CHINA'S INDUSTRIAL PERFORMANCE (1980-1992): THE INTERACTION BETWEEN RESOURCE MOBILISATION AND PRODUCTIVITY CHANGE

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A thesis submitted in accordance with the requirements for the degree of Doctor of Philosophy

The University of London
School of Oriental and African Studies

October 1995

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Abstract

Since 1978, China has been one of the fastest growing economies in the world. Notable features of its economic performance have been its industrial growth and the expansion of its manufactured exports. The focus of this research is China's industrial performance during the years 1980 and 1992. Its principal objective is to analyze industrial growth from the twin perspectives of resource mobilisation and productivity change. It is argued that these two aspects, both of which reflect the impact of Dengist reforms, are interrelated.

Our analysis of resource mobilisation suggests that a number of factors have contributed to China's rapid industrial growth. Two of these have been of particular importance. First, increased emphasis on the role of the market, in terms of facilitating more rapid growth of household demand and strengthening intersectoral linkages, enabled the industrial sector to improve its access to widening domestic and foreign markets. Second, the transformation of funding arrangements for industry had two beneficial results: it permitted non-state agents to play a greater role in financing industrial expansion; and it enabled the traditional state funding system to enhance its role as a means of improving intersectoral balance.

The analysis of productivity change in post-reform industry is deliberately set in the context of the changes in market structures which have faced China's industrial enterprises. Our findings indicate that enterprise reforms and structural adjustments have been a source of improvement in levels of industrial productivity in China. But they also suggest that such improvements have been neither consistent, nor balanced over time and between different branches of industry.

In an attempt to identify the forces which have given rise to the distinctive patterns of resource mobilisation and productivity change in China's industrial sector under the impact of reform, we have deliberately focused on the interactions between government, enterprises and the market. It is noteworthy that the increased role played by regional and local governments has facilitated the more intensive use of local productive resources. But it is also clear that the same factor has been the source of regional market fragmentation. Both of these elements have impacted on China's industrial performance since the early 1980s.

Acknowledgements

This thesis is the product of postgraduate studies in Britain which I began in 1991. The work could not have proceeded without the help of Dr. Robert F. Ash, who agreed to supervise my research and whose intellectual guidance has been invaluable. The rigorous standards set by him and the insights he has provided have helped shape this thesis and bring it to what I hope is a successful conclusion. I also benefited from comments made by members of the Economics Graduate Research Seminar, chaired by Professor Ben Fine, at the School of Oriental and African Studies (SOAS). I should also like to thank Dic Lo for his help, especially in the late stages of my research.

In formulating the basic ideas underlying this thesis, I benefited greatly from the comments of Dr. Peter Nolan (Jesus College, Cambridge), who initially guided my research. At a later stage, he also helped me to clarify many perplexing points.

At different points in my postgraduate career in Britain, I was fortunate to receive financial support from a number of organizations. They included: the CVCP Overseas Research Studentship, the Cambridge Overseas Trust, the K. C. Wong Educational Trust in Hong Kong, and the Great Britain - China Educational Trust, and Sino-British Fellowship Trust.

This thesis is dedicated to my wife, Xiaobo, who has had to bear the heavy burden entailed by my research commitment over several years.

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Chapter One

Introduction

The central theme of our study on the performance of China's industry 1980-1992 is to explain China's industrial growth in terms of resource mobilisation and productivity change. The two aspects are regarded as being interrelated. In this introduction, we will first outline the objective and structure of the study in Section I. A brief account of reforms and growth in China's industry since the later 1970s is given in Section II. Our analytical framework for the study is set forth in Section III by highlighting some theoretical generalisations concerning economic performance analysis.

I. The Structure of Study

As some theorists note, economic growth may be explained in many different ways for different purposes such as growth prediction or impact assessment of a development policy[1]. Our purpose set forth here in this research programme is to assess the economic performance of post-reform China's industry with reference to resource mobilisation and productivity change. It is concerned with the issue of policy implications as described below.

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[1] See, for example, Richard R. Nelson: "Recent Exercises in Growth Accounting: New Understanding or Dead End?", American Economic Review [AER], Vol. 63, No. 3, June 1973.

First, our central concern is the overall orientation of reform policies relating to China's industry. As summarised in the next section, China's reform policy has two characteristics: firstly, moving gradually towards a market-type economy in virtually all areas but, secondly, the progress has been uneven in some areas. With this broad background, we intend to reveal how China's industrial growth has been influenced by the reforms in terms of both overall and sub-sectoral trends in output growth and productivity change.

Second, our standpoint in the study can be regarded as a combination of forward-looking perspective and retrospection. The forward-looking perspective tends to give more consideration to factors that are believed to obstruct further development and therefore illuminates in a broad sense the possible direction of future reforms. The retrospective view, on the other hand, emphasises more of the differences between the pre- and post-reform periods and therefore helps to reveal factors that are considered to be conducive to economic development. The two perspectives are in principle complementary.

Economic performance is defined in our analytical framework as the extent to which economic actors respond to changes in the market by mobilising productive resources and improving their productivity. This general definition of economic performance arises from a more general perception that economic growth may be regarded as a process when resource mobilisation and productivity change are interrelated. Empirically, performance assessment may be sought with comparison of output growth, input growth, and productivity change, at economy and sector levels. Our analysis will therefore aim to explore these measures in post-reform China's industry and their relative

change by making full use of newly-enriched official Chinese statistics[2].

The structure of the research programme falls into three parts. The first part, consisting of Chapters Two and Three, deals with market expansion and investment expansion in post-reform China's industry. Market expansion concerns issues such as the restoration of inter-sectoral linkages through the market, and the pursuit of market expansion both at home and abroad. Investment expansion concerns the mobilisation of capital resources into industry in the context of changed inter-sectoral relations. Transformation of inter-sectoral relations is our analytical focus. The second part, consisting of Chapters Four, Five and Six, contains our comparative study of output growth and productivity change in post-reform China's industry. Our empirical investigation has been broken down into sub-sector level and also taken into account sectoral shifts and their impact. The third part, consisting of Chapters Seven and Eight, presents our tentative interpretation of post-reform Chinese industrial growth in terms of interaction between enterprises, governments(including regional and local governments) and the market. The investigation is conducted at industrial branch and provincial region level, respectively. The purpose is to reveal how resource mobilisation has been linked, by economic actors in post-reform China's industry, with gains from greater market exposure.

The contents of individual chapters are as follows.

In Chapter Two, we examine the factors that fostered growing demand in post-reform China's industrial markets. The following positive impacts of reforms on China's industrial growth are exhibited. (i) The household sector grew faster in the post-reform period which boosted a growing demand for

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[2] The State Statistics Bureau of China [SSB] has published sectoral data for China's industry since 1985. But the scope and definitions of statistical data have been subject to some frequent alterations. Series on a more consistent basis began to appear in 1989 and continue to a recent date.

industrial consumer goods; (ii) accelerated urbanisation is considered a significant factor that helped to enlarge domestic markets for industrial goods; (iii) linkages between heavy and light industry began to be restored through the market. Along with structural changes and technological progress, demand for capital goods was also growing; (iv) the open-door policy has given Chinese industrial enterprises more exposure to overseas markets and therefore enable them to take advantage of growing foreign demand. Altogether, changes in industrial markets have substantially helped to transform the inter-sectoral constraints facing China's industry.

Chapter Three deals with investment expansion in post-reform China's industry. The key questions faced include: (i) to what extent has post-reform China's industrial growth relied on investment expansion? (ii) along with changes in the state funding system and reforms in financial markets, how could China's industry maintain its high tendency towards investment expansion? (iii) what role is played by the continued state funding for industrial growth compared to that of market forces? Our investigations show that post-reform China's industrial growth has been to a large extent supported by fast investment expansion, and sources of industrial investment funds have became diversified and also conducive to industrial expansion. We also find that unbalanced sectoral movements existed in post-reform China's industrial investment expansion.

Chapter Four is an introduction to our productivity analysis, which makes use of the total factor productivity method. The purpose of total factor productivity analysis is to compare the relative contributions to output growth of input growth and productivity improvement. The main arguments we present there are: (i) total factor productivity can be taken as an indicator of productivity growth that may be conceptually different from technological progress; (ii) market conditions and their changes must be taken into account

when interpreting the results of total factor productivity analysis; (iii) sectoral shifts may be an important source of aggregate total factor productivity. In that chapter, we also clarify some issues concerning the use of official Chinese industrial statistics.

In Chapter Five, we elaborate existing statistical data to obtain a series of industrial output and input level in 1980-1992 with a consistent basis. Features of this work include: (i) the newly-available producer price index is used to deflate industrial output; (ii) price deflators for the industrial capital base for the whole period 1980-1992 are constructed in a manner consistent with their official counterpart which covers recent years only; (iii) as an experiment, we have also attempted to establish factor shares of industrial output for the whole period, which is considered particularly useful for revealing sharply-contrasting trends in returns to factors in post-reform China's industry. Results of the work provide a consistent base for the total factor productivity estimates that are presented in Chapter Six.

For total factor productivity at industry level we have compared several measures of output and capital inputs, in Chapter Six, which have implications for current debate. To further the analysis, we explore at sector level in industry: sectors by form of ownership, by type of activity, and by size of enterprise. The purpose of this decomposition is, firstly, to ascertain particular sectoral sources of aggregate total factor productivity, and secondly, to establish the impact of sectoral shifts on aggregate total factor productivity. Through comparisons of output growth, input growth, and total factor productivity, across sectors and over periods, our empirical investigations reveal a number of important features of output growth and productivity change in post-reform China's industry.

The finding in Chapter Six confirms that, overall, post-reform

China's industry has achieved positive productivity growth, though not to a great degree. The relatively slow growth in productivity does not, to our understanding, imply that technological progress in post-reform China's industry has been sluggish. What the result would suggest may be that the positive impact of technological progress on productivity growth may have been to a certain degree concealed by some other factors that have impeded the productivity growth in post-reform China's industry. To reveal these factors and their influences on industrial growth, we need to consider the impact of reforms on market structure and enterprise behaviour which were all under the influence of regional and local governments. Investigation of these issues is conducted in Chapters Seven and Eight.

The study in Chapter Seven examines the issue of profit-oriented behaviour of post-reform Chinese industrial enterprises. We hypothesise that stronger profit-seeking behaviour and greater mobility of capital across branches would lead to returns on capital converging between industrial branches. It is found that a popular result sought by post-reform China's industrial enterprises was a mixture of profits and tax returns. This finding suggests that the behaviour of China's industrial enterprises was under the great influence of governments, especially regional and local governments.

The impact of regional governments' direct intervention on industrial growth is examined in Chapter Eight. Though market forces have played a greater role in determining geographical shifts of industrial production in the post-reform period, we have found that regional governments exerted great influence on regional industrialisation by controlling regional markets and productive resources including raw material supply. We have also found a characteristic of factor markets in post-reform China's industry: capital movement across branches within a region developed faster than capital movement across regions. A degree of market fragmentation formed a feature of

decentralisation in post-reform China's industry. Though the market fragmentation had certain negative impacts on productivity growth, it was nevertheless an outcome of the greater role played by regional governments in mobilising and allocating regional productive resources including market exploration and raw material supply.

Chapter Nine concludes our study of the performance of post-reform China's industry. In summarising the results of analysis, it highlights two questions of particular importance: (i) how is resource mobilisation related to productivity improvement in post-reform China's industry? (ii) what are the basic causes of unbalanced growth in post-reform China's industry?

II. Reforms and Growth in China's Industry: A Brief Account

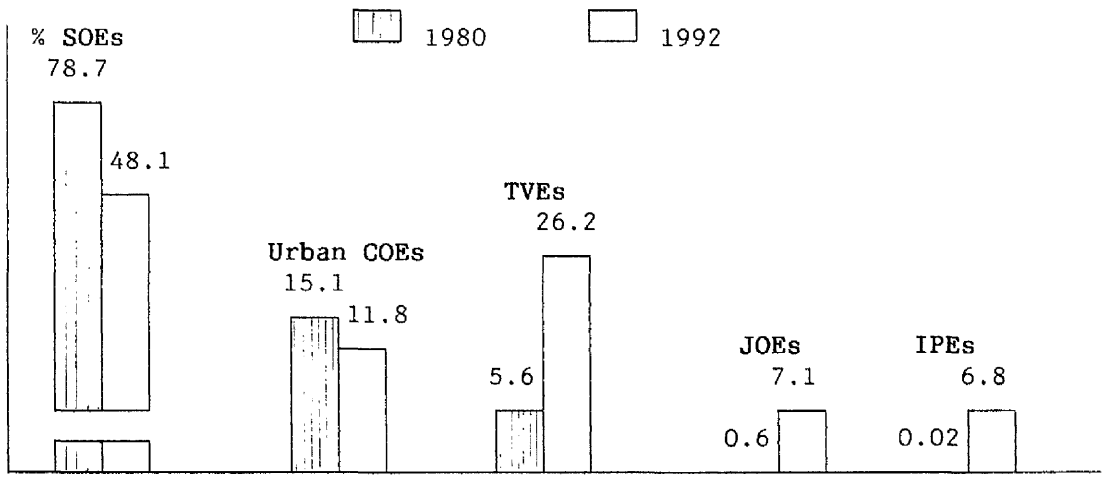
Following reforms in agriculture, reforms began in China's industry in the later 1970s with the introduction of an increased autonomy for enterprise, in the form of the profit retention scheme(1979) and economic responsibility system(1980). These measures aimed at improving the efficiency of state-owned enterprises (SOEs) by granting them more material incentives, and a degree of freedom to adjust production plans. However, under these measures the responsibilities of enterprises and their supervisory bureaux were often not clearly demarcated, and so because subject to endless negotiations. A new reform, the contract responsibility system that aimed to define more explicitly enterprise responsibility, was introduced in 1987, and has become central to the operation of SOEs since then[3].

Parallell with reforms in SOEs is the opening up of the non-state sector. In the pre-reform period after the mid-1950s, the only form of non-

[3] For a comprehensive review of reforms in SOEs, see: Qimiao Fan and Mark E. Schaffer, Enterprise Reforms in Chinese and Polish State-Owned Industries, CP No. 13, STICERD, the London School of Economics, April 1991

state enterprise in industry was collective enterprises (COEs), most of which operated on a small scale in urban areas. While this type of COE has continued to grow in the post-reform period, its counterpart in rural areas, the township and village enterprises (TVEs), registered faster growth. The rapid growth of TVEs constitutes a basic feature of post-reform China's industrial development. Meanwhile, other forms of ownership, joint-ownership enterprises (JOEs) and individual and private enterprises (IPEs), have also achieved impressive growth records(Figure 1-1).

