.1
Average growth rate, 2001-03			28.9	11.8	32.5	33.2
d. Exports (million yuan) & growth rate						
2001	105					
2002	184		127.4		117.8	137.0
2003	199		186.2		88.7	283.7
Average growth rate, 2001-03			156.8		103.2	210.3
e. Exports as % of sales (avge, 3 firms)			-	-	8.0	57.9
Total number of enterprises		(35)		(13)	(12)	(10)

Source: Same as table A.5.2

Note:

1. Sales, employment and export growth rates based on equal weight given to each enterprise regardless of size.
2. Approximate labour productivity growth rate = Sales growth rate – employment growth rate (Labour productivity growth rate based here on nominal sales/worker rather than real value-added/worker).
3. Some firms started operating in 2002 and 2003, so average growth rates for 2001-03 do not equal average for 2002-03.

Table A.5. 5 Product and Input Markets of Surveyed SMEs in Baoji City, 2004

	Total	Percent			
	All	Food	Machinery	Pharmaceutical
Share sold in different markets, 2003	100.0	100.0	100.0	100.0
This prefecture	36.6	60.3	22.9	2.8
Other prefectures	23.6	22.0	22.9	28.1
Other regions	31.3	17.7	42.3	37.1
Exported	8.5	-	1.4	33.8
Export Destination, 2003 (%)	100.0		100	100
Industrialized countries	63.5	-	55	68
East Asia/Southeast Asia	33.5	-	40	30
Developing countries	3.0	-	5	2
(Number of reporting enterprises)	(5)		(2)	(3)
% Inputs & Supplies from Province (Prefecture)				
Raw materials/intermediate inputs	85.4 (31.5)	96.6 (25.4)	76.3 (29.0)	81.6 (42.3)
Equipment & machinery	44.0 (11.8)	31.7 (7.9)	57.2 (12.6)	44.2 (16.0)
Services	90.6 (7.9)	84.7 (11.2)	91.0 (9.3)	98.0 (2.0)
Labour	99.0 (7.4)	99.2 (10.4)	98.8 (5.0)	98.8 (6.3)
Working capital	99.4 (10.3)	100.0 (7.7)	97.5 (14.2)	100.0 (8.0)
% Inputs & Supplies from other Regions				
Raw materials/intermediate inputs	14.5	3.4	23.8	17.9
Equipment & machinery	52.3	61.3	42.0	52.8
Services	8.8	14.6	8.3	2.0
Labour	1.1	0.8	1.3	1.2
Working capital	0.9	-	2.5	-
Total number of enterprises	(35)	(13)	(12)	(10)

Source: Same as table A.5.2

Table A.5. 6 Technology Features of Surveyed SMEs in Baoji City, 2004

	Total	Percent	Food	Machinery	Pharmaceutical
New products/models in last 3 years	3	11			
Share of top 3 enterprises: New products		80			
New processes		74			
% Firms with no new products/technology		63	69	58	60
Firms with patents	6	17.1	15.4	16.7	20.0
Firms with trademarks	26	74.3	100.0	42.0	80.0
Licensing agreements with foreign firms	1	2.9%			
Technology level of machinery					
Manually operated		60	44.8	65.7	67.1
Automatic/computer controlled equip't		40	55.2	34.3	32.9
Enterprises using internet					
Email	20	57.1	53.8	41.7	80.0
Website, Chinese language	12	34.3	15.4	41.7	50.0
Website, English language	4	11.4	0.0	16.7	20.0
International standards					
ISO 9000 (quality standards)	15	42.8	40.0	50.0	45.0
ISO 14000 (environmental standards)	3	8.6	15.4	0.0	10.0
Research and development					
Average personnel	6.8	5.4	5.4	5.8	5.8
Eng./science degree staff (%R&D staff)	2.5	36.7	34.6	24.1	55.1
Avge expenditure (000s Yuan), % sales	375	2.8	1.5	2.8	5.2
Total number of enterprises	35		13	12	10

Source: Same as table A.5.2

Table A.5. 7 Technology Acquisition Channels of Surveyed SMEs in Baoji City, 2004

