

Notes

Chapter 1 Main Features

- 1 The Chinese started to publish statistics for their gross national product in 1985. However, their method of calculating GNP is somewhat different from that used by the West, in that policemen, military personnel, and other public employees are excluded from the service sector. The GNP in 1985 was 856.8 billion yuan or 816 yuan per capita, and that in 1987 was 1,135.1 billion yuan or 1,050 yuan per capita. Converted into U.S. dollars at the official exchange rate for 1985 of 2.937 yuan to the dollar, and 3.722 yuan to the dollar for 1987, the per capita figures translate into U.S.\$278 and U.S.\$282 respectively. When assessed at the effective exchange rate based on purchasing power, may fall within the range of U.S.\$300 to U.S.\$310.

The classifications of countries based on per capita GNP used in later discussions in this chapter are the same as those employed by the World Bank in the 1987 edition of its *World Development Report*: a “low-income economies” (with per capita GNP of U.S.\$400 or less), a “lower middle-income country” (up to U.S.\$1,500), an “upper middle-income economies” (up to U.S.\$7,000) and a “industrial market economies” (up to U.S.\$17,000).

- 2 UNESCO, *Statistical Year Book, 1986* (Geneva: UNESCO, 1987).
- 3 In September 1987 the author interviewed officials in the southwestern provinces on the progress of implementing compulsory education in their respective provinces. He was told the following goals that each province hoped to fulfill by the year 1990. Hubei Province intended to put the compulsory nine years of education into effect in the areas under direct provincial jurisdiction; Guizhou Province expected to be providing elementary education in more than half the counties within the province, and a junior middle school education to 15 per cent of the province’s children who were of junior middle school age; Sichuan Province would be provid-

- ing elementary school education in 90 per cent of the province and junior high education in 20 per cent; Yunnan Province would have 15 per cent of its children of elementary school age enrolled in schools.
- 4 The Ministry of Ordnance Industry has now been merged with the Ministry of Machine-Building Industry and the new organization renamed the State Machine-Building Industry Commission.
 - 5 Zhongguo-guofang-jingjixue-yanjiuhui-choubeizu (Preparatory research group on Chinese national defense economics), ed., *Guofang jingjixue lunwenji* [Collected papers on national defense economics] (Beijing: Jiefangjun-chubanshe, 1986), pp. 242–43.
 - 6 *Beijing Review* (Japanese edition), July 29, 1986.
 - 7 Zhongguo-jingji-nianjian-bianjibu (Editorial staff of *China economic yearbook*), ed., *Zhongguo jixie gongye de fazhan* [Development of China's machinery industry] (Beijing: Zhong guo-nongye-jixie-chubanshe, 1983), p.18
 - 8 Li Boxi, Zhang Zehou, and Qu ligong, eds., *Zhongguo jishugaizao wenti yanjiu* [A study of Chinese technological reconstruction], Vol. 1 (Shanxi: Shanxi-renmin-chubanshe, 1984), p. 105.
 - 9 For the foregoing industrial data, see Li Boxi et al., eds., *Zhongguo jishugaizao*, pp. 4–13, 142, and 173–87.
 - 10 Between 3.6% and 3.8% during the 1960s, between 3.8% and 4.2% during the 1970s, then to between 4.2% and 4.6% during the early 1980s.
 - 11 “Guowuyuan guanyu fabu ‘Guoyin qiye geding zichan zhejiu shixing tiaoling’ de tongzhi” [Announcement of the State Council regarding the regulation for enforcement of fixed assets depreciation in state-owned enterprises], in *Guoweyuan gongbao* [State Council bulletin], May 30, 1985.
 - 12 The “four items of expenditures” for technological innovation consist of the expenditures for establishing and maintaining technological organizations, those for trial manufacturing of new products, those for ensuring workers' safety and protection, and those for purchasing miscellaneous items of fixed assets. For further details, see Chapter 2.
 - 13 Li Boxi et al, eds., *Zhongguo jishugaizao wenti yanjiu*, p. 275.
 - 14 Sun Shanqing et al., eds., *Lun jingji jiegou duice* [On the policy of economic structure] (Beijing: Zhongguo-shehui-kexue-chubanshe, 1984), pp. 24–25.
 - 15 Provinces, municipalities, and autonomous regions.
 - 16 State Standardization Bureau, *Zhongguo biaojunhua sanshiwu nian* [Thirty-five years of standardization in China], Vol. 1 of *Guanhui de chengshu* [Brilliant achievements] (Beijing: Renmin-chubanshe, 1984), p. 585.
 - 17 *Dangdai Zhongguo de biaojunhua* [Contemporary standardization in China] (Beijing: Zhongguo-shehuikexue-chubanshe, 1986), p. 64.
 - 18 Yukihiko Kiyokawa and Shigeru Ishikawa, “The Significance of Standardization in the Development of the Machine-tool Industry: The Case of Japan and China,” Hitotsubashi University Economic Institute Discussion Paper Series, No. 123 (Tokyo: Hitotsubashi University, 1985), pp. 70–71.
 - 19 Sun Shanqing et al., eds., *Lun jingji jiegou duice*, p. 482.
 - 20 For further discussion on the problems concerning this point, see Tamio Shimakura and Nobuo Maruyama, *Chūgoku keizai no jirenma* [Dilemmas for the Chinese Economy] (Tokyo: Yūhikaku, 1983), p. 146.
 - 21 *Renmin ribao*, September 20, 1980