Figure 1-1. Percentage Share in Industrial Production by Form of Ownership



Data source: The State Statistics Bureau [SSB], Zhongguo tongji nianjian (The Statistical Yearbook of China), thereafter TJNJ, (Beijing: Zhongguo tongji chubanse, 1993), p.409; SSB, Zhongguo gongye jingji tongji zhiliao (The Statistical Data of China's Industrial Economy), thereafter ZGGYJJTJZL (Beijing: Zhongguo tongji chubanshe, 1986), p.128.

Because enterprises with these various forms of ownership arose from different environments there are considerable structural and behavioural differences among them. We will examine the distinctive natures of the enterprises and their implications later in our study (particularly in Section III of Chapter Four and Section III of Chapter Seven). Here it is sufficient to note that SOEs are still the leading sector in urban areas in terms of its absorption of employment(Table 1-1). By 1992, though more than one half of all China's

industrial employment was absorbed by non-state enterprises, over two-thirds of industrial workers in urban areas remained in SOEs. This rate of urban industrial employment is virtually the same as that in 1985.

Table 1-1. SOEs in China's industry(%)

	1978	1985	1988	1992
In industrial production	77.6	64.9	56.8	48.1
In industrial employment	51.5	45.7	43.8	44.2
In urban industrial employment	72.1	68.7	68.7	68.3

Source and note: TJNJ 1993, p.414(industrial production), p.98(total labour force engaged in industry); p.104(total urban industrial employment).

Besides enterprise reforms, a cluster of de-regulations were gradually introduced into industrial markets. Price de-controls first appeared in some consumer goods markets where supply roughly balanced demand, spreading eventually over virtually all consumer goods. In capital goods markets, a two-track pricing system was introduced in the mid-1980s to allow for a greater role for market demand whilst planning authorities maintained a degree of control over the operations of SOEs. The overall trend in this respect is that price determination of an increasing number of products, both consumer goods and capital goods, become free of direct government control[4].

Reforms in labour markets and capital markets have been rather slow and uneven, on the other hand. From their onset TVEs have had great flexibility in forming employment contracts. In contrast, SOEs faced strong resistance to their gaining any ability to decide employment levels. There

[4] For a more accurate and detailed account of development in price reforms in China, see William A. Byrd, The Market Mechanism and Economic Reforms in China, New York: M.E. Sharpe, Inc. 1991

does not yet exist an effective social security system that would provide for possible mass unemployment in urban areas[5]. In financial markets, specialised state banking institutions have undergone a degree of commercialization but mostly in areas of short-term and small-scale operations. Notwithstanding their de-linking with the state, those specialised state banking institutions have become subject to more interventions by regional governments[6,7].

Relations between central and regional governments over economic development have experienced a great deal of change. In 1980, a form of tax-return-sharing scheme was introduced between central and provincial authorities which gave regional governments strong incentives to seek production expansion. With the weakening of the centrally planned system, regional governments gained more power to initiate their own development policies[8]. In this respect, decentralisation is key to the overall trend of reform in China.

Reforms have also evolved in external economic relations. Under the open-door policy, a number of special economic zones were set up in coastal areas to attract foreign capital inflow and promote export-oriented activities, as well as to establish examples of a market-type economy for China's industrial enterprises. Meanwhile, the Chinese government has

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[5] See, Athar Hussain, "Social Security in Present-Day China and Its Reform", AER, Vol. 84, No. 2, May 1994

[6] See, for details, Ryoshin Minami, The Economic Development of China: A Comparison with the Japanese Experience, London: Macmillan, 1994, Sec. 2.3

[7] The imbalance and fragmented characteristics of China's factor markets(e.g., labour, capital and land) have been well tackled in William A. Byrd and Gene Tidrick, "Factor Allocation and Enterprise Incentives", in China's Industrial Reform, ed. by Gene Tidrick and Chen Jiyuan, New York: Oxford University Press [OUP], 1987

[8] For a review of fiscal reforms regarding to relations between the central and regional/local governments, see Christine P.W. Wong, "Central-Local Relations in an Era of Fiscal Decline: The Paradox of Fiscal Decentralization in Post-Mao China", The China Quarterly [CQ], No. 128 (December 1991)

undertaken a number of protective policies to prevent domestic industry from foreign competition, and has used macroeconomic measures such as devaluations of RMB to promote export expansion in overseas markets[9].

With reforms in all these spheres, China's industry has achieved a high growth rate since the late 1970s. In official Chinese statistics, the annual average growth rate of the gross value of industrial output(GVIO), measured in constant 1980 prices, has reached as high as 13.2% in 1979-1992, that is clearly higher than that of 9.5% in the 1970s[10]. Viewed from estimates made by the World Bank, the rapid industrial growth in post-reform China is also impressive. The Bank's estimates show that the average annual growth rate of value added in China's industry was 11.0% in 1980-1991, again a clear rise from that of 7.8% in 1970-1980[11]. It is evident that industrial growth in China in the post-reform period has accelerated[12].

Coupled with the overall growth in industrial production, China's manufacturing exports have registered an even faster growth record. From 1978 to 1992, China's total commodity exports in dollar value increased nearly ninefold, equivalent to an annual average growth rate of 16.7%. Meanwhile, the

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[9] For an overall summary on China's foreign trade policy and its evolution, see: Erin McGuire Endean, "China's Foreign Commercial Relations", in the US Congress Joint Economic Committee [USCJEC], China's Economic Dilemmas in the 1990s: The Problems of Reforms, Modernization, and Interdependence, Vol. II, Washington, D.C., 1991

[10] Figures cited here and thereafter, unless otherwise stated, are from the TJNJ 1993.

[11] See the World Bank [WB], World Development Report 1993, World Development Indicators. Figures about China's industrial growth reported there are estimated by the World Bank.

[12] It may be noted that while industry continued to be the leading sector in China's economy in terms of GDP creation and relative speed of growth, its position in the economy has slightly changed as other sectors experienced more impressive growth in post-reform period. In 1980-1991, the annual growth rate of the agricultural and service sectors was 5.7% and 11.2% respectively, much higher than their growth rate in the 1970s (2.6% and 6.1% respectively). See WB, ibid.

share of manufactured goods in the total of commodity exports rose from about 45% to 80%. The average annual growth rate of China's manufacturing exports was as high as over 18% in 1980-1992. In the United Nations' estimates[13], China's total exports expanded at 16% annually in 1980-1991, resulting in China's rating in the ranking of the world's exporters escalating to eleventh from twenty seventh. Their estimates also show that the share of manufactured goods in the total level of exports rose to 77% from 50% during the same period. This rapid export growth has also helped China to become one of the leading importers in the world(the eleventh largest importer in 1992) and therefore to begin to have a significant impact on the world economy. This is unprecedented in China's economic history.

From these statistical records of industrial output growth and manufacturing export expansion in post-reform China, it is not surprising when an observer concludes that "the reality of rapid and sustained growth [in China's industry] is beyond dispute"[14]. It looks certain that reforms have led China to achieve rapid and sustained industrial growth. On the other hand, however, it seems unclear exactly how the industrial growth was associated with resource mobilisation and productivity change. To this question our present study will respond.

III. Performance Analysis: An Analytical Framework

The central question we address in the present study is not whether China's industry has achieved a respectable growth record, but what economic implications the high growth record has for China's industrial development

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[13] The United Nations [UN], World Economic Survey 1993, Box III.2: China: Another Success in Asia of an Outward-Looking Development Strategy, pp.67-68.

[14] Thomas G. Rawski, "China's Industrial Reform: Accomplishments, Prospects, and Implications", AER, Vol. 84, No. 2 (May 1994), p. 271

under reforms. Currently, not only are there doubts over how China's ability to achieve the high industrial growth during a period longer than a decade[15], but also a controversy has arisen over whether the high growth has also meant improvement in efficiency in China's industry. An author has expressed his scepticism thus:

> While the Chinese have achieved a high rate of growth, they have not yet been able to raise significantly the productivity of labour or the efficiency with which capital is used, particularly at state-operated enterprises.[16]

On the other side, some observers have strongly argued for an opposite judgement:

> The increasing efficiency of China's industry is indicated by its success in selling in competitive world markets: exports grew in real terms at over 10% per year between 1978 and 1990; the ratio of exports to GNP had risen to 17%(compare this to Japan's 9%). While growth of national income should not be the only criterion for evaluating the success of economic policies, it is the first and most important indicator of success. An economic system --- especially in a poor

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[15] For example, some economists have questioned: "Why China has grown so fast when conditions thought to be necessary for growth.... were absent?" (Oliver Blanchard and Stanley Fisher, eds. NBER Macroeconomics Annual 1993, Boston: MIT Press, 1993, p.4; quoted in Rawski, ibid.)

[16] Robert Michael Field, "China's Industrial Performance since 1978", CQ, No. 131(September 1992). Similar remarks can be also found elsewhere, for example, Jan S. Prybyla, Reforms in China and Other Socialist Economies, Ch. 13, Why China's Economic Reforms Fail?, Washington, D.C.: The AEI Press, 1990; and Wing Thye Woo, Wen Hai, Yibiao Jin, and Fang Fan, "How Successful Has Chinese Enterprise Reform Been? Pitfalls in Opposite Biases and Focus", Journal of Comparative Economics[JCE], 18:410-437, 1994

country --- must be judged by its performance in providing increased levels of goods to its citizens, and this can be roughly measured by the growth of GNP per capita. By the simple criterion of making ordinary people better off(or, more accurately, less badly off), China has been spectacularly successful.[17]

Involved in the debate are a number of theoretical issues concerning economic performance assessment, which include: (i) the critera of economic performance applicable to an economy or industry; (ii) the relationship between resource use and productivity change; and (iii) the implications of an imbalance in market conditions for long-term development. Below we will set forth our analytical framework for this study by attempting to define these issues.

1. Conceptual Note on Performance, Productivity, Technological Progress, and Production Efficiency

Terms of performance, productivity change, technological progress, and production efficiency are sometimes used inter-changeably in the literature. For example, to some economists, economic performance is regarded as a reflection of productivity change or technological progress only or mostly[18];

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[17] John McMillan and Barry Naughton, "How to Reform a Planned Economy: Lessons from China", Oxford Review of Economic Policy, Vol. 8, No. 1 (January 1992), p.133. The authors have gone so far as to say that SOEs in China have "achieved respectable productivity gains"(p.135). A more recent expression of this assessment has been made by Thomas G. Rawski, saying, "[China's i]ndustry has broken a long-standing pattern of 'extensive' output growth arising from applying larger quantities of labour, capital and materials to the production process."(see his, op.cit., p.271).

[18] For example, Bruce Reynolds has judged China's industrial performance by referring to the total factor productivity that led him to arrive at "dismal failure" of reforms in China's industry up to mid-1980s. See his, "Introduction", in a special symposium on Chinese industrial reform, JCE, September 1987

to some others, technological progress may be in general indicative of productivity change or efficiency improvement[19]. For our purpose of analysis it seems imperative to give each of these terms a distinctive definition, in a manner which conforms to economists' general perception of production.

By "the general perception of production" we imply those general and less-controversial points made about production. They may include: (i) the purpose of production is to seek gains by using productive resources; (ii) production is a process caused by interaction between forces of demand and supply; (iii) all production faces certain resource constraints and technological constraints: the former is the degree of availability of or access to productive resources, and the latter is the possible level of maximum output obtained from a status quo use of resources. Given these premises it is possible to define the above terms as follows.

(1) production efficiency: it refers to a move in production towards the possible maximum output under unchanged technological and resource constraints as well as demand conditions. Referring to the terminology used in production function theory, this implies a move from interior points towards a production frontier when the frontier is held unchanged at a point of time. Production efficiency is also called technical efficiency in the literature. The concept reveals any problem of disuse of factor inputs, such as labour(implicit under-utilisation of employment), capital(idle fixed capital stock), and materials(excessive consumption of raw materials)[20].

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[19] For a summarised account of this concept, see C. Kennedy and A. P. Thirlwall, "Technical Progress", Economic Journal, May 1972

[20] Notion of production efficiency of this kind is firstly introduced by M. J. Farrell, "The Measurement of Productive Efficiency", Journal of the Royal Statistical Society, A series 120, pt. III(1957), 253-81. A theoretical justification of the concept is the X-inefficiency in a competitive firm(see, for example, R. S. Frantz, X-Efficiency: Theory, Evidence and Applications, Boston: Kluwer Academics, 1988). Economists with neoclassical inclination actually tend to deny this concept. See, for example, George J. Stigler, "Xistence of X-Efficiency", AER, 66:213-16 (May 1976).

Improvement in technical efficiency if any is conducive to overall productivity growth.

(2) technological progress: it refers to a change of the possible maximum output level under unchanged resource constraints and demand conditions. From a neoclassical production function point of view, this indicates that a production frontier has moved outwards, i.e., use of the same quantity of factor inputs has generated a higher level of output. Sources of technological progress may not necessarily lie only in technical inventions or equipment up-grading. Factors such as increasing returns to scale, learning by doing, and improved organisational competence may all help a shift in the production frontier. From a long-term development point of view, technological progress is a most important source of economic growth and productivity growth.

(3) productivity change: it refers to gain in production when resource constraints remain unchanged but demand conditions may or may not change. Conceptually, if demand conditions are unchanged, productivity change is virtually the same as technological progress. Important differences between the two concepts can arise however when demand conditions change over time. Changes in demand conditions will certainly affect productivity but have no impact, by definition, on technological progress. By "changes in demand conditions" we mainly mean changes in sectoral relative prices within an economy and/or for an open economy changes in the terms of trade with foreign countries[21]. An emphasised difference between productivity change and technological progress here is that demand conditions or changes in demand

[21] In the field of international trade, economists have demonstrated that under certain conditions, changes in terms of trade can have an impact on a country's gains from its production expansion. Literature on the "immiserising growth" is a typical case. See, for example, Jagdish Bhagwati, "Immiserizing Growth: A Geometrical Note", Review of Economic Studies, Vol. 25, No. 3 (June 1958)

conditions can have an impact on gains from production in the case of productivity change, but when dealing with technological progress the impact has been assumed away. We will give a detailed illustration of the implications of changed demand conditions on aggregate productivity in terms of sectoral production shifts later in Section II of Chapter Four.