	Total Firms	Percent All	Food	Machinery	Pharmaceutical
1. Hiring key technical personnel	28	80.0	61.5	83.3	100.0
2. Developed or adapted locally	26	74.3	69.2	91.7	60.0
3. New machinery and equipment	23	65.7	84.6	66.7	40.0
4. Study tours	13	37.1	53.8	41.7	10.0
5. Developed in cooperation with clients	12	34.3	15.4	50.0	40.0
6. Trade fairs	11	31.4	30.8	25.0	40.0
7. Cooperated with similar firms	8	22.9	7.7	16.7	50.0
8. Business or industry association	7	20.0	23.1	33.3	-
9. Licensing/turnkey, domestic sources	6	17.1	23.1	16.7	10.0
10. Developed with equipment suppliers	5	14.3	15.4	25.0	-
11. Universities and research institutes	5	14.3	7.7	16.7	10.0
12. Publications, technical literature	4	11.4	23.1	8.3	-
13. Transferred from parent company	2	5.7		8.3	10.0
14. Other	2	5.7	7.7	8.3	-
15. Consultants, private technical services	2	5.7		8.3	10.0
16. Licensing/turnkey, internat. sources	0	-	-	-	-
Total number of enterprises	35		13	12	10

Source: Same as table A.5.2

Table A.5. 8 Education Level and Training in Surveyed SMEs in Baoji City, 2004

	Average	Percent	Food	Machinery	Pharmaceutical
Education level	142	100.0	100.0	100.0	100.0
Only primary school	7	4.8	10.0	8.0	2.0
Junior secondary school	47	33.0	39.0	37.0	19.0
Senior secondary school	68	48.2	39.0	45.0	60.0
University or tertiary education	20	14.0	12.0	10.0	19.0
Formal training of employees	142	100.0	100.0	100.0	100.0
Classroom, workshop, laboratory	92	65.0	82.1	44.6	70.7
Training outside enterprise	17	12.1	8.4	7.1	22.7
No formal training	33	22.9	9.5	48.3	6.6
Training expenditure, % of sales (000)	63	1.0	0.6	0.8	1.0
Education level of top manager					
Secondary school		20.0	38.5	16.7	0.0
University degree		80.0	61.5	83.3	100.0
Founders' previous experience					
Other SMEs		54.5	53.8	50.0	62.5
Government employment		30.3	15.4	25.0	62.5
Family business		21.1	15.4	25.0	25.0
Large national enterprise		21.1	7.7	25.0	37.5
University or research institute		12.1	0.0	8.3	37.5
Foreign enterprise		9.1	0.0	0.0	37.5
(Responding firms)		(33)	(13)	(12)	(8)
Importance of founders' previous exp.					
Other SMEs			85.7	100.0	80.0
Government employment			100.0	66.7	60.0
Family business			50.0	100.0	100.0
Large national enterprise			0.0	100.0	100.0
University or research institute			-	100.0	100.0
Foreign enterprise			-	-	100.0
(Responding firms)		(33)	(13)	(12)	(8)
Total number of enterprises	35		13	12	10

Source: Same as table A.5.2

Table A.5. 9 Importance of Selected Constraints in Operation and Growth of SMEs

	Order of importance (Combined Scale 0-100)[a]			
	All	Food	Machinery	Pharmaceutical
1. Access to finance	68.0	69.2	77.5	55.6
2. Skills and education of workers	32.0	32.7	30.0	33.3
3. Cost of financing	31.3	28.8	30.0	36.1
4. Uncertainty of economic policies	25.0	21.2	30.0	25.0
5. Access to land	22.7	21.2	40.0	5.6
6. Transportation	26.6	38.5	17.5	19.4
7. Crime, theft and disorder	28.1	21.2	50.0	13.9
8. Corruption	26.6	15.4	50.0	16.7
9. Tax administration	17.2	11.5	32.5	8.3
10. Macroeconomic instability	25.0	11.5	42.5	13.9
11. Business licensing and permits	18.0	7.7	37.5	11.1
12. Tax rates	19.5	17.3	27.5	13.9
13. Electricity	19.5	23.1	20.0	13.9
14. Anti-competitive practices	14.8	11.5	17.5	16.7
15. Labour regulations	9.4	3.8	25.0	0.0
16. International standard housing	8.6	11.5	10.0	2.8
17. Telecommunications	7.0	7.7	7.5	5.0
18. Customs and trade regulations	6.3	1.9	15.0	2.8
Total number of enterprises	(35)	(13)	(12)	(10)

Source: Same as table A.5.2
Note: a. Scale combines frequency of contact with importance of contact.