Chapter 2 Research and Development

- 1 In addition to these four departments, the Chinese Academy of Sciences used to have a department of philosophy and social sciences. But this was separated from the academy and became independent as the Chinese Academy of Social Sciences.
- 2 She He, *Wuoguo keyan jingfei touzhi xiaoguo buxi* [Analysis of the results of R&D expenditures in China], *Kuexuexue yanjiu*, January 1986. It should be noted that the total scientific research expenditures of 8,250 million yuan quoted therein does not coincide with the official data given in Table 2-5.
- 3 These data are from Zhongguo-guofan-jingjixue-yanjiuhui-choubeizu [Preparatory research group on the China national defense economy], *Guofan jingjixue lunwenji* [Essays on the defense economy] (Beijing: Jiefangjun-chubanshe, 1986), p. 234; and Chen Huiqin, "Woguo sansi nianlai jishu yinjin gonzuo jingji xiaoguo chubu fenxi" [Preliminary analysis of economic results after thirty years of Chinese technological importation], Part 2, *Gongye jingji* (Zhongguo renmin daxue, fuyin baokan zuliao [People's University of China, materials copied from newspapers and magazines]), No. 6, 1981.
- 4 *Keji ribao*, July 21, 1986
- 5 Based on definitions given in State Statistical Bureau, *Zhongguo tongji nianjian, 1988* [Statistical yearbook of China, 1988] (Beijing: Zhongguo-tongji-chubanshe, 1988).
- 6 State Science and Technology Commission, the Educational Committee, ed., *Kexue jishu guanlixue gailun* [An introduction to science and technology management] (Beijing: Zhongguo-shehui-kexue-chubanshe, 1987), p. 286.
- 7 Japan, Science and Technology Agency, ed., *Kagaku gijutsu yoran, 1986* [Indicators of science and technology] (Tokyo: Science and Technology Agency, 1987).
- 8 *Chūgoku tsūshin* (Tokyo), May 4, 1984.
- 9 For Jilin Province and industrial data, see *Keji ribao*, December 12, 1986 and February 19, 1987.
- 10 *Renmin ribao*, December 2, 1986.
- 11 *Renmin ribao*, March 20, 1985.
- 12 The Fourth Session of the Sixth National People's Congress adopted *Zhonghua-renminggongheguo zhuangli fa* (Patent Law of the People's Republic of China) on March 12, 1984.
- 13 State Council, "Tuidong duli keyan, shejidanwei jinru dazhongxing qiye he qiye jituan de guideng" [The regulation on promoting the amalgamation of independent research institutes and design organizations within large and medium-size enterprises and enterprise groups], *Renmin ribao*, February 8, 1987.
- 14 "Guowuyuan guanyu keji renyuan heli liudong de ruogan guiding" [The State Council regulation on the national mobilization of scientific personnel], in *Zhonghua-renminggongheguo kexue jishu fagui xuenbian* [Selective laws and regulations on science and technology for the People's Republic of China] (Beijing: Kexue-jishu-chubanshe, 1984).
- 15 There is a proviso that the figure for 1986 is incomplete, but no explanation is given as to why the 1986 figure was smaller than the previous year's figure. See *Renmin ribao*, May 27 and September 27, 1987.
- 16 *Keji ribao*, February 16, 1987.