(4) economic performance: it refers to changes in production when various constraints, of technology or of resources, may have all changed over a period of time. Changes in resource use can be a simply quantitative increase or re-allocation of existing resources. As all of the constraints may be subject to change over time, economic performance is in essence a long-term issue and therefore usually related to overall achievement in an economy or industry. Because of this overall nature, the term economic performance can contain many measurable elements, as put by an author:

> The most convenient way of assessing industrial success would thus be to examine the growth of manufacturing value-added over a long period, and such indicators of efficiency and dynamism as incremental capital-output ratios, growth of total factor productivity, export growth and diversification, and levels of protection afforded to domestic industry.[22]

An essential feature of the concept of economic performance is therefore that resource constraints facing an economy or industry can change or can be changed over a course of development. Factors that may be involved, for instance, may be a greater participation of the population in the labour force, a new discovery of mineral reserves, or more access to foreign markets

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[22] Sanjaya Lall, "Explaining Industrial Success in the Developing World", in Current Issues in Development Economics, ed. by V. N. Balasubramanyam, London: Macmillan, 1991, p.122

or foreign financial assistance. For this reason, any assessment of economic performance should necessarily take into account issues of resource mobilisation as well as that of productivity change.

Based on this understanding of economic performance, our study will examine both of these issues, resource mobilisation and productivity change, in post-reform China's industry. In studying productivity change, issues of production efficiency and technological progress will also be taken into account.

2. Resource Mobilisation versus Productivity Change

Having said that the concept of economic performance entails resource mobilisation and productivity change, it is felt that the relationship between the two terms needs to be defined further, to clarify their relative implication for performance analysis. Main points that we wish to make here are: (i) decomposition of economic growth into resource inputs and productivity change can be used to distinguish paths of economic development; (ii) the relative importance of resource mobilisation and productivity change is an important issue when considering production expansion; (iii) from a longer-term perspective of economic development, productivity increase is a more important element and therefore should be given more attention in overall performance assessment. Discussion below is brief and serves to justify our analytical framework of the performance of post-reform China's industry.

The theme that economic growth can be regarded as a process formed by the interaction of resource mobilisation and productivity has been expressed by development economists. For example, Moshe Syrquin has put it,

> The process of economic growth can be formally described as the

result of the expansion of productive resources and the increase in the efficiency of their use.[23]

A policy implication of this perception of economic growth is that emphasis may be given to either an increased use of resources or an improvement in productivity. This has also been articulated by development economists:

> Development strategies try to accelerate growth either through increasing the supply of labour and capital or through more efficient use of resources.[24]

Accordingly, the biases in economic growth or development strategy may be described as either "extensive growth" or "intensive growth". "Extensive growth" means an increase in resource use overshadowing productivity improvement, and "intensive growth" refers to the contrary case. Although these terms are still subject to rigorous definition as economic growth would usually involve both increase in resource use and productivity change, economists have used them to analyse some of the developing economies, e.g., China[25].

A more sensible question associated with the notions of "extensive" and "intensive" growth may be to ask what rationale would lie behind the policy inclinations classified by the "extensive" and "intensive" growth

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[23] Moshe Syrquin, "Patterns of Structural Change", in Handbook of Development Economics, Vol. I, ed. by Hollis Chenery and T. N. Srinivasan, Amsterdam: North Holland, 1988, p.224

[24] Hollis Chenery and Moshe Syrquin, Industrialization and Growth: A Comparative Study, New York: OUP, 1986, p.95

[25] For example, Thomas G. Rawski concluded in mid-1980s that in China's industry, "the desired transition from 'extensive' to 'intensive' growth has hardly began"("Overview: Industry and Transport", in USCJEC, eds. Chinese Economy to the Year of 2000, Washington, D.C., 1986, p.502).

approaches. Exploration into this question would lead us far beyond the scope of the present study. We however wish to stress here that the biases in policy inclination would arise from differences in the perception of gains from production expansion and such differences could affect the critera appropriate for the evaluation of economic performance[26].

Let's take two simplistic and extreme cases to illustrate the point. One is that gains are perceived mostly as physical increases in production. For example, iron and steel was singled out on the top development agenda by the Chinese leadership during the "Great Leap Forward". Taking it for granted that the target was warranted for, say, national interest, the criterion of success would be an increase in the output of iron and steel with little regard to the costs incurred in achieving the output growth. Another and more general case is that gains are perceived as the income earned by productive factors including labour. Obviously real average income would not necessarily increase with output growth, since costs incurred are not taken into account. In general, seeking real income growth would require emphasising productivity improvement, whilst seeking production expansion itself would demand greater input growth especially in the short run.

Compared to the policy emphasising productivity improvement, development policy emphasising production expansion would have a stronger

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[26] Note a remark made on the issue in the 1970s: "Any attempt to evaluate the post-1945 development experience needs first to recognize the change in objectives over the period. In recent years, there has been a sharp shift in emphases. It is now considered that maximization of the gross national product(GNP) per capita is too narrow an objective; aims related to the reduction of poverty also need to be considered, such as improving income distribution, increasing employment, and fulfilling basic needs." David Morawets, "Twenty-Five Years of Economic Development", Finance and Development, September 1977; reprinted in Leading Issues in Economic Development, ed. by Gerald M. Meier, New York: OUP, 4th edition, 1984, p.45

implication for employment creation[27]. When the population grows fast and a huge amount of surplus labour in rural areas builds up, employment pressure will be high in the economy. Under such situations, the perception of economic gain would be linked to production expansion and less associated with productivity improvement. The link here between employment growth and production expansion means that those who are not in employment yet may get more more benefit; on the other hand, an emphasis on productivity improvement would tend to provide benefit mostly to those who are already in the process of production, at least in the short run[28].

In the long run, another situation can occur when population growth slows down and employment pressure becomes less fierce. With these changes, the perception of economic gain would shift towards productivity improvement as it is a source of real average income growth.

In short, the above discussion leads us to a more balanced view towards economic growth(economic performance) in terms of the relative importance of input growth(an increase in resource use) and productivity change(the efficiency of resource use). It appears that this stand-point has become a development economists' consensus, as it has been summarised below:

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[27] For a socialist-styled economy, this can be seen from a formal and simplified description. Suppose that the central planner is to decide division of output(Q) between labour(L) and social savings(assuming that labour is the only factor in the economy, and workers do not save from their wages), so that $Q = wL + sQ$, where w is wage rate and s ratio of social savings to output. Writing the Q on the left-hand side as a product of labour(L) and labour productivity(l), we can obtain a new expression: $L = \{s/(l - w)\}Q$. This may be seen as an employment function in a socialist-styled economy: it is positively related with production(Q) but negatively with labour productivity(l).

[28] This distinction of economic gains has been used, at a micro level, to explain SOEs' behaviour in China: the worker-dominated enterprises tended to maximize total net product(in terms of income received by all family members, currently employed or would-be employed) rather than average net product(in terms of income received by currently-employed family members). See William Byrd and Gene Tidrick, op.cit., pp.62-63.

> At the first level, the growth of total output is explained by the growth of various inputs, typically labour and capital. At a second level, the growth of these inputs in turn needs to be explained, as well as changes in their efficiency in producing output.[29]

We shall therefore consider both of these two aspects in explaining post-reform China's industrial growth: resource increase and productivity change. In investigating these factors we will further relate them and the relationship between them to the transitional nature of China's industry in the post-reform period.

3. Balanced and Unbalanced Growth

The terms balanced, unbalanced, and an imbalance in growth will be frequently used in our descriptions and analyses of post-reform China's industry. It is felt necessary to give them some clarification here to avoid ambiguities or mis-interpretations. In recognition of possibly plural usages of these terms, we shall define them in a framework concerning the transition from a planning system to a market economy.

A common feature of the terms balanced, unbalanced, and an imbalance in growth is the concern with inter-sector or inter-branch relationship in an economy. The relationships are measured in two ways: output growth rate and productivity. Needless to say that even in a market economy, the rate of growth in different sectors or branches would hardly be same since relative demand and supply forces differ. Yet differences in productivity would exist among sectors or branches at any point in time due to various factors or conditions, but in the long run such differences would diminish. The driving

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[29] Maurice Scott, "Explaining Economic Growth", AER, May 1993.

forces in the convergence process are the price flexibility and factor mobility. If there are differences in sectoral productivity, factors would tend to flow into those with higher productivity away from those with lower productivity. With these sectoral supply changes, factor prices in sectors with increasing factors would go down relative to prices in sectors with decreasing factors. Productivity in terms of returns to factors will thus tend to converge among sectors over a certain period of time, in a market economy.

In a planning system, inter-sector relationships are however subject to planning authorities' intervention since they control sectoral prices and factor flow across sectors. Under such an economic system, not only could unbalanced or an imbalance on inter-sector relationships occur but also they may be a persistent feature over time. Unbalanced growth occurs when planning authorities shift factor inputs into a few selected sectors to seek higher growth in the targeted areas[30]. That pre-reform China stronly invested in its heavy industry such as iron and steel production is a typical example. A characteristic of unbalanced growth is that inter-sector factor flow is not guided by the signals of market prices showing which sector offers greatest productivity, but by plans.

On the other hand, unbalance does not necessarily mean imbalance as long as the equality between supply and demand is maintained. An imbalance in relationships refers particularly to a situation where there is excessive demand relative to supply (shortages) or excessive supply relative to demand (surpluses). In the sense that if prices are flexible enough there will be no shortages or surpluses at all, imbalances are a problem with price system. The problem of imbalances can become particularly severe when factor mobility

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[30] This definition of unbalance is in essence compliant with the theoretical generalization concerning the debate between the balanced growth model and the unbalanced growth model in development economics. See Pan A. Yotopoulos and Jeffrey B. Nugent, Economics of Development: Empirical Investigations, New York: Harper & Row, 1976, pp.293.

increases but prices remain distorted and inflexible[31].

Transition from a planning system to a market-type economy therefore requires both greater factor mobility and the free price realignment available with market conditions. The success of the transition would be thus characterised by a diminution of unbalanced or any imbalance in sectoral relationships.

In the above discussion, we have related the issue of unbalance with government intervention. This however should not always be the case. First, we do not mean that all government interventions are undesirable. In some areas, such as issues concerning regional development, intervention enforced by a central government would be economically healthy and important so as to prevent uneven trends from becoming hazardous. In fact, unbalanced relationships of certain types do also exist in market economies[32]. Secondly, the term of "unbalance" can also in some cases refer to gaps between an actual situation and a desirable state in terms of what transition and long-term economic development would require. This is a meaning of the term "unbalance" in a broad sense. With this perception, we may be able to tackle issues concerning the interaction of market forces and government intervention. For instance, when discussing sectoral differences between state investment and enterprise investment later, in Chapter Three, we will show that state investment in industry actually acts as a force to respond to some problems of unbalanced growth incurred within an imperfect transition environment where

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[31] Firstly, distorted prices will send a wrong signal to enterprises over productivity or profitability; secondly, shortages or surpluses so incurred may not be able to be rectified by adjusting prices. See William Byrd and Gene Tidrick, op.cit., pp.91-92.

[32] For example, it has been observed that agricultural productivity in developed countries tends to be inflated by protection policy. See Alfred Maizels, Industrial Growth and World Trade, Cambridge: Cambridge University Press [CUP], 1963, pp.27-28.

market forces cannot yet play a sufficient self-correcting role[33].

In the present study, we will mainly confine our attention to relative production expansion and productivity change between sectors or branches in post-reform China's industry(Chapter Six). Furthermore, we wish to show how successful reforms have helped to transform inter-branch or inter-region relationships, generating a shift towards a state where market forces play a more important and more self-sufficient role in determining these relationships(Chapters Seven and Eight). Our analysis will be focused upon how resource mobilisation and productivity improvement have interacted in the process of transition and growth in post-reform China's industry.

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[33] Overall, state interventions seem to have been in some cases a cause of unbalance problems and in other cases a counter-measure against unbalance problems. This is not just a phenomenon in industry. For instance, in China's agricultural sector, it has been noted that in the mid-1980s, with state funding partially withdrawing, investment in agricultural infrastructures saw a sign of decline, opposite to the requirements of long-term growth in agriculture. See Y.Y. Kueh and Robert F. Ash, eds., Economic Trends in Chinese Agriculture: The Impacts of Post-Mao Reforms, Oxford: OUP, 1993, Introduction; also, Robert F. Ash, "The agricultural Sector in China: Performance and Policy Dilemmas during the 1990s", CQ, No. 131 (September 1992)

PART ONE

MOBILISING RESOURCES

Chapter Two

Market Expansion and Growth of Demand

The principal reasons for increasing the level of demand are to provide an enlarged market for the results of production and to guide structural shifts in production. In the sense that changes in demand are not a self-driving process especially from a long-term point of view an increase in demand can be regarded as an aspect of resource mobilisation. Firstly, an increase in demand raises the issue of which part of the total domestic market is to be increased. Secondly, it implies the use of foreign markets as an additional source of demand. In the process of economic transition, increases in demand and its impact on the level of economic growth are closely associated with a shift towards a system where increasingly important role is played by the market compared to the state command.

Market expansion and the growth of demand therefore stand out as an important issue in any appraisal of post-reform China's industrial growth. The purpose of our study in this chapter is to trace basic trends in the post-reform demand growth for industry and to exhibit some important implications of the changes in demand on industrial growth. The results which we have arrived at suggest that reforms have helped to significantly change the demand conditions facing China's industry and that industrial production is now affected by market forces.

In what follows we will first show the growth of the household sector and its impact on the increase in demand for industrial goods; this discussion is followed by a consideration of the growing demand for capital goods that has also become a feature of post-reform China's industrial growth. Thirdly, we will turn to an appraisal of the use of foreign markets as an additional source of demand, which was made possible in China only after the implementation of the open-door policy. Last but not least, we will present an overview of the changed relationships between industry and other sectors, highlighted by the constraints on industrial growth caused by the lagged agricultural development. This section also serves to summarise the overall changes in demand facing industry, and changes in the way that industry is affected by market forces.