Table A.5. 10 Days without or Insufficient Power, Water and Telephone Services, SMEs

	All	Food	Machinery	Pharmaceutical
Electricity	4.5			
Water supply	3.6	6.5	8.4	
Telephone	2.0			
Internet	2.0			2.0
Total number of enterprises	35	13	12	10

Source: Same as table A.5.2

Table A.5. 11 Processing Time for Imports and Exports, SMEs

	All	Food	Machinery	Pharmaceutical
Import				
Average processing time	5.0		3.0	7.0
Longest processing time	9.5		7.0	12.0
Export				
Average processing time	10.0		17.0	6.5
Longest processing time	14.5		27.0	8.3
Responding enterprises	6	0	2	4

Source: Same as table A.5.2

Table A.5. 12 SME Interaction with other Firms, Agencies and Institutions

	Frequency of contact (number of firms):				
	No Contact	Rare Contact	Some Contact	Frequent Contact	Regular Contact
1. Customers	1	0	1	25	7
2. Suppliers	1	0	1	23	9
3. Competitors	4	7	14	7	2
4. Public finance institutions	4	1	12	16	1
5. Private finance institutions	23	1	3	6	0
6. Local institutions	20	3	4	6	1
7. Government agencies	6	3	9	12	3
8. Government laboratories	9	4	9	8	3
9. Business or industry associations	9	4	11	6	3
10. Public training institutions	17	7	6	3	0
11. Private training institutions	22	5	6	0	0
12. Universities and research institutes	12	9	7	5	0
13. Private technical services, consultants	17	6	4	6	0

	Order of importance (Combined Scale 0-100)[a]			
	All	Food	Machinery	Pharmaceuticals
1. Suppliers	77.2	76.9	85.4	66.7
2. Customers	78.7	78.8	87.5	66.7
3. Competitors	47.1	46.2	50.0	44.4
4. Public finance institutions	56.6	44.2	64.6	63.9
5. Private finance institutions	18.9	5.8	20.8	37.5
6. Local institutions	24.3	15.4	27.1	33.3
7. Government agencies	52.3	51.9	63.6	38.9
8. Government laboratories	43.9	51.9	36.4	41.7
9. Business or industry associations	42.4	42.3	47.7	36.1
10. Public training institutions	21.2	17.3	20.5	27.8
11. Private training institutions	12.9	5.8	13.6	22.2
12. Universities and research institutes	28.8	25.0	25.0	38.9
13. Private technical services, consultants	24.2	26.0	22.7	22.2
Total number of enterprises	(35)	(13)	(12)	(10)

Source: Same as table 7.3

Note: a. Scale combines frequency of contact with importance of contact.

Table A.5. 13 Institutional Support and Business Associations for SMEs

	Total	Percent	Food	Machinery	Pharmaceutical
Firms receiving institutional support	24	68.6	53.8	66.7	90.0
Firms not receiving institutional support	11	31.4			
Reasons for not receiving support	11	100.0	100.0	100.0	100.0
No support exists for business	5	45.5	50.0	50.0	
Tried but did not work	2	18.2	16.7	25.0	
Too time consuming	2	18.2	16.7		100.0
Too bureaucratic	1	9.1	16.7		
(Responding firms)	(10)				(1)
Order of importance of institutions [a]					
Government, quality control & inspection	3	3.4	11.3	0.0	11.3
Government, technical support	1	1.1	3.8	0.0	3.8
Government, other services	29	34.0	25.0	34.0	25.0
Universities	14	15.3	10.0	8.0	10.0
Research institutes	9	10.4	5.0	10.0	5.0
Associations	6	5.6	17.5	1.0	17.5
Other	5	6.7	0.0	14.0	0.0
(Responses & Respondents)	(67)	(25)	(8)	(8)	(9)
Membership of industry associations	19	55.8	77.0	55	30
Order of Importance for Associations:					
Accrediting standards or quality		57.9	60.0	50.0	66.6
Domestic products and input markets		48.7	37.5	62.5	58.3
Information on govt policy, regulation		48.7	37.5	70.8	41.7
Lobbying government		34.2	25.0	33.3	66.7
International products and markets		30.3	15.0	50.0	41.7
Dispute resolution		27.6	20.0	41.6	25.0
Total number of enterprises	35		13	12	10

Note: a. Order of importance: 4. very important, 3. important, 2. somewhat important, 1. of little value, 0. no value

ANNEX TABLES TO CHAPTER 6

Table A.6. 1 Regional labour productivity rankings for food-related industries, Yuan (2001)