- 17 Ibid., August 1, 1987.
- 18 Ibid., June 2, 1986.
- 19 An engineer in Wuzhou City in Guangxi Zhuang Autonomous Region after work time designed a floating pier for a factory in another province and received 600 yuan in remuneration. An engineer of a town-owned factory in the same city participated during his free time in the designing of an irrigation system for the city's suburb and was paid 2,000 yuan for his work. The units they belonged to denounced them for corruption and the prosecution arrested them. (*Renmin ribao*, January 22, 1987.)
- 20 The following formula is used to measure the degree of utilization and application of science and technology:
Utilization rate of science and technological result = $A / B \times 100$; where A = research cost incurred to develop research results transferred to other units, B = total research cost (of the research institute involved).
- 21 *Keji ribao*, July 9, 1986.
- 22 Cheng Qingtai, the plant manager of the No. 2 Automobile Plant at Shiyan City in Hubei Province, now the largest automobiles producing plant in China, is one such persons. He is a Quinghua University graduate and in his early forties.
- 23 Ibid., July 21, 1987.
- 24 Li Xingquan and Mu Suping, eds., *Qiye yanjiu kaifa de zuzhi yu guanli* [Organization and management for research and development in enterprises] (Beijing: Kexue-jishu-chubanshe, 1986), p. 90.
- 25 *Renmin ribao*, October 16, 1987.

Chapter 3 Industrialization Strategy

- 1 The editorial office of *Jingji yanjiu*, ed., *Jianguo yilai shehuizhuyi jingji lilun wenti zhengming, 1949–1984* [Polemic on socialist economic theory since founding, 1949–84] (Beijing: Zhongguo-caizheng-jingji-chubanshe, 1985), pp. 716–18.
- 2 Zhou Shulian and Pei Shuping, “Shilun xinxing changye he chuantong changye de guangxi” [Essay on the relation between newly rising industries and traditional industries], *Jingji yanjiu*, 1984, No. 8.
- 3 This is based on the following materials: The editorial office of *Jingji yanjiu*, ed., “Jianguo yilai”; Zhou Lin, Yang Yunlong, and Liu Wei, *Yong changye zhongce tuijin fazhang yu gaige* [Using industrial policy to promote development and reform], *Jingji yanjiu*, 1987, No. 3; Qin Linzheng, *Fazhang zhangrue lun* [On development strategy] (Luoyang: Henan-renmin-chubanshe, 1987); and Wu Mingyu, *Zhongguo keji fazhang zhangrue* [China's development strategy for science and technology], in *Woguo shehuijingji he keji fazhang zhangrue wenti* [Development strategy of our socioeconomy and science-technology] (Beijing: Zhishi-chubanshe, 1987).
- 4 Zhou, Yang, and Liu, “Yong changye zhongce.”
- 5 Huang Fangyi, “Dangmian woguo yinjin he duiwai jingji maoyi de zhiyue yinsu he gajing shexiang” [Ideas for reforming restrictive factors on external trade and the introduction of foreign technology], *Jingji yanjiu*, 1985, No. 12; and Li Yang, “Qianyi ‘waixiangxing’ jingji” [Short-essay on outward-looking economy], *Jingji yanjiu*, 1986, No. 12.

- 6 Zhou, Yang, and Liu, “Yong changye zhongce”; and Liu Changli, “Jingkoutidai shi woguo ganzhao shijie gongye daguo de changqi zhangrue [Import substitution is our long-term strategy for outrunning the world’s industrial powers], *Jingji yanjiu*, 1987, No. 8.
- 7 Wu Jingcai, “Sakerarenai ‘keizai-byō’” [An unavoidable economic malaise], *Beijing Review* (Japanese edition), February 9, 1988.
- 8 This author’s interview with one of the senior researchers at the Economic System Reform Institute of China in Beijing.

Select Bibliography

- Akagi, Akio, and Satō, Morihiko. *Chūgoku no gijutsu sōzō* [China's technology creation]. Tokyo: Chūō-kōron-sha, 1975.
- Baark, Erik, and Jamison, Andrew, eds. *Technological Development in China, India and Japan*. Hong Kong: Macmillan Press, 1986.
- Bauer, Eugene E. *China Takes Off: Technology Transfer and Modernization*. Seattle: University of Washington Press, 1986.
- Berliner, Joseph S. *The Innovation Decision in Soviet Industry*. Cambridge, Mass.: MIT Press, 1976.
- Byrd, William A. *The Shenyang Smelter: A Case Study of Problems and Reforms in China's Nonferrous Metals Industry*. World Bank Staff Working Papers, No. 766. Washington, D.C.: World Bank, 1985.
- Byrd, William; Tidrick, Gene; Chen Jiyuan; Xu Lu; Tang Zongkun; and Chen Lantong. *Recent Chinese Economic Reforms: Studies of Two Industrial Enterprises*. World Bank Staff Working Papers, No. 652, Washington, D.C.: World Bank, 1984.
- Cheng, Chu-yuan. *Scientific and Engineering Manpower in Communist China, 1949–1963*. Washington, D.C.: National Science Foundation, 1965.
- Clark, M. Gardner, *The Development of China's Steel Industry and Soviet Technical Aid*. Ithaca, N.Y.: Cornell University Press, 1973.
- Dandai-Zhongguo-congshu-bianji-weiyuanhui 当代中国丛书编辑委员会. *Dandai Zhongguo de biaojunhua* 当代中国的标准化 [The standardization of contemporary China]. Beijing: Zhongguo-shehui-kexue-chubanshe, 1986.
- _____. *Dandai Zhongguo de dianzi gongye* 当代中国的电子工业 [The electronics industry of contemporary China]. Beijing: Zhongguo-shehui-kexue-chubanshe, 1986.