I. Growth of the Household Sector

In a summarised review of China's economic growth up to the late 1970s, it is noted that,

> A ... distinguishing characteristic of Chinese development has been the ability of the nation to mobilize fully its resources for growth. The rising share of the producer goods sector is one aspect of this phenomenon. As national product has increased, China has succeeded in holding the rise in personal consumption to modest levels. Government consumption, mainly in the form of military expenditures necessitated by the 1960 break with the Soviet Union, rose sharply in the 1960s; despite this rise there is little doubt that China's investment rate (gross domestic capital formation as a percentage of GDP) has increased

to a very high level.[1]

That pre-reform China has been able to mobilise fully its resources for growth should be, to our understanding, interpreted to mean that the centralised economy has been able to raise the investment rate to a very high level and sustain this over a long period of time. It should be also pointed out that this was achieved primarily through depressing the growth of the household sector. The growth of the household sector was restrained in pre-reform China mainly through the low wage policy in the urban-industry sector[2] and the policy of exploitation in the rural-agriculture sector[3]. Clearly, this type of resource mobilisation had its prices to pay: the slow growth of real consumption per capita and the slow development of agriculture[4].

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[1] Dwight H. Perkins, "The Central Features of China's Economic Development", in China's Development Experience in Comparative Perspective, ed. by Robert F. Dernberger, Cambridge, Mass.: Harvard University Press, 1980, p.139

[2] A summary of long-term trend in real wages in urban-industry China during the pre-reform period can be found in Christopher Howe, Wage Pattern and Wage Policy in Modern China 1919-1972, Cambridge: CUP, 1973, pp.28-54. Estimates there show that most of the post-1949 wage increase occurred in mid-1950s, and afterwards a tendency between decline and stagnation was seen.

[3] Studies have shown that the rural-agricultural sector in China began to be subject to some systematic exploitation in the mid-1950s. Estimates made by Dwight Perkins and S. Yusuf(Rural Development in China, Washington, D.C.: Johns Hopkins University Press, 1984, pp.17-21) show that the amount of agricultural net product that was siphoned off through agricultural tax and taxation on industrial goods sold in rural areas in the mid-1950s was about eight billion yuan in value, contributing to about 16% of the state's total investment. In addition, there was an implicit transfer through the low agricultural prices that was calculated as about two or three billion yuan in the 1950s.

[4] In fact, some industrialisation policies implemented in pre-reform China had more damaging impacts on the economy than on the general growth rate of consumption or agriculture. For instance, the famine in the early 1960s may have occurred as China pursued resource mobilisation for its industrialisation too far. See Peter Nolan, "Why Do Famines Occur and How Can They Be Avoided? A Critique of A.K. Sen on Famine with Special Reference to China", in State and Market in the Chinese Economy: Essays on Controversial Issues, London: Macmillan, 1993.

Against this background, it is interesting to know the impact of reform on the level of resource mobilisation when China has apparently changed its policy towards the wage growth in the urban-industry sector[5] and its policy towards rural-agricultural development[6] in the post-reform period. The question may be addressed in another way: as the high investment rate was achieved under the centralised planning system through depressing the growth of the household sector and shifting resources away from the rural-agricultural sector, would it be expected to fall in the post-reform period when the household sector begins to grow fast, and the relationship of the rural-agriculture sector with the rest of the economy moves towards a more balanced state? We will show, in the next chapter, that post-reform China has been actually able to maintain a high investment rate and this has been to an increasingly large degree contributed to by household savings and rural investment. It is evident that forms of resource mobilisation have undergone significant changes and the recent growth of the household sector has exerted a positive impact on post-reform China's economic development.

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[5] As a reflection, official Chinese statistics record that the real average wage level in industry began to rise in 1978, after twelve years of stagnation since 1966; yet there are several years in the 1980s when real average wage outgrew real labour productivity in China's industry; overall, in 1978-1992, the annual growth rate of real average wages in urban-industry was 4.1%, and that of real labour productivity in industry (measured in gross output) was 4.9%(TJNJ 1993, pp.66, 132 and 431). Our study later in Section III of Chapter Five also shows that labour income as a percentage of net output in China's industry has risen considerably in 1980-1992. For a summarised account of post-reform wage issues, see: S. Jackson and C.R. Little, "Wage Trends and Policies in China: Dynamics and Contradictions", Industrial Relations Journal, No. 22 (1991).

[6] For a comprehensive review of changes in China's policy towards the rural-agricultural sector and the impact on accelerated agricultural growth in post-reform period, see Y.Y. Kueh and Robert F. Ash, eds. Economic Trends in Chinese Agriculture: The Impacts of Post-Mao Reforms, Oxford: OUP, 1993. A specific study on the topic of financial resource transfer concerning agriculture has been conducted in Yuling Sheng, Intersectoral Resource Flows and China's Economic Development, London: Macmillan, 1993. It concludes that net financial resource transfer from agriculture to urban-industry in China ceased to be effective in 1979-1983.

In this section, we will mainly consider basic trends in the post-reform growth of the household sector and its implications for demand for China's industry. The propensity to consume industrial goods will be examined in both the urban and rural aspects, where previously existing differences provided a significant opportunity for the population shift from rural areas into urban areas to generate an immense impact on the demand for industrial goods.

1. The Household Sector

In current official Chinese statistics there is no decomposition of national income into personal or household income. What is recorded on the expenditure side of national income is household consumption, social consumption(that of government and non-enterprise institutions), and accumulation (fixed capital formation and net increase in circulating capital including reserves etc). Based on the decomposed data and estimates of household savings made by research staff of the IMF and the World Bank, it is possible to work out the size of the household sector comprising household consumption and saving. The results are listed in Table 2-1(they are up to 1988 only, since data of household savings for more recent years are not yet available).

It can be seen from Table 2-1 that household consumption as a percentage of national income began to rise in 1978, but encountered a U-turn however after 1982 which was to a large degree due to a sharp rise in household saving. The combined consumption and saving in the household sector clearly saw a rapidly and steadily rising trend in 1978-1984. In 1984-1988, the overall share of the household sector in national income has slightly fallen, but the level at the end of period was much higher than that in 1978. This suggests unequivocally that national income tended to shift towards the

household sector in the post-reform period, a trend much in contrast to that of the pre-reform period.

Table 2-1. Household sector as a % of national income, 1978-1988

	National Income	Household consumption	Accumulation		Total household sector
			Total	Household	
1978	100.0	56.2	36.5	3.4	57.4
1980	100.0	60.1	31.5	13.5	64.4
1982	100.0	62.7	28.8	23.8	69.6
1984	100.0	59.6	31.5	44.0	73.5
1986	100.0	56.2	34.7	39.9	70.1
1988	100.0	57.0	34.5	44.7	72.4

Source and note: Column Two: TJNJ 1993, p.43 and p.45; Column Three: TJNJ 1993, p.43; (difference between Column One(national income) and the sum of Columns Two and Three is social consumption, which is not listed in the table but its share can be seen to have declined slightly over the period); Column Four is household savings as a % of domestic savings(see the World Bank, China: Macroeconomic Stability and Industrial Growth under Decentralized Socialism, 1990, Washington, D.C., p.103). Column Five is household consumption and savings as a % of national income.

Given the fact that the growth of national income has accelerated in the post-reform period(see below), the shift towards the household sector also implies that income per capita in household sector has experienced a more rapid growth in the post-reform period. In this respect, a decline in the population growth rate has also helped to accelerate the growth of national income per capita. National income in comparable prices grew at an annual

average rate of 6.0% in 1952-1978 when the population growing at 2.0% per annum, resulting in national income per capita grew by 3.9% annually. In 1978-1992, the annual average growth rate of national income rose to 8.8%, and the population growth rate decreased to 1.4%, causing an annual growth rate of national income per capita of 7.3%. Both the income shift towards the household sector and the slowing-down of population growth have contributed to the accelerated growth of income per capita in the post-reform period[7].

Comparing the differences in the growth rate of national income per capita and household consumption per capita in pre- and post-reform periods would also show changing patterns with regard to household income and consumption. In 1952-1978, household consumption per capita in real terms grew by 2.2% annually, a level much lower than the 3.9% growth rate of real national income per capita. In 1978-1992, however, the annual growth rate of real household consumption per capita rose to 6.8%, a level close to the 7.3% per capita income growth rate in the same period. This changed relationship implies that a larger part of national income has been turned into household consumption in the post-reform period compared to that in the pre-reform period.

Because household income and consumption are a main source of domestic demand for industrial consumer goods, the fast growth can be thought to have supported the rapid growth in China's consumer goods industry (mainly light industry) in the post-reform period. In 1952-1978, the annual average growth rate of GVIO in light industry and heavy industry was 9.3% and 13.8% respectively, and in 1978-1992 the same indicator became 14.8% and 11.9% respectively. Clearly, from the pre-reform period to the post-reform period,

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[7] See also, Joseph C. H. Chai, "Consumption and Living Standards in China", CQ, No. 131 (September 1992); and Azizur Rahman, Keith Griffin, Carl Riskin, and Zhao Renwei, "Household Income and Its Distribution in China", CQ, No. 132 (December 1992)

the growth rate of light industry has scaled up relative to that of heavy industry. Structural changes in this respect have been apparently associated with the growth of household income and consumption[8,9].

2. Propensity to Consume Industrial Goods: Urban and Rural Areas

Below is our brief consideration of propensities to consume industrial goods in urban and rural areas based on data of household living expenditures. These data demonstrate that positive marginal propensities to consume industrial goods existed in both urban and rural areas. The existence of such positive marginal propensities implies that domestic markets in terms of the final demand for China's industry, were expanding in line with the growth of household income and consumption.

Table 2-2 summarises changes in the composition of urban household living expenditures from 1964 to 1990. Among all the components of living expenditures, it is the non-food category that is most close to industrial goods, i.e., non-agricultural goods(presumably there was an increased proportion of food products supplied by industry other than by agriculture, but it is not known from the existing statistics). As we can see from the

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[8] There are notably some other factors that have affected the relative growth rate of light industry to heavy industry in post-reform period, such as the policy shift that gives less emphasis to defence-related heavy industry after Mao's leadership (see, for example, Tien-tung Huseh and Tun-oy Woo, "The Political Economy of the Heavy Industry Sector in the People's Republic of China", The Australian Journal of Chinese Affairs, No. 15 (January 1986). We may also note that heavy industry still maintains a high growth rate in the post-reform period, that has been, among other things, associated with the growing demand for capital goods and improved market linkage(see Sec. II later this chapter).

[9] Some observers have emphasised the role of "explosive expansion" of durable consumer goods in post-reform Chinese industrial growth(see, for example, Dic Lo, Market and Institutional Regulation in Chinese Industrialisation, PhD thesis, the University of Leeds, 1994). From this point of view, growth of household income and consumption plays a more fundamental role in post-reform Chinese industrial growth.

Table 2-2. % of urban family living expenditures, yearly average, per capita

	All living expenditures	All commodities			Service
		Grain	Non-grain	Non-food	
1964	100.0	22.4	63.0	34.8	14.6
1981	100.0	12.9	79.1	48.4	8.0
1985	100.0	8.5	83.7	52.8	7.8
1988	100.0	6.8	85.0	53.6	8.2
1990	100.0	6.6	83.4	50.5	10.0

Source and note: TJNJ 1986, p.668; TJNJ 1991, p.280.

Table 2-3. Commodities as a % of urban family living expenditures, by category of income level, yearly average, per capita

Income groups	1985		1990	
	Non-grain	Non-food	Non-grain	Non-food
lowest	79.9	43.9	80.4	42.2
lower	81.6	47.5	81.7	45.6
lower-middle	82.4	49.9	82.6	47.7
middle	83.7	52.2	83.6	50.6
upper-middle	84.5	54.5	84.1	52.4
higher	85.5	57.0	84.6	53.7
highest	86.2	58.7	84.7	55.2

Source and note: TJNJ 1986, p.671; TJNJ 1991, p.281. Definitions of non-grain and non-food commodities are the same as in Table 2-2. For 1985, per capita income level ranged from less than 500 Yuan for the lowest group to about 1,400 yuan for the highest group. For 1990, the bottom and top levels were 860 Yuan and 2,700 Yuan respectively.

table, share of non-food goods in urban household living expenditures steadily rose up to 1988, and this rise seemed to have been greatly contributed to by the fall of the share of grain in consumption. It is striking that share of grain in urban household consumption has steadily declined over a long period (even dating back to the pre-reform period, 1964). On the other hand, consumption of services also played an important role in affecting the share of non-food consumption. A notable difference is that the share of services in urban household consumption fell until 1985, and has risen since then. The latter rise has apparently reduced the previously rising share of non-food consumption. The trend of a rising share of services in household consumption seems to conform more to a normal pattern of consumption growth.

From the time-series data in Table 2-2, it is actually impossible to know whether and to what degree changes in the composition of living expenditures have been associated with income growth. In fact, real income per capita in urban households began to a fall in 1988-1989(see TJNJ 1993, p.282). We have however found a close positive association between the share of non-food consumption and per capita income level in urban households in cross-section data(Table 2-3). The table lists shares of non-grain and non-food products in urban household living expenditures by income groups in 1985 and 1990. In both years, the data clearly show that the share of expenditure on these two categories rose with the per capita income level.

Table 2-4 shows a similar trend of changes in the composition of living expenditure for rural households. In 1978-1988, when the share of self-supporting consumption fell by 28 percentage points, the share of all commodities rose by 25 points and that of service by 3.0 points. Much of the expenditure saved by the reduction in the level of self-supporting consumption went to commodity consumption. This implies that, to an increasingly large degree, rural households turned to the consumer goods markets. Compared to

urban households, however, rural households spent relatively more on food commodities, and the share of expenditure on food commodities even increased in the 1980s. This partly reflects the low level of per capita income in rural households. Again, in the period after 1988, non-food commodity consumption in rural households actually declined, quite sharply in 1988-1990(6 percentage points). A primary and directly responsible factor was the renewed rise of self-supporting consumption in the period(5 percentage points). The economic contraction in the two years seems to blame.

Table 2-4. % of rural family living expenditures, yearly average, per capita

	All living expenditures	Commodities		Self-supporting consumption	Service
		Food	Non-food		
1978	100.0	16.3	22.3	58.6	2.7
1980	100.0	19.2	29.9	48.3	2.6
1985	100.0	24.1	34.4	38.7	2.9
1988	100.0	26.6	37.2	30.6	5.7
1990	100.0	25.9	31.3	35.9	6.9
1992	100.0	25.9	30.9	34.5	8.7

Source and note: TJNJ 1993, p.315.

For the propensity to consume non-food industrial goods in rural households, similar cross-section data like that of urban households are not available. It seems, as a speculation, that, in allocating their living expenditures between food commodities and non-food commodities, both of which were realised through markets, a rural household had to consider their corresponding(and/or substitution) relationship with self-supporting

consumption(self-supporting food and self-supporting non-food), in addition to the factor of service. A trend in rural household commodity consumption that conforms to Engel's Law would become more apparent only after the self-supporting consumption has been substantially reduced or replaced by commodity consumption.