Food Manufacturing			Food processing			Beverages		
Ranking	**Province**	**Value**	**Ranking**	**Province**	**Value**	**Ranking**	**Province**	**Value**
1	Jilin	968.4	1	Guangdong	778.0	1	Shanghai	1,793.5
2	Beijing	751.1	2	Shandong	714.4	2	Guangdong	1,300.4
3	Shanghai	737.3	3	Hubei	697.0	3	Zhejiang	1,143.4
4	Guangdong	712.7	4	Hunan	691.5	4	Hubei	1,010.8
5	Inner Mongolia	644.5	5	Jiangsu	687.9	5	Beijing	991.5
6	Hainan	640.8	6	Fujian	644.7	6	Sichuan	983.7
7	Heilongjiang	610.7	7	Sichuan	599.8	7	Fujian	912.2
8	Jiangsu	584.2	8	Henan	577.8	8	Tibet	888.9
9	Shandong	524.2	9	Inner Mongolia	571.6	9	Hainan	770.7
10	Hebei	523.5	10	Guangxi	527.6	10	Liaoning	703.2
11	Tianjin	484.6	11	Zhejiang	488.3	11	Chongqing	649.1
12	Hubei	464.6	12	Gansu	484.3	12	Jiangsu	627.5
13	Liaoning	458.0	13	Yunnan	470.7	13	Hebei	604.2
14	Henan	382.7	14	Jilin	458.4	14	Guizhou	602.8
15	Xinjiang	370.5	15	Xinjiang	456.5	15	Xinjiang	559.1
16	Zhejiang	364.8	16	Jiangxi	455.7	16	Guangxi	554.7
17	Fujian	361.2	17	Tianjin	433.1	17	Shandong	536.2
18	Shaanxi	354.1	18	Heilongjiang	425.3	18	Hunan	510.5
19	Sichuan	353.2	19	Liaoning	411.8	19	Jilin	491.1
20	Chongqing	344.6	20	Anhui	393.0	20	Heilongjiang	488.9
21	Ningxia	328.3	21	Hainan	375.0	21	Anhui	461.3
22	Guizhou	322.4	22	Beijing	356.8	22	Shaanxi	457.7
23	Gansu	320.4	23	Ningxia	323.1	23	Qinghai	406.7
24	Hunan	299.0	24	Tibet	322.2	24	Shanxi	401.6
25	Guangxi	297.9	25	Shaanxi	312.5	25	Yunnan	368.2
26	Anhui	274.8	26	Hebei	301.1	26	Gansu	367.0
27	Shanxi	269.5	27	Chongqing	293.8	27	Jiangxi	350.3
28	Yunnan	251.6	28	Shanxi	247.1	28	Inner Mongolia	348.8
29	Jiangxi	222.3	29	Guizhou	229.5	29	Henan	346.2
30	Tibet	161.9	30	Shanghai	195.1	30	Ningxia	295.8
31	Qinghai	130.0	31	Qinghai	153.7	31	Tianjin	211.1
	China (average)	501.8		China (average)	566.0		China (average)	676.5

Source: 'Industrial Economics Statistics 2003, National Bureau of Statistics, China

Table A.6. 2 Shaanxi's performance in the world's 20 largest and most dynamic food-processed exports (above 1 billion US$ in 2002)