- . *Dandai Zhongguo de hanten shiye* 当代中国的航天事业 [The space industry of contemporary China]. Beijing: Zhongguo-shehui-kexue-chubanshe, 1986.
- . *Dandai Zhongguo de huaxue gongye* 当代中国的化学工业 [The chemical industry of contemporary China]. Beijing: Zhongguo-shehui-kexue-chubanshe, 1986.
- . *Dandai Zhongguo de he gongye* 当代中国的核工业 [The nuclear industry of contemporary China]. Beijing: Zhongguo-shehui-kexue-chubanshe, 1987.
- . *Dandai Zhongguo de shiyou huaxue gongye* 当代中国的石油化学工业 [The petrochemical industry of contemporary China], Beijing: Zhongguo-shehui-kexue-chubanshe, 1987.
- . *Dandai Zhongguo de hangkong gongye* 当代中国的航空事业 [The aviation industry of contemporary China]. Beijing: Zhongguo-shehui-kexue-chubanshe, 1988.
- Ellman, Michael. *Socialist Planning*. London: Cambridge University Press, 1979.
- Goossen, Richard J. *Technology Transfer in the People's Republic of China: Law and Practice*. Dordrecht: Martinus Nijhoff Publishers, 1987.
- Guojia-kexuejishu-weiyuanhui-kejiguanlijui, ed. 国家科学技术委员会科技管理局编辑. *Zhonghua renming gongheguo kexuejishu fagui xuanbian* 中华人民共和国科学技术法规选编 [People's Republic of China selected regulations on science and technology]. Beijing: Kexue-jishu-wenjian-chubanshe, 1984.
- Hama, Katsuhiko. *Tou Shouhei jidai no Chūgoku keizai* [Chinese economy during the Deng Xiaoping era]. Tokyo: Aki-shobō, 1987.
- Ishikawa, Shigeru. *Chūgoku keizai no toukeiteki kenkyū* [Statistical study of the Chinese economy]. Chōsa-kenkyū-houkoku-sōsho, No. 7. Tokyo: Institute of Developing Economies, 1962.
- Japan-China Association on Economy and Trade, ed. *Japan-China Trade Yearbook*, 1974–88 editions. Tokyo: Japan-China Association on Economy and Trade, 1975–89.
- Kneen, Peter. *Soviet Scientists and the State: An Examination of the Social and Political Aspects of Science in the USSR*. Hong Kong: Macmillan Press, 1984.
- Kojima, Reetsu. *Chūgoku no keizai to gijutsu* [Chinese economy and technology]. Tokyo: Keisō-shobō, 1974.
- . ed. *Chūgoku no keizai kaikaku* [Economic reform in China]. Tokyo: Keisō-shobō, 1988.
- Li Hao; Jiang Yiwei; and Zhou Shulian, eds. 李灏、蒋一苇、周淑莲主编. *Zhongguo gongye jingji fazhan zhanrue yanjiu* 中国工业经济发展战略研究 [A study of China's strategy for developing its industrial economy]. Beijing: Jingji-guanli-chubanshe, 1986.
- Liu, Guoguang, ed. 刘国光主编. *Zhongguo jingji fazhanzhanrue wenti yanjiu*