In disentangling urban and rural households' propensities to consume and their impact on the domestic market for post-reform China's industry, we should stress an implicit element: housing. In the decomposition of living expenditure, housing is an item under the category of services. Its impact on the domestic market is, nonetheless, considered great. Growing demand for housing would cause housing investment to rise, which in turn would drive up demand for related industrial materials. As will be shown in the next chapter, housing investment constitutes an important part of post-reform fixed capital investment, and its share in total fixed capital investment has risen considerably in the first half of the 1980s, and maintained a level afterwards higher than that of the pre-reform period. The role of growing demand for housing in post-reform industrial growth was indeed great.

In principle, increasing demand for housing is part of the growth process in both urban and rural household sectors. Because there were different price structures in the two areas, and government policies were biased towards the urban-industry sector, urban and rural households saw sharp differences between housing as a component of living expenditure(Table 2-5). In urban areas, households paid proportionately much less for their housing needs out of their total living expenditure than rural households, and the share of expenditure on housing was actually falling in the 1980s. In conjuntion with the fact that a huge and increasing amount of housing investment had been undertaken in urban areas, this asymmetrical relationship implies that a degree of price distortion within housing markets existed or

continued to exist in post-reform urban China. The distortion was mainly caused by low rental prices paid by urban households(especially workers in state sector), as the state hugely subsidised this sector[10].

Table 2-5. Housing as a % of living expenditure

	Urban households (rent for housing)	Rural households	
		commodity housing	non-commodity housing
1978	2.6(1964)	3.0	0.2
1980	1.4(1981)	7.0	0.9
1985	1.1	12.1	0.3
1988	0.7	14.7	0.2
1990	0.7	11.8	0.1
1992	0.9	10.1	0.2

Source and note: For urban households up to 1985, TJNJ 1986, p.668; for urban households in the rest of the years and rural households in all the years, TJNJ 1993, pp.286 and 315.

In rural areas, on the other hand, households spend much more out of their living expenditures on housing, and the proportion is rising up to 1988. More importantly, much of the spending on housing was through the market (commodity housing). Housing prices in rural areas seem to have been linked more with the market and less with state intervention. This difference in the price of housing between rural and urban areas, together with price

[10] China's peculiar features in this area has been compared with international experience in the World Bank, China: Long-Term Development and Options, Appendix V. China's Economic System in International Perspective, Washington, D.C., 1985. It concludes that both demand tendencies and policy-driven price structures have affected structural compositions of demand and production in China's economy, which were considerably different from typical international experience(pp.33-36).

differences in some other service areas, may partly explain the higher tendency to consume non-food goods in urban areas.

3. Impact of Urbanisation

The preceding discussion points out that though there was a rising level of non-food goods consumption in both urban and rural areas in most years of the 1980s, a considerable gap between the tendencies of urban and rural areas existed(typically 18 percentage points throughout the 1980s, as summarised in Table 2-6 based on Tables 2-2 and 2-4). Given such a difference, the impact of urbanisation on an overall increase in non-food goods consumption would presumably be large.

Table 2-6 reveals a simplified examination of the impact of urbanisation, using 1980-1990 data. To avoid the influence on the measurements of uneven levels between urban and rural areas, we regard the total non-food goods consumption (the share of non-food goods in total living expenditure for both urban and rural areas) as a sum of the individual tendencies in urban and rural areas weighted by their shares in the total population. With this summation, it is possible to decompose the total increase into a part that was due to increases in individual non-food goods consumption levels in urban and rural areas, and another part that was due to changes in population ratios between urban and rural areas[11]. As revealed in the table, the effect of urbanisation on the increase in total non-food goods consumption has been positive throughout the 1980s, with a relative contribution of about 15% in

[11] It can be expressed as: $(p_{ut}c_{ut} + p_{rt}c_{rt}) - (p_{u0}c_{u0} + p_{r0}c_{r0}) = \{(p_{ut}c_{u0} + p_{rt}c_{r0}) - (p_{u0}c_{u0} + p_{r0}c_{r0})\} + \{(p_{u0}c_{ut} + p_{r0}c_{rt}) - (p_{u0}c_{u0} + p_{r0}c_{r0})\}$, where p is population ratio, c non-food good consumption ratio; subscript u for urban, r rural, and t for current period, 0 previous period. The first {...} indicates the effect of the shifting population ratio, and the second {...} indicates the effect of the changing non-food goods consumption ratio.

1980-1988. In 1988-1990, the contribution from urbanisation was rather small compared to the previous period, but nevertheless it helped to prevent the total non-food goods consumption ratio from falling more quickly.

Table 2-6. Impact of urbanisation on the increase in non-food goods consumption, %, 1980-1990

	1980	1985	1988	1990
Share in total population				
Urban	19.4	23.7	25.8	26.4
Rural	80.6	76.3	74.2	73.6
Share of non-food goods in living expenditures at per capita level				
Urban	48.4	52.8	53.6	50.2
Rural	29.9	34.4	37.2	31.3
The difference	18.5	18.4	16.4	18.9
Total share of non-food goods in living expenditures				
I(weighted by current expenditure ratios)	33.5	38.8	41.4	36.3
II(weighted by previous expenditure ratio)		34.3	39.2	41.5
III(weighted by previous population ratio)		38.0	41.1	36.2
Contribution to increase in I		'80-85	'85-88	'88-90
increase in I		15.7	6.9	-12.4
by II(urbanisation)		2.4	1.0	0.2
by III(change in consumption tendency)		13.4	6.0	-12.7

Source and note: Population: TJNJ 1993, p.81; share of non-food goods in living expenditures: Tables 2-2 and 2-4. For derivation of increase in total non-food goods consumption ratio using different weights, see the text.

Urbanisation in China did not accelerate until the reforms of the 1980s. In the period from the early 1950s to the mid-1960s, the proportion of the urban population in China's total population increased from 12% to 18%. But in the period from the mid-1960s to the late 1970s, the process of urbanisation was actually stationary in China, varing around a level below

18%. This was very different from international experience in the same period. In 1950-1980, the urbanisation ratio in the whole world rose from 28% to 41%, with industrial countries' ratio rising from 52% to 71%, and developing countries' ratio rising from 16% to 31%. The difference in levels of urbanisation between China and the rest of world became narrower only after recent years[12]. The tendency towards accelerating urbanisation is closely associated with both agricultural development and the diversification of urban economic development in the post-reform period[13].

II. Growing Demand for Capital Goods

The preceding discussion in the above section primarily concerns issues of demand for consumer goods. Corresponding to the demand for consumer goods is demand for capital goods. The production of consumer goods needs inputs of capital goods including materials and equipment etc. Moreover, capital goods produced in industry are also used in other sectors, e.g., agriculture, construction, transport, and services. Any growth of demand for industrial consumer goods <u>and</u> production expansion in other sectors can induce an increase in demand for capital goods and that of the capital goods industry.

Generally speaking, demand for capital goods is directly dependent on the investment ratio(a percentage expression of the proportion of capital formation to national product) and the capital consumption ratio(a percentage

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[12] In the World Bank's statistics, by 1992, China's urban population ratio is 27%, whereas the world's ratio is 42%, and the high income countries' ratio 78%. See WB, <u>The World Development Report 1994</u>, World Development Indicators

[13] For an overview of the issue, see: Harry Xiaoying Wu, "Rural to Urban Migration in the People's Republic of China", <u>CQ</u>, No. 139(September 1994); and Kyung-sup Chang, "Chinese Urbanization and Development before and after Economic Reform: A Comparative Reappraisal", <u>World Development</u>, Vol. 22, No. 4, 1994

expression of the proportion of consumption of capital goods in total production). By these two criteria, post-reform China has maintained its high and fast-growing demand for capital goods. We will discuss the investment ratio in the next chapter and here look at the capital consumption ratio.

Table 2-7. Capital consumption as a % of gross value of production

	1978	1980	1985	1988	1992
All sectors	**56.0**	**56.8**	**57.7**	**60.6**	**64.5**
Industry	64.9	65.0	67.4	70.3	73.5
Agriculture	29.4	31.0	31.1	34.9	36.2
Construction	78.0	75.9	75.3	73.6	71.6
Transportation	42.4	49.6	46.9	45.0	47.0
Commerce	32.9	43.9	36.8	34.1	32.6

Source and note: TJNJ 1993, p.65. All are in current prices.

Table 2-8. Consumption of capital goods as a % of GVIO

	1980	1985	1988	1992
Light industry	70.2	72.2	73.5	74.9
using agricultural materials	72.8	74.0	74.0	75.5
using non-agricultural materials	62.0	68.0	72.5	73.7
Heavy industry	62.5	63.7	67.8	71.8
mining	49.3	50.1	53.7	59.3
material processing	62.8	64.5	68.4	74.0
finished-goods producing	66.2	66.6	70.6	72.5

Source and note: SSB, Zhongguo gonghe jingji tongji nianjian 1993 (Statistical Yearbook of China's Industrial Economy), hereafter ZGGYJJTJNJ (Beijing: Zhongguo tongji chubanshe, 1993, pp.143-144). Consumption of capital goods is GVIO deducted by NVIO(net value of industrial output). Both are in current prices.

Table 2-7 lists the capital consumption ratio for major sectors in China from 1978 to 1992. The overall trend was clearly rising over the period. Showing a constant rise were industry, agriculture and transportation. There might have been a number of factors that compelled the rise in the ratio, such as technological progress, structural shifts, relative prices of inputs to output, as well as efficiency in the use of capital goods[14]. Overall, the rising ratio indicates that demand for capital goods has risen in general.

A more important and specific issue concerning the growth of demand for capital goods in the context of China's economy seems to be the transformation of inter-sectoral and inter-enterprise relationships in industry, along with the greater role of the market. Looking at Table 2-8, we may note that since 1980 the ratio of capital consumption to production has risen in all sub-sectors. This overwhelming rise may be particularly associated with specialisation at product level(other factors may include the relative rise in price of capital goods). It has been noted that, traditionally, many state enterprises had a strong tendency towards self-sufficiency, i.e., tended to supply themselves with parts and inputs as much as possible. Consequently, this tendency tended to reduce the level of capital goods purchases through the market. With the development in capital goods markets, specialisation at product level and the purchase of capital goods through the market became widespread. As reflected in these statistics, the ratio of capital goods consumption to production tended to rise[15].

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[14] For a general discussion, see: Hollis Chenery and Moshe Syrquin, Industrialization and Growth: A Comparative Study, New York: OUP, 1986, Ch. 3; and for a discussion relating to Chinese economy, see: WB, China: Long-Term Development Issues and Options, Appendix V, Washington, D.C., 1985, Ch. 3

[15] See, Robert Michael Field, "China's Industrial Performance since 1978", CQ, No. 131 (September 1992), p.583.

Table 2-9. Index of fixed capital per worker

	1980	1985	1988	1992
State-owned enterprises	100.0(12.0)	132.9	177.2	292.9
Collective enterprises	100.0 (2.1)	161.9	256.1	469.4
Joint-ownership enterprises	100.0 (4.3)	198.0	348.1	851.4
Light industry	100.0 (4.2)	151.1	223.9	409.8
Heavy industry	100.0(11.0)	125.4	165.2	281.8
Large-sized enterprises	100.0(19.0)	135.8	176.4	278.0
Medium-sized enterprises	100.0(11.8)	131.0	160.9	226.4
Small enterprises	100.0 (4.1)	137.0	188.7	310.6

Source and note: ZGGYJJTJNJ 1993, pp.168-171. Figures in parenthesis are fixed capital per worker in thousand yuans in 1980.

One feature of post-reform China's industrial growth is that fixed capital grew faster in those traditionally labour-intensive sectors or branches(table 2-9). For example, in 1980, the capital-labour ratio(fixed capital per worker) in state enterprises was about sixfold that in collective enterprises, but the speed of increase in the ratio in collective enterprises during 1980-1992 was almost twice as high as that in state enterprises. A similar relationship existed between light and heavy industry, and to a lesser degree, between large-sized enterprises and small enterprises. These sectors, such as collective enterprises, light industry and small enterprises, were those undergoing faster growth throughout the post-reform period. Their pursuit of a more rapid increase in fixed capital means that, in total, the growth of demand for fixed capital was accelerated.

Perhaps a most important aspect of the issue of demand for capital goods is to consider the market linkage between the capital goods industry and consumer goods industry. We approximate here heavy industry as the capital goods industry and light industry as the consumer goods industry. The fact

that heavy industry grew faster than light industry in the pre-reform period does not necessarily mean that heavy industry provided light industry with greater capital support or that such support has grown in line with the overall growth in heavy industry. Because much of pre-reform development of heavy industry was undertaken for defence purposes[16], the linkage between heavy industry and light industry was weak under the traditional centralised planning system[17]. This is partly evidenced by the fact that in 1980-1982, when light industry underwent fast growth, the growth of heavy industry actually collapsed. These two years are the period in which China began to transform its heavy industry in order to make it more conducive to civilian purposes and therefore of more service to light industry. Since then, the growth rates of light and heavy industry have converged.

Making the assumption that light industry obtains supply of its capital goods from heavy industry, one way to measure the linkage between heavy and light industry is to look at the proportion of light industry product that is produced by using non-agricultural materials, and the ratio of capital goods consumption in light industry to gross product in heavy industry. We list the these two indicators for 1980-1992 below:

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[16] For example, in 1953-1957, defence industry accounted for 46.7% of total investment in heavy industry. This is derived from the figures that aircraft industry occupied 2.18% of national investment and 26.69% of total investment in the defence industry in the first-five-year plan period, 1953-57. See Wang Huijun et al, eds. Zhongguo pumen chanye chenze yanjiu(Studies in Industrial Policy for Various Sectors in China), Beijing: Zhongguo caizhen jingji chubanshe, 1989, Ch. 20: Aircraft Industry. Figures of investment in heavy industry in the same period are from TJNJ.

[17] Some Chinese scholars have called this type of relations as the "self-serving structure of heavy industry" mainly prevailed in pre-reform China. See: Yang Jianbai and Li Xuezheng, "Len long qin zhong jigou kuanxi" (On Structural Relations between Agriculture, Light Industry and Heavy Industry), in Ma Hong and Sun Shangqin (eds), Zhongguo jingji jiegou wenti yanjiu (Research on Problems relating to China's Economic Structure), Beijing: Renmin chubanshe, 1981, Vol. I, pp.119-22.