Product Ranking	4 digit SITC code rev 3	Product Name	World		Shaanxi			
			Export value 2002 ($000)	Annual growth rate 1995-2002	Export value 2002 ($)	Annual growth rate 1995-2002[1]	World Market Share 2002[2]	Change in World Market Share 1995-2002[3]
1	0481	Cereals/breakfast foods	2,488,210	7.7%	4,607	-18.3%	0.000%	-0.001%
2	0174	Poultry, prepared/presvd.nes	1,906,531	7.7%	-	-	0.000%	0.000%
3	0485	Bakers mixes/dough	1,032,615	6.5%	-	-	0.000%	0.000%
4	0985	Soups and broths	1,106,458	6.0%	-	-	0.000%	0.000%
5	0732	Cocoa preps/choc.(bulk)	1,414,848	6.0%	-	-	0.000%	0.000%
6	1110	Beverage non alcohol nes	6,273,155	5.3%	-	-	0.000%	0.000%
7	0984	Sauce/condiments etc	3,478,780	4.5%	40,455	1.8%	0.001%	0.000%
8	0619	Sugars nes/syrups/etc.	1,433,375	4.5%	1,171,594	**96.6%**	**0.082%***	**0.081%***
9	1121	Wine of fresh grapes	14,481,454	4.5%	-	-	0.000%	0.000%
10	0484	Bread/pastry/cakes/etc.	9,320,341	3.6%	1,340	-	0.000%	0.000%
11	1123	Beer/ale/stout/porter	5,881,309	3.0%	-	-	0.000%	0.000%
12	0583	Fruit/nuts uncooked/boil	1,037,960	2.3%	178,985	-0.1%	0.017%	-0.003%
13	0161	Bacon, ham, etc.	1,710,559	1.7%	-	-	0.000%	-0.002%
14	0591	Orange juice	2,831,345	1.6%	-	-	0.000%	0.000%
15	0739	Cocoa foods nes	3,738,658	1.5%	-	-	0.000%	0.000%
16	0989	Food preparations n.e.s.	14,227,301	1.4%	1,352,431	**25.0%**	0.010%	0.007%
17	0622	Sugar conf/white choc.	4,177,714	0.8%	4,610	-	0.000%	0.000%
18	1124	Distilled alcoholic bev	11,481,843	0.7%	42,209	-15.8%	0.000%	-0.001%
19	0482	Malt/ malt flour	1,569,588	0.5%	-	-	0.000%	0.000%
20	0483	Pasta, uncooked	1,492,485	0.5%	977	-42.0%	0.000%	-0.003%

Source: Special Tabulations, Customs Office of China and UN Comtrade data

Note:

[1] figure in bold indicates that region's export growth above world's export growth for the period

[2] figure in bold indicates the region's significant world market share (above 0.05%) for that particular product. * between 0.05% and 0.09%; ** 0.1% or more

[3] figure in bold indicates the region's significant increase in world market share (above 0.05%) for that particular product. * between 0.05% and 0.09%; ** 0.1% or more

Table A.6. 3 Regional labour productivity rankings for machinery-related industries, yuan (2001)

Ordinary machine			Special purpose equipment			Electric equipment and machine		
Ranking	**Province**	**Value**	**Ranking**	**Province**	**Value**	**Ranking**	**Province**	**Value**
1	Shanghai	708.1	1	Beijing	686.5	1	Shandong	953.3
2	Guangdong	548.7	2	Guangdong	522.8	2	Xinjiang	940.8
3	Tianjin	447.4	3	Shanghai	502.9	3	Hainan	840.0
4	Jiangsu	432.3	4	Zhejiang	476.4	4	Anhui	800.0
5	Zhejiang	425.8	5	Shandong	457.0	5	Shanghai	795.6
6	Fujian	425.7	6	Jiangsu	420.1	6	Jiangsu	761.2
7	Shandong	415.5	7	Fujian	417.7	7	Guangdong	683.1
8	Beijing	413.4	8	Anhui	332.7	8	Beijing	678.8
9	Hubei	340.6	9	Tianjin	329.9	9	Fujian	613.1
10	Liaoning	335.3	10	Hubei	297.7	10	Hubei	598.6
11	Guangxi	334.2	11	Henan	280.8	11	Zhejiang	581.1
12	Hainan	322.2	12	Hebei	279.3	12	Hebei	529.5
13	Chongqing	262.4	13	Liaoning	258.7	13	Tianjin	454.7
14	Hebei	257.3	14	Hunan	257.5	14	Henan	453.3
15	Sichuan	252.5	15	Shaanxi	249.5	15	Shaanxi	363.8
16	Shaanxi	252.4	16	Sichuan	242.1	16	Liaoning	357.1
17	Anhui	252.4	17	Inner Mongolia	221.7	17	Guangxi	354.7
18	Yunnan	247.7	18	Jiangxi	204.6	18	Jilin	325.0
19	Ningxia	225.5	19	Tibet	200.0	19	Sichuan	321.3
20	Henan	218.6	20	Guangxi	195.9	20	Jiangxi	306.8
21	Xinjiang	176.0	21	Chongqing	192.3	21	Hunan	301.2
22	Inner Mongolia	174.7	22	Qinghai	191.3	22	Yunnan	291.9
23	Hunan	166.3	23	Yunnan	171.0	23	Gansu	281.8
24	Jilin	165.5	24	Xinjiang	159.8	24	Ningxia	278.1
25	Jiangxi	162.7	25	Jilin	152.1	25	Heilongjiang	260.2
26	Heilongjiang	153.4	26	Shanxi	126.4	26	Guizhou	230.0
27	Shanxi	152.2	27	Gansu	118.4	27	Chongqing	226.9
28	Gansu	122.4	28	Ningxia	115.8	28	Inner Mongolia	215.7
29	Qinghai	104.2	29	Heilongjiang	114.4	29	Shanxi	212.3
30	Guizhou	86.3	30	Hainan	109.5	30	Qinghai	158.8
31	Tibet	-	31	Guizhou	93.0	31	Tibet	-
	China (average)	357.2		China (average)	343.1		China (average)	611.1