- 中国经济发展战略问题研究 [A study of China's strategy for developing its economy]. Shanghai: Shanghai-renmin-chubanshe, 1984.
- Maruyama, Nobuo. *Tenki ni tatsu Chūgoku keizai* [The Chinese economy in transition], Kenkyū-sōsho, No. 329. Tokyo: Institute of Developing Economies, 1985.
- Moritani, Masanori. *Nihon, Chūgoku, Kankoku sangyō gijutsu hikaku* [Comparison of industrial technology in Japan, China, and the Republic of Korea]. Tokyo: Tōyō-keizai-shimpōsha, 1980.
- Orleans, Leo A., ed. *Science in Contemporary China*. Stanford, Calif.: Stanford University Press, 1980.
- Parrott, Bruce. *Politics and Technology in the Soviet Union*. Cambridge, Mass.: MIT Press, 1985.
- Pollack, Jonathan D. *The Chinese Electronics Industry in Transition*. Santa Monica, Calif.: RAND Corporation, 1985.
- Qian Weichang; Fei Xiaotong; Wu Mingyu, et al. 钱伟长、费孝通、吴明瑜等著. *Wuoguo shehui jingji he ke ji fazhan zhanrue wenti*, 我国社会经济和科技发展问题 [The issue of the strategy for developing the socioeconomy and science and technology in China]. Shanghai: Zhishi-chubanshe, 1987.
- Richman, Barry M. *Industrial Society in Communist China*. New York: Random House, 1969.
- Robinson, Richard D. ed. *Foreign Capital and Technology in China*. New York: Praeger Publishers, 1987.
- Shi Qingqi; Qin Baoding; and Chen Jing 史清琪、秦宝庭、陈警. *Jishu jingbu yu jingji chengzhang* 技术进步与经济成长 [Technological development and economic growth]. Beijing: Kexue-jishu-chubanshe, 1985.
- Shimakura, Tamio, and Maruyama, Nobuo. *Chūgoku keizai no jirenma* [Dilemmas for the Chinese economy]. Tokyo: Yūhikaku, 1983.
- Sigurdson, Jon. *Technology and Science in the People's Republic of China: An Introduction*. Oxford: Pergamon Press, 1980.
- Simon, Denis Fred, and Rehn, Detlef. *Technological Innovation in China: The Case of the Shanghai Semiconductor Industry*. Cambridge, Mass.: Ballinger Publishing Co., 1988.
- Sobeslavsky, Vladimir, and Beazley, P.G. *The Transfer of Technology to Socialist Countries: The Case of the Soviet Chemical Industry*. Aldershot, Hants: Gower Publishing Co., 1980.
- Sun Shangqing, ed. 孙尚清主编. *Lun jingji jiegou duice* 论经济结构对策 [The policy of economic structure]. Beijing: Zhongguo-shehui-kuxue-chubanshe, 1984.
- Suttmeier, Richard P. *Science, Technology, and China's Drive for Modernization*. Stanford, Calif.: Hoover Institution Press, 1980.
- Sutton, Antony C. *Western Technology and Soviet Economic Development, 1945 to 1965*. Stanford, Calif.: Hoover Institution Press, 1973.
- Tang, Tong B. *Science and Technology in China*. London: Longman 1984.

- Tidrick, Gene, and Chen, Jiyuan, eds. *China's Industrial Reform*. New York: Oxford University Press, 1987.
- Uehara, Kazuyoshi. *Chūgoku no keizai kaikaku to kaihou seisaku* [China's economic reform and open-door policy]. Tokyo: Aoki-shoten. 1987.
- U.S., Congress, Joint Economic Committee. *China under the Four Modernizations*, Part 1. Washington, D.C.: U.S. Government Printing Office, 1982.
- U.S., Congress, Office of Technology Assessment. *Technology Transfer to China*. Washington, D.C.: U.S. Government Printing Office, 1987.
- Volti, Rudi. *Technology, Politics, and Society in China*. Boulder, Colo.: Westview Press, 1982.
- Walder, Andrew G. *Communist Neo-Traditionalism: Work and Authority in Chinese Industry*. Berkeley, Calif.: University of California Press, 1986.
- Wang Haibo, ed. 汪海波主编. *Xin Zhongguo gongye jingji shi* 新中国工业经济史 [History of new China's industrial economy]. Beijing: Jingji-guanli-chubanshe, 1986.
- Wang Jiye, ed. 王积业主编. *Jishu jinbu de pingjia lirun yu shijian* 技术进步的评价理论与实践 [Evaluation theory of technological progress and its practice]. Beijing: Kexue-jishu-wenjian-chubashe, 1986.
- World Bank. *China: Long-Term Development Issue and Options*. A World Bank Country Economic Report. Baltimore, Md.: Johns Hopkins University Press, 1985.
- World Bank. *China: Economic Structure in International Perspective*. Annex 5 to *China: Long-Term Development Issue and Options*. A World Bank Country Study. Washington, D.C.: World Bank, 1985.
- Yeh, K.C. *Industrial Innovation in China with Special Reference to the Metallurgical Industry*. Santa Monica, Calif.: RAND Corporation, 1985.
- Zhongguo-guofang-jingjixue-yanjiuhui-choubeizu, ed. 中国国防经济学研究会筹备组编辑. *Guofang jinjixue lunwenji* 国防经济学论文集 [Essays on the national defense economy]. Beijing: Jiefangjun-chubanshe, 1986.