	% of light industry using non-agricultural materials in light industry's GVIO	% of capital goods consumption in light industry using non-agricultural materials in heavy industry's GVIO
1980	24.5	12.8
1985	29.2	16.4
1988	31.5	20.4
1992	32.2	18.7

Source and note: ZGGYJJTJNJ 1992, pp.104 and 143.

The two ratios both see a clearly rising trend in the 1980s. The implications are: first, that light industry that relied on the support of heavy industry grew faster than that which relied on the agricultural supply of materials; and second, that more of the products of heavy industry was sold to light industry. This is clearly a piece of evidence suggesting that the market linkage between heavy industry and light industry in post-reform China has improved. (The slight fall of the ratio in recent years may be due to a growth of heavy industry exports. Since 1988, machinery goods have been a sector with the fastest export growth in China).

III. Domestic Markets versus Foreign Markets

Foreign trade played an important role in China's industrialisation even in the pre-reform period for it provided China with advanced technology and equipment. Many observers have noted that after the break with the Soviet Union in early 1960s, China turned to western countries for technology imports, and such imports were scaled up considerably in the 1970s[18].

However, a characteristic of the development strategy adopted by pre-

[18] See: Hans Heymann, Jr. "Acquisition and Diffusion of Technology", in USCJEC, ed. China: A Reassessment of the Economy, Washington, D.C., 1975

reform China was that it emphasised import substitution rather than export-oriented growth. Any encouragement to increase export levels was in general limited to correspond with China's import needs, and export growth was mostly implemented in some non-manufacturing areas such as agriculture and mining, together with traditional Chinese handcraft products[19].

When the open-door policy was introduced, China's attitude towards the outside world changed and she began to regard foreign markets as a potentially important source of effective demand[20]. Manufactured exports were subsequently encouraged through measures such as the establishment of special economic zones over coastal regions, allowances granted to enterprises

Table 2-10. Share of manufactured exports in total commodity exports and domestic production, %

	In total commodity exports	In domestic manufacturing production
1980	49.7	3.1
1984	54.3	5.0
1986	64.2	7.8
1988	69.7	9.4
1990	74.4	12.7
1992	79.5	14.3

Source and note: TJNJ 1993, pp.604, 611, 633 and 635. For the second column, manufactured exports in RMB value are obtained using actual exchange rates in commodity export; domestic manufactured production is measured in GVIO which is for all independent-accounting industrial enterprises excluding extracting industry, see ZGGYJJTJNJ 1991, pp.133-34, and TJNJ 1993, p.417.

[19] Agricultural goods were China's major exports until the early 1960s, and subsequently in the 1970s mining products were an important export item. See: Alexander Eckstein, Communist China's Economic Growth and Foreign Trade, New York: McGraw-Hill, 1966; and Chu-Yuan Cheng, China's Economic Development: Growth and Structural Change, Colorado: Westview Press, 1982, Ch. 14

[20] See: Wendy Friemand and Thomas W. Robinson, "Costs and Benefits of Interdependence: A Net Assessment", in USCJEC, ed. China's Economic Dilemmas in the 1990s: The Problems of Reforms, Modernization and Interdependence, Vol. 2, Washington, D.C., 1991

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(domestic and foreign-related) that achieve good export records, and the devaluation of the yuan, etc. Table 2-10 summarises the achievement of China's manufactured exports in terms of their proportion of total commodity exports and in domestic manufacturing production. The two ratios have steadily risen throughout the period 1980-1992. Of the overall growth of manufactured exports, two features are worth noting. First, non-textile and non-handcraft manufactured exports have achieved rapid growth records especially since the later 1980s. For example, the share of machinery and transport equipment in industrial exports rose from 6.6% in 1987 to 19.5% in 1992[21]. Second, the destination of a large proportion of China's rapidly expanding manufactured exports has been industrialised markets. As a whole, the share of industrial economies as a destination of China's exports rose from 71.4% in 1986 to 79.0% in 1992[22].

One way to appreciate the role of export expansion in post-reform China's industrial growth is to compare the effects of domestic household consumption growth and foreign trade growth, as detailed in Table 2-11. Before interpreting the analysis, we should make it clear that our focus on final demand here is for the purpose of comparison only, i.e. comparing the relative effects of domestic market and foreign market. By no means does it imply that growth was solely reliant on the level of final demand.

Our comparative study has four steps. (1) Firstly, we obtain rural

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[21] The role of foreign-related enterprises especially in special economic zones is considered great in promoting China's non-textile and non-handcraft manufactured exports. Overall, the contribution from foreign-owned firms to China's exports has increased from 1.1% in 1985 to 20.0% in 1992. See, UN, World Economic Survey 1993, p.197

[22] Figures from the International Monetary Fund [IMF], Direction of Trade Statistics Yearbook 1993. In the calculation Hong Kong has been included, because the majority of China's exports to Hong Kong were then channelled into industrialised markets such as the USA and UK etc. See Robert Ash and Y.Y. Yueh, "Economic Integration within Greater China: Trade and Investment Flows between China, Hong Kong and Taiwan", CQ, No. 136 (December 1993)

Table 2-11. Summary of growth rates in demand and production

	1980	1984	1988	1990
Consumption of industrial goods(100 mil. yuan in 1980 prices)				
Rural	213.9	436.0	719.5	611.8
Urban	405.7	512.8	881.6	920.7
Share in total consumption of industrial goods(%)				
Rural	34.5	46.0	44.9	39.9
Urban	65.5	54.1	55.1	61.1

	1980-1984	1984-1988	1988-1990
Growth rate of GVIO(%)	9.8	17.8	8.2
Growth rate of household income(%)			
Rural	13.6[α]	3.5[β]	1.9
Urban	4.9[α]	5.2[β]	2.6
Weighted growth of consumption of industrial goods(%)			
Rural	6.7	6.1	-3.5
due to changes in propensity	2.0	4.5	-4.4
Urban	4.0	7.8	1.2
due to changes in propensity	0.7	5.1	0.2
Sum of rural and urban	10.7	14.0	-2.3
Growth rate of trade in industrial goods(%)			
imports	-14.2	-19.5	1.9
exports	12.1	23.6	18.1
sum	-2.1	4.1	20.1

Source and note: (i) rural and urban household consumption in current prices and their growth index based on comparable prices are from TJNJ 1993, pp.45-46; rural and urban consumption of industrial goods is calculated using data of the rural and urban propensity to consume industrial goods, as defined and quoted in table 2-2 and 2-4; for rural households, self-supporting consumption is excluded from total rural consumption before applying the percentage share of non-food commodity consumption in total non-self-supporting living expenditure. (ii) growth rate of GVIO from TJNJ 1993, p.58; all growth rates in the table are an annual average growth rate based on comparable prices except that for the import and export of industrial goods. (iii) the growth rate of rural and urban household income is from TJNJ 1993, p.282; for rural, it is net family income per capita, and for urban it is actual family income per capita minus income from borrowing and lending; figures with α are for 1980-1985, and those with β for 1985-1988. (iv) the weighted growth rates of rural and urban consumption of industrial goods are the growth rates of rural and urban consumption of industrial goods multiplied by their individual shares in the total consumption of industrial goods; the growth rate due to changes in propensity is the weighted growth rate minus the growth rate of income for rural and urban households which is also weighted by their share in the total consumption of industrial goods. (v) the growth rate of import and export of industrial goods is based on figures in dollars, see TJNJ 1993, pp.634-35; the growth of imports has a minus sign if it increases, and a plus sign if it decreases.

and urban consumption of industrial goods in constant prices, from which individual growth rates for rural and urban areas and their weights can be derived(see the first panel in Table 2-11). It can be noted that rural consumption of industrial goods grew faster than urban consumption until the mid-1980s.

(2) The second stage is to derive the relative contribution to a growth in demand for industrial goods from rural and urban consumption of industrial goods. To do this the growth rates of rural and urban consumption of industrial goods are weighted by their shares in the total consumption of industrial goods respectively. As shown in the table, in 1980-1984 much of the contribution to the growth in demand for industrial goods was from rural areas, but this relative relationship between rural and urban areas was overturned in 1984-1988. Furthermore, the contribution from rural areas became negative in 1988-1990.

(3) Thirdly, by deducting the growth rate of rural and urban household income from the growth rate of rural and urban industrial consumption respectively, we obtain a component of the growth in rural and urban industrial consumption that could be attributed to changes in the rural and urban propensity to consume industrial goods. An assumption made here is that if the propensity to consume industrial goods remains unchanged over time, the growth in consumption of industrial goods would be proportionate to the growth of income; any difference between the two can be regarded as resulting from changes in the propensity. In 1980-1984, when the contribution to rural growth of consumption of industrial goods from changes in the propensity to consume was modest, that for urban areas was also small. In 1984-1988, the effects of changes in the propensity to consume industrial goods were considerable for both rural and urban areas. In 1988-1990, when income growth slowed down in both rural and urban areas, the effects

diminished in urban areas and became negative in rural areas.

(4) Lastly, we wish to make a comparison between the growth of GVIO and the growth of domestic consumption of industrial goods. The assumption that is made here is that the two growth rates would be proportionate to each other if effect of trade on industrial growth was neutral, i.e., if the import and export of industrial goods grew at same rate or were balanced in quantity. By comparing the growth rates of GVIO, the sum of weighted rural and urban consumption of industrial goods, and the sum of imports and exports of industrial goods, we note that relationship between these elements changed during the period: in 1980-1984, the growth rate in domestic final demand for industrial goods in terms of total rural and urban household consumption of industrial goods exceeded the growth rate of GVIO, implying that part of the growing domestic demand went to imported industrial goods in nett, which is also confirmed by the fact that imports of industrial goods grew faster than exports of industrial goods in the period; in 1984-1988, however, the relative relationship reversed as the growth rate of GVIO was higher than that of domestic household demand for industrial goods, and the exports of industrial goods grew faster than imports; lastly, in 1988-1990, when domestic demand for industrial goods actually started to decrease, the growth of GVIO was entirely supported by faster growth of exports of industrial goods compared with the growth of imports.

Post-reform China's greater use of overseas markets has had profound implications for its long-term development perspective in two important dimensions: firstly, it helped to transform inter-sectoral relationships, and, secondly, it changed inter-regional relations in China's domestic economy. We will demonstrate the first dimension in the next section, and the second dimension in Chapter Eight (Section I).

IV. Transforming Inter-Sectoral Relations

Having reviewed some basic trends in China's industrial markets during the post-reform period, we are now able to give an overview of the two central issues: how China has successfully transformed its inter-sectoral relationships compared with the situation under the centralised planning system, and what implications this transformation has for post-reform industrial growth.

Characteristics of pre-reform China's centralised planning system and development strategy include: (i) the state endeavoured to mobilise resources (mostly capital resources) fully in order to promote industrialisation, especially rapid growth in heavy industry; (ii) the depression of any growth of the household sector and a simultaneous exploitation of agriculture; (iii) the restriction of the role of foreign trade, that was limited to the degree of imports of advanced equipment and technology.

Under this economic system and development strategy, China's industry was in a pivotal position for the national economy. However, it faced several important constraints. First, funding for industry crucially relied on central government's ability to raise capital resources through various means, including agricultural contributions and implicitly forced household savings. Second, the inward development policy discouraged exports of industrial products, especially manufactured goods, rendering domestic markets the virtually sole source of demand for industrial products. Third, within domestic markets, demand for consumer goods was dismal because of the depressed household income growth, and, therefore, the role of the consumer goods industry in inducing any growth of demand for the capital goods industry was weak. The market for the capital goods industry, i.e., heavy industry, was largely dependent on central government's spending plans, which in turn were

crucially reliant on the government's ability to collect funds.

In these chains of inter-sectoral relationships, agriculture occupied an important position. As over four-fifths of China's population lived in rural areas before the 1980s, more than half of the domestic markets for industrial consumer goods were in rural areas, and therefore dependent on agricultural growth. Slow growth in agriculture meant that the state could expect to take less from agriculture, and in some cases could have to "give it back" to agriculture, therefore affecting the government's ability to finance any accelerating industrial growth. Insufficient grain supply for the urban population, as occurred in the early 1960s and intermittently returned since then, forced the government to abandon financial reliance on grain exports and turn to importing grain instead. This necessity was a drain on the foreign exchanges which pre-reform China regarded as a precious resource for its industrialisation.

In theory it would be possible for the state to increase investment in agriculture and thereby raise its productivity. Such attempts were indeed made in the pre-reform period. However, two problems might have occurred: firstly, that increasing investment in agriculture could lead to a rise in surplus labour in rural areas, and secondly, that any resultant increase in agricultural labour productivity might not be necessarily followed by an increase in land productivity or would even reduce land productivity, in the worst case. In either case, a vast quantity of surplus labour in agriculture would necessarily require sufficient absorption in non-agricultural sectors, particularly in industry. A contradiction in terms therefore arises: industrial growth is restricted as investment shifts towards agriculture and the industrial sector is nevertheless unable to absorb surplus labour. Finally, the lower obtainable rate of return in agriculture than in, say, industry, because of lower agricultural labour productivity, made the option

of increasing investment in agriculture particularly unappealing to the state.

To escape from the dilemma made the transformation of economic system and development strategy inevitable[23]. Reforms since the later 1970s have been directed towards these issues. And amongst all the areas of reform progress has been made particularly strongly here. (1) Firstly, agriculture was given a greater stimulus towards development through the "household responsibility system" and agricultural price reforms. Agricultural production expanded and peasants' income increased. The market for industrial goods, both consumer and capital goods, enlarged in rural areas. Meanwhile, some of surplus labour force existing in rural areas began to find an alternative employment outlet: township and village enterprises (TVEs). (2) Secondly, in urban-industry areas, reforms in wage policy also helped the household sector to grow fast, which in turn stimulated the dynamic growth of consumer goods markets. (3) Thirdly, the opening-up policy encouraged the outward development of China's industry by promoting manufactured exports. Foreign markets became an increasingly important source of demand for China's industry. Constraints from the need for foreign exchange on domestic growth also became less fierce. (4) Fourthly, linkages between the consumer goods industry and the capital goods industry have been substantially improved by allowing market forces to play a more important and direct role, and by weakening the reliance of heavy industry on government spending plans. (5) Fifthly, post-reform funding for industrial growth was to a increasingly large degree supported by a rapid growth of savings in the household sector: both from peasants' enthusiasm for investing in TVEs and urban households' savings(see the next chapter).