Source: Same as annex table A.6.1.

Table A.6. 4 Shaanxi's performance in the world's 20 largest and most dynamic machinery-related exports (above 4 billion US$ in 2002)

Product Ranking	4 digit SITC code rev 3	Product Name	World		Shaanxi			
			Export value 2002 ($000)	Annual growth rate 1995-2002	Export value 2002 ($)	Annual growth rate 1995-2002[1]	World Market Share 2002[2]	Change in World Market Share 1995-2002[3]
1	7479	Tap/cock/valve parts	4,443,381	7.4%	6,714,989	**87.7%**	**0.151%****	**0.148%****
2	7436	Filter/purify equipment	12,839,126	4.8%	-	-	0.000%	-0.001%
3	7239	Earth moving mach parts	16,327,632	4.7%	935,396	**24.3%**	0.006%	0.004%
4	7439	Parts centrifuge/filters	4,339,618	4.6%	251,760	-	0.006%	0.006%
5	7456	Spraying etc equipment	7,104,300	4.1%	693,046	**44.2%**	0.010%	0.009%
6	7438	Parts for fans/gas pumps	5,100,521	3.6%	756,786	**68.8%**	0.015%	0.014%
7	7212	Harvesting machinery	7,025,208	3.2%	95,232	**38.7%**	0.001%	0.001%
8	7429	Pump/liq elevator parts	5,245,430	2.9%	828,118	**28.5%**	0.016%	0.012%
9	7478	Taps/cocks/valves nes	14,067,054	2.8%	9,171,562	**27.3%**	**0.065%***	**0.051%***
10	7499	Machine parts non-el nes	4,709,773	2.7%	425,625	**8.4%**	0.009%	0.003%
11	7431	Air/vacuum pumps,comprsr	13,797,533	2.6%	1,806,279	**15.5%**	0.013%	0.007%
12	7422	Piston eng fuel/wtr pump	4,452,335	2.4%	4,528	-	0.000%	0.000%
13	7415	Air-conditioning equipmt	12,611,673	2.4%	1,205,641	**36.3%**	0.010%	0.008%
14	7491	Moulds (exc metal ingot)	8,442,121	2.2%	386,229	**3.0%**	0.005%	0.000%
15	7414	Indust refrigeration equ	8,569,414	2.2%	17,513	-17.9%	0.000%	-0.001%
16	7484	Gears and gearing	5,307,371	2.1%	6,568,518	**42.1%**	**0.124%****	**0.112%****
17	7285	Parts spec indust machny	12,727,725	1.6%	298,695	-3.2%	0.002%	-0.001%
18	7232	Mechan shovel/excavators	11,807,825	1.5%	167,244	**14.0%**	0.001%	0.001%
19	7441	Goods trucks/tractors/et	6,405,482	1.3%	186,133	-4.5%	0.003%	-0.002%
20	7449	Lift/handle machine part	7,854,705	1.2%	893,973	**25.5%**	0.011%	0.009%

Source: Same as annex table A.6.2.

Note:

[1] figure in bold indicates that region's export growth above world's export growth for the period

[2] figure in bold indicates the region's significant world market share (above 0.05%) for that particular product. * between 0.05% and 0.09%; ** 0.1% or more

[3] figure in bold indicates the region's significant increase in world market share (above 0.05%) for that particular product. * between 0.05% and 0.09%; ** 0.1% or more

Table A.6. 5 Regional labour productivity rankings for pharmaceutical/medical industries yuan (2001)