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[23] Some economists have stressed the importance of the policy shift towards an outward-looking development strategy by regarding the open-door policy as "a major attempt to break through the impasse". See, Yak Yeow Kueh and Zhao Renwei, "Market-Oriented Transformation of China's Economic System: Accelerator or Handicap of the Socio-Economic Development Process?" in China's Contemporary Economic Reforms as a Development Strategy, ed. by Dieter Cassel and Gunter Heiduk, Baden-Baden: Nomos Verlagsgesellscheft, 1990, p.33

One implication of these developments is that, as China's industry has found new markets and new sources of funding, its reliance on state support and therefore on agricultural growth has become less great. Though agricultural growth continued to play an important role in supplying grain and raw materials for the urban-industry sector, in providing a large market for industrial goods, and in contributing financial support for industrial investment, the role has nevertheless become less important compared to that which existed in the pre-reform period. The main reasons for this effect were the accelerating population shift towards urban areas and the outward-looking growth in industry.

This change seems to have been confirmed by a study presented in Table 2-12. It examines the hypothesis that industrial growth was affected by agricultural growth and that such linkage might have changed between the pre-

Table 2-12. Regression of Industrial Production on Agricultural Production, 1953-1992

	Agr	Agr(-1)	R^2	RSS	F statistic
1954-66	-2.162	3.137	.586	2195.9	9.494
	(-3.061)	(4.356)			(2, 10)
1967-77	1.405	-2.537	.503	1054.9	4.045
	(1.229)	(-2.526)			(2, 8)
1978-92	-.174	.330	.042	537.2	.265
	(-.301)	(.650)			(2, 12)

Source and note: The regressand is annual growth rate of current year gross value of industrial production in comparable prices, and the regressors are annual growth rate of gross value of agricultural production in comparable prices at a current year(Agr) and at a lagged year(Agr(-1)); the data from TJNJ 1993, p.52. A constant term is included in regression for all periods. RSS is for residual sum of squares. Figures in parenthesis under the estimate are t-value, and that under the F statistic are degree of freedom. The Chow test is run as follows: (1) given the RSS of 7276.5 for 1954-1977, the computed F(3,18) is 7.43, exceeding the table F of 3.13 at critical level of 5%, and indicating that the two regressions for 1954-66 and 1967-77 are not same; (2) given the RSS of 2423.6 for 1967-1992, the computed F(3,20) is 3.48, exceeding the table F of 3.10 at critical level of 5%, and indicating that the two regressions for 1967-77 and 1978-92 are not same.

reform and the post-reform period. The central results of our examination of the hypothesis are: (i) that the impact of agricultural growth on industrial growth was significant in both 1954-1966 and 1967-1977; (ii) that the direct relationship appeared to have broken down in 1978-1992[24]; (iii) that in both 1954-1966 or 1967-1977 agricultural growth seems to have had a negative impact on industrial growth(in the first period the data measures agricultural growth in the current year, and in the second period it shows the agricultural growth in the previous year). This seems a clear indication of the conflicting nature of the relationship between industry and agriculture in the pre-reform period, as we have described above.

We should also present another interpretation of this results of regression study. On the one hand, reforms and development policy shifts have successfully transformed inter-sectoral relationships in the Chinese economy, particularly the constraints from the agricultural sector on industrial growth. This transformation was achieved basically through restoring market linkages between the capital and consumer goods industry, and searching for new sources of demand and funding, which are hardly imaginable under the centralised planning system of the pre-reform period. Though the centralised planning system had been able to raise funding for industry to a high level, it nevertheless depressed market linkages and limited any further enlargement of demand, or funding sources.

On the other hand, the changing inter-sectoral relationships in the post-reform Chinese economy should not be construed as concluding that there are no longer and impact of agricultural growth on industrial growth. In fact,

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[24] In Chu-yuan Cheng, op.cit., the issue is perceived as the diminishing influence of food production on China's general economic development since the mid-1960s; a regression analysis using 1980s provincial data of industrial and agricultural growth has also arrived at a similar conclusion, see WB, China: Macroeconomic Stability and Industrial Growth under Decentralized Socialism, Washington, D.C., 1991.

as the total population in China continues to grow and more people move into urban areas, the demand for grain and other agricultural products will remain high and increasing. Given this population shift and the related changes in the economy, the requirement of increases in agricultural productivity will be stronger than before. From a long-term point of view, the possibility of increases in agricultural productivity is a crucial factor in determining the pace of growth of domestic markets. Though industrial exports have expanded rapidly, they cannot replace the role of agricultural productivity growth because of the immense size of the economy. Moreover, the considerable gap that exists in China between agricultural productivity and industrial productivity implies that potential gains to further economic growth from increased agricultural productivity are great.

Chapter Three

Investment Expansion in China's Industry

For many years since the early 1950s, the growth of China's economy has to a large extent relied on investment expansion, i.e., the high investment rate[1]. As we have indicated in the previous chapter, this reliance was closely associated with the way in which the centralised planning system mobilised capital resources, i.e., through constraining the growth of the household sector and exploiting the agricultural sector. Though the centralised planning system was able to raise the investment rate to a high level, and provided industry, especially heavy industry, with huge funding support, economic growth in the pre-reform period was achieved at the price of slow development in the rural-agricultural sector and overall slow growth of domestic markets. This was in addition to the problem of low efficiency in the use of capital.

In the sense that fast economic growth needs to be financed to an adequate degree, mobilisation of capital resources in the post-reform period continues to be an important issue for China's economic growth, along with the

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[1] See, Dwight H. Perkins, "The Central Features of China's Economic Development", in Robert F. Dernberger, ed. China's Development Experience in Comparative Perspective, Cambridge, Mass.: Harvard University Press, 1980. For a description up to 1980, see Chu-yuan Cheng, China's Economic Development: Growth and Structural Change, Colorado: Westview Press, 1982, Ch. 10; for description of the post-reform period, see: Ryoshin Minami, The Economic Development of China: A Comparison with the Japanese Experience, London: Macmillan, 1994, Ch. 7

issue of improving the efficiency with which capital resources are used. As China's economic system has begun to move towards a market-type economy since the late 1970s, market forces have became an increasingly important factor to in determining the pace and pattern of investment expansion. The question of resource mobilisation under the transitional system turns out to be, in this respect, a question how the state and market forces interact in the process of financing economic growth.

One particular issue concerning post-reform China's economic and financial development is whether, and how, China could maintain a high investment rate when financial resources begin to shift into the non-state sector. The question may be addressed in this manner: unlike the centralised planning system that was able to force the social saving rate to increase through various means such as planned prices(including wage rates in urban-industry sector) and fiscal measures, the new regime which emerged in the post-reform period could no longer, or at least no longer to the same magnitude, rely on traditional schemes to achieve the same objective; if there were no sufficient forces, market or non-market, to ensure the maintainance of a high level of social savings, a fall in the social saving rate might be expected. And if this was the case, it would pose a potential threat to the funding abase of post-reform China's economic growth[2].

In this chapter, we attempt to explain investment expansion in post-

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[2] It has been pointed out that in the agricultural sector, there is no guarantee that de-control and subsequent output growth will be followed by an increase in capital formation. See Yak Yeow Kueh and Zhao Renwei, "Market-Oriented Transformation of China's Economic System: Accelerator or Handicap of the Socio-Economic Development Process", in China's Contemporary Economic Reforms as a Development Strategy, ed. by Dieter Cassel and Gunter Heiduk, Baden-Baden: Nomos Verlagsgesellschaft, 1990. Similar questions can also be addressed to the urban-industry sector. However, once a high rate of capital formation or a high investment rate is observed, the question seems to be more appropriately addressed by asking "who paid for it". See: John Knight, "Price Scissors and Intersectoral Resource Transfer: Who Paid for Industrialisation in China?" Oxford Economic Papers, No. 47 (1995).

reform China's industry with regard to the changing relationship between the state and the market. In Section I, we will give an overall description of the investment rate in post-reform China in comparison with the pre-reform period. The issue of industrial investment expansion relative to GDP is considered as a combination of two ratios: gross investment in proportion to GDP and allocation of gross investment into industry. Focusing on the first aspect, Section II will in particular discuss the growth of household income and savings and the transformation of the state funding system. In Section III, we will come to the issue of the allocation of funds to industry. We will also consider behaviourial differences between state and non-state industrial investment.

I. The Role of Investment Expansion in China's Industrial Growth

When looking at immediate effects, the role of investment expansion in economic growth shows a combination of two inter-related effects. First, it enlarges productive capability by increasing fixed capital stock. Second, it induces a growth in aggregate demand by raising demand for capital goods. From a broad, longer-term, point of view, the role of investment expansion may also entail facilitation of technological progress, for it involves financing equipment renovation and research and development projects[3]. For all these reasons, investment expansion has an enormous influence on economic growth. If an economy wishes to achieve a higher growth rate, it is therefore in general desirable to achieve an accordingly high investment rate without

[3] In Moshe Syrquin's phrase, it is "the role of capital accumulation as a carrier of technological change"("Patterns of Structural Change", in Handbook of Development Economics, Vol. I, ed. by Hollis Chenery and T.N. Srinivasan, Amsterdam: North Holland, 1988, p.225). This perception has been earlier expressed in A.K. Cairncross, "The Place of Capital in Economic Progress", in Economic Progress, ed. by L.H. Dupriez, Louvain: The International Economic Association, 1955

jeopardising the efficiency with which increased capital is used.

One way to appreciate the dynamic relationship between investment expansion and output growth is to observe the incremental capital-output ratio (ICOR) and its change. Though there are a number of theoretical and practical problems with this measure[4], it may be seen an indicator describing the reliance of output growth on capital growth, under a mutatis mutandis assumption that investment expansion is associated with changes in other productive factors. In other words, it may help to see to what extent economic growth has relied on investment expansion compared to experience in either a different period or a different country.

Here we are mainly interested in the question of whether the ICOR in China's economy as a whole and in its industry in particular has undergone any alteration in the post-reform period compared to the pre-reform period. Table 3-1 presents the ICOR for 1980-1992 based on national income. It seems that for both the economy as a whole and industry in particular, there was no uniform trend during the period: it fell in the first half of the 1980s, began to rise around the end of the decade, and began to fall again in 1990-1992. Whether the latest change represents a general trend remains to be seen[5].

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[4] For a theoretical discussion, see Gerald M. Meier, "Criticisms of the Capital-Output Ratio", in Leading Issues in Economic Development, New York: OUP, 4th edition, 1984. The main argument presented there is to deny ICOR's value as a policy instrument in development project appraisal. A more recent (re)appraisal on the issue has appeared in Dennis Anderson, "Investment and Economic Growth", World Development, Vol. 18, No. 8 (1990). Use of the ICOR analysis in China's economy or industry has been cautioned with regard to its relevance to judge economic efficiency. See, for example, Peter Nolan, State and Market in the Chinese Economy, London: Macmillan, 1993, p. 291; Adrian Wood: China's Economic System: A Brief Description with Some Suggestions for Further Reform, CP No 12, STICERD, London School of Economics, 1991. Bearing in mind these criticisms, we do not intend to use this criterion to judge China's economic performance, but rather to examine the degree of reliance of its economic growth on investment expansion.

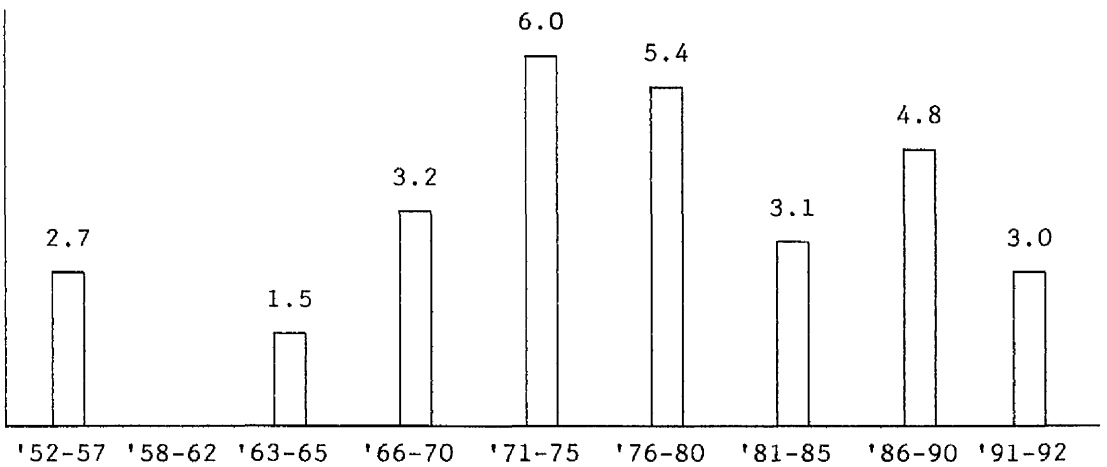
[5] Compared to other countries' experience in the 1980s, China's position in this respect seems modestly good(see Ryoshin Minami, op.cit., pp.156-59). But as Adrian Wood(op.cit., p.18) has warned, the international comparison should be treated with more caution because of differences in scope of

Table 3-1. The ICOR in the China's Economy and Industry, 1980-1992

	Growth of NI(%)		Investment rate(%)		ICOR	
	Economy	Industry	Economy	Industry	Economy	Industry
1980	6.4	10.9	31.5	22.7	4.92	2.08
1981	4.9	1.7	28.3	23.4	5.78	13.76
1982	8.2	6.0	28.8	27.7	3.51	4.62
1983	10.0	9.8	29.7	29.3	2.97	2.99
1984	13.6	14.9	31.5	31.1	2.32	2.09
1985	13.5	19.6	35.0	34.8	2.59	1.78
1986	7.7	9.6	34.7	38.8	4.51	4.04
1987	10.2	13.0	34.1	41.5	3.34	3.19
1988	11.3	17.4	34.5	41.2	3.05	2.37
1989	3.7	6.0	33.8	31.6	9.14	5.27
1990	5.1	5.5	32.8	32.4	6.43	5.89
1991	7.7	12.8	32.8	33.3	4.26	2.60
1992	14.4	21.4	34.3	38.1	2.38	1.78

Source: TJNJ 1993, pp.35 and 43. Growth rate of national income(NI) is in comparable prices. The investment rate for whole economy is the accumulation ratio(% of gross formation of fixed capital and net increase of circulating capital in national income). For industry it is fixed capital investment(see Table 3-2 for details of data sources and scope) as a % of the net value of industrial output. The ICOR is the investment rate divided by the growth rate. The ICOR for the economy is not fully compatible with the ICOR for industry.