Ranking	Province	Value
1	Hainan	1,335.8
2	Guangdong	1,272.5
3	Tibet	1,193.3
4	Guizhou	1,043.5
5	Shaanxi	1,021.8
6	Jilin	952.5
7	Beijing	893.2
8	Shanghai	819.5
9	Zhejiang	765.5
10	Jiangsu	761.4
11	Fujian	761.4
12	Tianjin	719.8
13	Yunnan	696.0
14	Sichuan	684.4
15	Guangxi	655.3
16	Shandong	617.5
17	Hebei	608.5
18	Ningxia	605.3
19	Hubei	603.7
20	Heilongjiang	595.1
21	Jiangxi	564.4
22	Chongqing	536.4
23	Shanxi	514.2
24	Liaoning	496.9
25	Hunan	481.4
26	Gansu	419.6
27	Inner Mongolia	395.8
28	Henan	381.5
29	Xinjiang	378.9
30	Qinghai	327.8
31	Anhui	319.7
	China (average)	701.5

Source: Same as annex table A.6.1.

Table A.6. 6 China's exports and imports of food-related products of the SITC rev 3, 3 digit, 1995/1998-2002 ($000)

		Exports ($000)					Imports ($000)				
SITC	Product name	1995	2002	Annual growth (95-02)	Share in China's total exports 2002	World Market Share 2002	1998	2002	Annual growth (98-02)	Share in total imports 2002	Trade balance 2002
016	Meat/offal preserved	21,291	8,497	-12.3%	0.0%	0.4%	668	472	-8.3%	0.00%	8,025
017	Meat/offal presvd n.e.s	327,406	698,092	11.4%	0.2%	11.7%	1,664	9,609	55.0%	0.00%	688,483
023	Butter and cheese	187	586	17.7%	0.0%	0.0%	912	6,737	64.9%	0.00%	-6,151
024	Cheese and curd	275	1,604	28.7%	0.0%	0.0%	1,144	5,733	49.6%	0.00%	-4,129
035	Fish,dried/salted/smoked	133,305	131,574	-0.2%	0.0%	5.7%	32,006	34,931	2.2%	0.01%	96,643
037	Fish/shellfish,prep/pres	788,140	1,628,246	10.9%	0.5%	21.7%	4,761	9,811	19.8%	0.00%	1,618,435
046	Flour/meal wheat/meslin	55,177	61,803	1.6%	0.0%	3.5%	15,489	10,040	-10.3%	0.00%	51,763
047	Cereal meal/flour n.e.s	5,476	5,772	0.8%	0.0%	1.2%	4,580	1,703	-21.9%	0.00%	4,069
048	Cereal etc flour/starch	148,585	158,778	1.0%	0.0%	1.0%	11,919	38,315	33.9%	0.01%	120,463
058	Fruit presvd/fruit preps	339,087	659,726	10.0%	0.2%	11.3%	6,465	15,010	23.4%	0.01%	644,716
059	Fruit/veg juices	35,484	199,307	28.0%	0.1%	3.3%	9,138	55,448	56.9%	0.02%	143,859
061	Sugar/mollasses/honey	285,371	184,516	-6.0%	0.1%	1.8%	157,449	257,662	13.1%	0.09%	-73,146
062	Sugar confectionery	93,141	195,928	11.2%	0.1%	4.5%	14,815	23,631	12.4%	0.01%	172,297
073	Chocolate/cocoa preps	8,659	18,861	11.8%	0.0%	0.2%	14,312	41,945	30.8%	0.01%	-23,084
091	Margarine/shortening	1,284	9,839	33.8%	0.0%	0.7%	6,621	23,794	37.7%	0.01%	-13,955
098	Edible products n.e.s.	290,472	758,116	14.7%	0.2%	3.8%	90,657	289,687	33.7%	0.10%	468,429
111	Beverage non-alcohol nes	229,117	354,659	6.4%	0.1%	5.7%	2,863	5,125	15.7%	0.00%	349,534
112	Alcoholic beverages	141,291	196,275	4.8%	0.1%	0.6%	70,632	139,316	18.5%	0.05%	56,959
	Total	**2,903,749**	**5,272,180**	**8.9%**	**1.6%**	**3.7%**	**446,095**	**968,969**	**21.4%**	**0.328%**	**4,303,211**

Source: Special tabulations, Customs Office of China and UN Comtrade data

Table A.6. 7 China's exports and imports of machinery-related products of the SITC rev 3, 3 digit, 1995/1998-2002 ($000)

		Exports ($000)					Imports ($000)				
SITC	Product name	1995	2002	Annual growth (95-02)	Share in China's total exports 2002	World Market Share 2002	1998	2002	Annual growth (98-02)	Share in total imports 2002	Trade balance 2002
721	Agric machine ex tractr	30,604	175,475	28.3%	0.1%	1.4%	102,646	168,461	13.2%	0.06%	7,014
723	Civil engineering plant	149,226	575,173	21.3%	0.2%	1.7%	575,231	1,278,459	22.1%	0.43%	-703,286
724	Textile/leather machinry	404,440	922,792	12.5%	0.3%	5.2%	1,436,532	4,017,065	29.3%	1.36%	-3,094,273
725	Paper industry machinery	24,566	65,286	15.0%	0.0%	1.1%	1,011,733	691,931	-9.1%	0.23%	-626,645
726	Printing industry machny	27,683	91,018	18.5%	0.0%	0.7%	424,064	1,107,084	27.1%	0.38%	-1,016,066
727	Food processing machines	46,302	85,558	9.2%	0.0%	1.4%	195,453	212,405	2.1%	0.07%	-126,847
728	Special indust machn nes	403,514	880,034	11.8%	0.3%	1.5%	4,537,090	8,149,243	15.8%	2.76%	-7,269,209
731	Mach-tools remove mtrial	216,434	263,285	2.8%	0.1%	1.9%	904,789	2,074,338	23.1%	0.70%	-1,811,053
733	Mtl m-tools w/o mtl-rmvl	57,505	49,511	-2.1%	0.0%	1.0%	486,564	1,075,665	21.9%	0.36%	-1,026,154
735	Metal machine tool parts	61,127	191,507	17.7%	0.1%	2.8%	515,619	265,662	-15.3%	0.09%	-74,155
737	Metalworking machine nes	87,376	196,806	12.3%	0.1%	2.3%	689,303	1,393,891	19.2%	0.47%	-1,197,085
741	Indust heat/cool equipmt	233,775	2,164,612	37.4%	0.7%	5.5%	1,242,555	2,532,646	19.5%	0.86%	-368,034
742	Pumps for liquids	110,751	473,188	23.1%	0.1%	2.3%	354,370	776,071	21.6%	0.26%	-302,883
743	Fans/filters/gas pumps	904,811	1,626,817	8.7%	0.5%	3.9%	1,047,847	2,763,328	27.4%	0.94%	-1,136,511
744	Mechanical handling equi	335,386	1,153,304	19.3%	0.4%	4.0%	1,110,241	1,346,469	4.9%	0.46%	-193,165
745	Non-electr machines nes	90,031	745,171	35.2%	0.2%	3.1%	572,777	1,095,113	17.6%	0.37%	-349,942
746	Ball/roller bearings	330,678	713,704	11.6%	0.2%	6.1%	231,932	638,458	28.8%	0.22%	75,246
747	Taps/cocks/valves	212,760	1,526,205	32.5%	0.5%	6.4%	388,265	969,773	25.7%	0.33%	556,432
748	Mech transmission equmnt	215,908	623,578	16.4%	0.2%	3.7%	192,332	717,715	39.0%	0.24%	-94,137
749	Non-elec parts/acc machn	80,309	378,760	24.8%	0.1%	2.6%	759,005	1,362,460	15.7%	0.46%	-983,700
	Total	**4,023,184**	**12,901,786**	**18.1%**	**4.0%**	**3.2%**	**16,778,348**	**32,636,237**	**18.1%**	**11.06%**	**-19,734,451**

Source: Special tabulations, Customs Office of China and UN Comtrade data

Table A.6. 8 China's exports and imports of pharmaceutical/medical products of the SITC rev 3, 3 digit, 1995/1998-2002 ($000)

		Exports ($000)					Imports ($000)				
SITC	Product name	1995	2002	Annual growth (95-02)	Share in China's total exports 2002	World Market Share 2002	1998	2002	Annual growth (98-02)	Share in total imports 2002	Trade balance 2002
541	Pharmaceut exc medicamnt	1,259,973	2,020,471	7.0%	0.62%	5.0%	199,216	471,729	24.0%	0.160%	1,548,742
542	Medicaments include vet	321,995	303,103	-0.9%	0.09%	0.2%	334,296	962,379	30.3%	0.326%	-659,276
	Total	**1,581,968**	**2,323,574**	**5.6%**	**0.7%**	**1.4%**	**533,512**	**1,434,108**	**28.0%**	**0.486%**	**889,466**

Source: Special Tabulations, Customs Office of China and UN Comtrade data