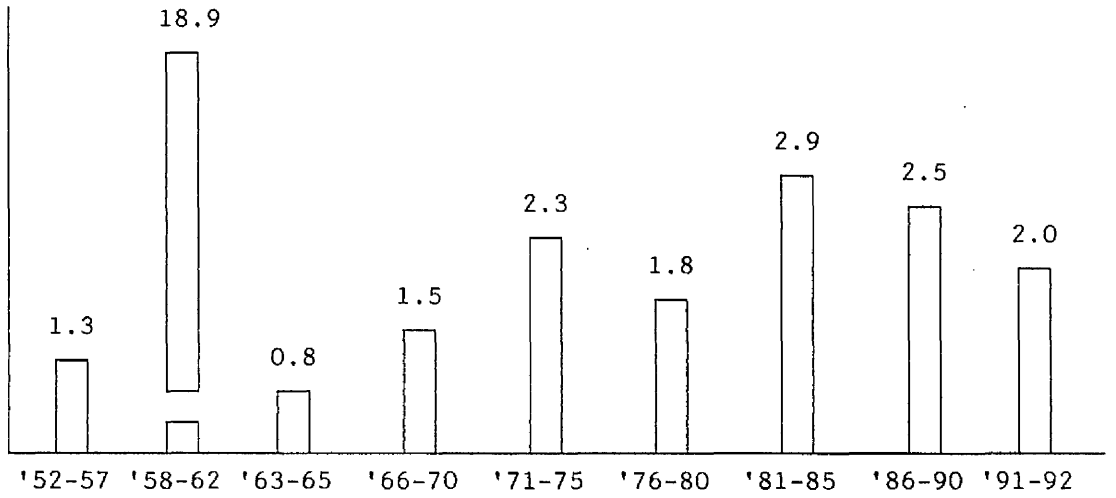
Figure 3-1. ICOR in China's economy 1952-1990



Source and note: Data source is same as to Table 3-1. There is no positive ICOR in 1958-1962 because real national income decreased during the period.

measurement and price structures, etc..

Figure 3-2. ICOR in China's industry 1952-1990



Source and Note: Data source is same as to Table 3-1. In the period up to 1980, industrial investment consisted of state investment in basic construction only.

Compared to the pre-reform period, it seems that the ICOR has fallen since the 1970s at the economy level(Figure 3-1). But we need to note that the level of the 1970s was the highest in the pre-reform period. Also, the latest level, 3.0 in 1991-1992, was still higher than the 2.7 of 1953-1957 and 1.5 of 1963-1965. For industry, similar patterns existed. The ICOR steadily rose from the early 1960s to the mid-1970s, reaching a high level in the first half of the 1980s; however, from 1980 to 1992, the long-period averages seem to have exhibited a falling trend, i.e., one that is more conspicuous than that exhibited in the annual series in Table 3-1. Overall, it may be fair to say that the ICOR in the post-reform period was an average between the high and the low levels in the pre-reform period, for both China's economy as a whole and industry in particular.

Perhaps it may be interesting to note differences in the output growth rate and the investment rate between the pre- and post-reform periods, as the ICOR is determined by these two factors. On the one hand, the overall output(national income) growth rate was higher in 1980-1992 (9.1%) than in 1952-1980(6.0%), but the growth rate remained the same for industry in the two

periods(11.3% in 1952-1980 and 1980-1992). On the other hand, the investment rate for the whole economy rose from an average level of 27.4% in 1952-1980 to one of 32.8% in 1980-1992[6], and that for industry rose from about 26.0% in 1952-1980 to about 29.2% in 1980-1992. Overall, the ICOR for the whole economy has fallen between the pre- and post-reform periods, but that for industry has risen instead.

The fact that the ICOR in industry has risen between the pre- and post periods implies that post-reform China's industrial growth has to a larger extent relied on a rise in investment rate, i.e., investment expansion. This in turn raises a question about how post-reform China's industry could continue to absorb capital resources for its growth[7]. Quantitatively, the question may be addressed as a combination of the two moving factors: for what reasons the overall investment rate continued to be high in post-reform China's economy, and how could industry absorb an increased proportion of total investment funds. In Table 3-2, we list the two series for 1980-1992. It clearly shows that the rise of industrial investment in proportion to GDP is a result of the rise in the share of gross investment in GDP and the rise in the share of industry in gross investment. To be more precise, in the first half of the 1980s, the upward trend was mainly a result of the rising share of gross investment in GDP when the share of industry in gross investment was slightly decreasing. Since the mid-1980s, both proportions were increasing.

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[6] The investment rate in China in the 1980s has been calculated as amongst the highest in the world. See, Ryoshin Minami, op.cit., pp.156-159

[7] To some authors, this question has been addressed as "who paid for China's industrialisation". See, for example, John Knight, op.cit., ft. 2. To our understanding, with the transition of the centralised planning system to a market-type economy, most of the issue has turned out to be how post-reform China's industry could maintain its pivotal position in absorbing or mobilising social capital resources.

Table 3-2. Trend of industrial fixed capital investment, 1980-1992

	Total investment as a % of GDP	Industry as a % of total investment	Industrial investment as a % of GDP
1980	20.4	44.9	9.2
1981	20.1	44.8	9.0
1982	23.7	43.9	10.4
1983	24.7	43.8	10.8
1984	26.5	42.7	11.3
1985	29.8	43.3	12.9
1986	31.2	46.0	14.3
1987	32.2	48.6	15.7
1988	32.0	49.7	15.9
1989	25.9	47.7	12.4
1990	25.2	48.1	12.1
1991	27.3	46.5	12.7
1992	32.7	47.6	15.6

Source and note: Figures of total investment and industrial investment for the years until 1986 are from the SSB, Zhongguo gudin zichan touzi tongji ziliao 1950-1985 (Statistical Data of China's Fixed Asset investment [ZGGDZCTZTJZL]; for subsequent years, see TJNJ, various issues. Rural collective industrial investment is incorporated in the statistics from 1981, and individual industrial investment from 1987(ZGGYJJTJNJ various issues since 1988). All are in current prices. Industrial investment as a % of GDP is the product of total investment as a % of GDP and industry as a % of total investment.

The share of gross investment in GDP is related to changes in the sources of funding. We will discuss this issue in the next section. The share of industry in gross investment concerns the allocation of investment funds to industry by both the state sector and the non-state sector. We shall in the last section of this chapter investigate how market forces and state intervention interacted in this process of investment allocation to industry.

II. Changes in Funding Sources of Investment

The question of how much can be saved or invested out of GDP under the centralised planning system seems in principle a matter of how much the state

can raise investment funds through its control on inter-sectoral resource flow and its collection from the state enterprises. By pricing industrial goods relatively high in the economy, financial resources tended to centre on industry. With the dominance of state enterprises in industry, the state was able to extract a large portion of the income generated by industry through profit remittance and taxes. This centralised planning system of capital mobilisation has understandably received a huge blow in the post-reform period: first, with price reforms, especially agricultural price reforms, the inter-sectoral price relations tend to move towards a market equilibrium level. Consequently, the state is less able to draw financial resources into industry by fixing a price policy. Second, the non-state enterprises (that are usually entitled to a larger degree of financial independence) achieve faster growth than state enterprises in industry, so attacting financial resources; and for state enterprises an increasingly large proportion of income remains with enterprises and their employees. As a result, the state is less able to collect funds from industry.

With these changes, the state's funding capacity has inevitably fallen in the post-reform period. As shown in Table 3-3, the share of the state budget as a source of fixed capital investment decreases from 62.2% in 1978 to 4.3% in 1992(in fact, the absolute amount is virtually stationary over the period). It is not an overstatement to say that all of the investment expansion in the post-reform period has been financed by non-state-budget sources: enterprise self-raising funds, domestic banking loans, foreign capital inflow, and others. Of these sources, the use of foreign capital is new to the socialist Chinese economy except for the 1950s when China had close economic relations with the Soviet Union[8].

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[8] See: Robert F. Dernberger and Richard S. Eckaus, Financing Asian Development 2: China and India, Washington, D.C.: University Press of America, 1988, pp.15-18

Table 3-3. Funding Sources for fixed capital investment

	1978	1980	1985	1988	1992
All sources	100.0	100.0	100.0	100.0	100.0
state budget	62.2	44.7	16.0	9.1	4.3
domestic banking loans	1.7	11.7	20.1	20.6	27.1
foreign funds	4.2	7.2	3.6	5.6	5.5
enterprise self-raising					51.2
other	31.9	36.5	60.3	64.5	12.0

Source and note: TJNJ 1991 and 1993.

Using the categories of official Chinese statistics, we cannot directly see the role of household savings in financing investment expansion. An estimate made by the World Bank and IMF staff shows that from 1978 to 1988, the share of the household sector in China's total savings rose from 3.4% to 44.7%[9]. It is evident that household and enterprise sectors become a major funding source of post-reform China's investment expansion. It also becomes apparent that the banking sector(or financial markets) has played an increasingly important role in channelling various sources of funding for investment expansion. In what follows, we will discuss the growth of household savings and enterprise self-raising funding and the role of the banking sector briefly.

1. Growth of Household Savings and Enterprise Self-Funding

The growth of household savings is dependent on the growth of household income and households' propensity to save. We have indicated in the previous chapter

[9] The World Bank, China: Macroeconomic Stability and Industrial Growth under Decentralized Socialism, Washington, D.C., 1990, p.103. Corresponding shares taken by the state and enterprises changed from 45.4% to 8.3% and from 51.2% to 47.0% respectively.

(Section II), that household income at per capita level experienced a faster rising trend in the post-reform period than that of the pre-reform period. Also important is the increasing household saving rate in urban and rural areas shown in Table 3-4. Taking account of the fact that income per capita has risen in general in the period, the rising saving rate can be regarded as an approximate indication of a positive marginal propensity to save in urban and rural households(the fall of the rate in some of the years may be associated with slower growth of per capita income in the same years, for example, in 1988 and 1989). From cross-section data for the urban household sector shown in Table 3-5, it becomes more apparent that the rising household saving rate was indeed closely associated with an increase in per capita income.

Table 3-4. Savings as a % of income, yearly average, per capita

	Urban areas	Rural areas
1978	9.4(1964)	13.1
1980	8.7(1981)	15.2
1983	11.7	20.0
1984	15.3	22.9
1985	10.9(10.1)	20.2
1986	12.2	15.8
1987	12.6	13.9
1988	7.4	12.5
1989	12.7	11.0
1990	16.0	14.8
1991	15.1	12.5
1992	17.7	15.9

Source and note: TJNJ, various issues. Savings are household income minus living expenditures; for rural households, net income is used. The scope of urban areas changed in 1985 slightly thereafter both municipal cities and townships were covered in surveys. The figure in parenthesis for 1985 urban areas is compatible with those of subsequent years in scope.

Another result we can deduce from Table 3-4 is that in the early

years of the post-reform period, the household saving rate was higher in rural areas than in urban areas, but the urban rate then rose fast, reaching a level close to that of rural areas. Reasons for this change as well as the reasons behind households propensity to save, in both rural and urban areas, may be several, and need further investigation[10]. The change in fact helped to raise the overall households saving rate as urbanisation accelerated in the period, which we have shown in Section II of Chapter Two.

Table 3-5. Savings as a % of income by income level, urban areas

Income groups	1985	1992
lowest income	5.6	6.7
lower income	8.0	11.2
lower-middle income	9.4	13.9
middle income	10.1	15.6
upper-middle income	11.3	18.9
higher income	12.3	22.4
highest income	16.0	26.8

Source and note: For 1985, TJNJ 1986, p.670; for 1992, TJNJ 1993, p. 287. The definition of savings is same as that in Table 3-4.

The growth of enterprise self-funding investment seems a more complicated issue. By definition, self-funding investment is different from self-raising investment for the latter includes funds from external sources such as net borrowing from financial markets. Enterprise self-funding investmentis restricted to the internal financial sources of an enterprise[11]. Major internal sources are depreciation charges drawn on fixed assets, and retained profits. China has raised the depreciation rate for all state

[10] See WB, op.cit., pp.110-113, for a review of the issue.

[11] For a detailed description of the issue, See: D. Hay et al, Economic Reform and State-Owned Enterprises in China 1978-1987, Oxford: OUP, 1993, Ch. 10

enterprises several times since 1978(TJNJ 1993, p.28). In state industry alone, the ratio of the depreciation fund to total fixed capital investment rose from 26.7% in 1985 to 27.3% in 1991(ZGGYJJTJNJ 1992, pp.90 and 103). As the total fixed capital investment in state industry understandably includes a large proportion of funds from external sources, such as state budgetary support and net lending from banks, any slight rise of the ratio in the statistics may actually reflect a greater contribution to investment expansion in state industry during the period.

Table 3-6. Retained profits in in-budget state industrial enterprises

	Nominal retained profits as a % of total profits and product tax	Actual retained profits as a % of total profits and product tax	Productive development as a % of actual retained profits
1978	1.1	1.1	
1980	8.1	8.1	17.9
1984	18.4	15.6	23.4
1985	20.3	17.3	38.6
1986	21.2	18.0	30.9
1987	21.4	18.2	44.1
1988	22.2	18.8	31.7

Source and note: The State Economic System Reform Commission: Zhongguo qiye gaige shiliang(The First Decade of Enterprise Reform in China), Beijing: Gaige chubanshe, 1990, p.646. Actual retained profits is retained profits minus the deduction of the energy and transportation fund at a rate of 15% since 1984.

Retained profits is a more dynamic source of enterprise self-funding investment. As shown in Table 3-6, at the beginning of reform in 1978, in-budget state enterprises(major SOEs in China's industry) were allowed to retain only a tiny portion of the total profits generated(including product tax remitted). The profit retention rate was quickly raised in the first half of the 1980s and became fairly stable in the second half of the 1980s. For all

China's industrial enterprises, the rate saw a decrease in 1988-1992, from 18.8% to 15.4%(ZGGYJJTJNJ 1993, p.142).

How much of the retained profits was used for investment by enterprises may be seen approximately by looking at the ratio of productive development to retained profits. The productive development fund had been designated for non-consumption purposes. As shown in Table 3-6, in the early years of reform, the ratio was rather low, implying that SOEs were reluctant to use their own funds to invest or reinvest, especially for productive development purposes[12]. To cope with the situation, the state has taken a number of measures since the mid-1980s to encourage (force) the rate to rise, these included the imposition of a quasi-tax, the energy and transportation fund, and an "adjustment tax" on enterprises that increased a welfare fund out of their retained profits, in 1985.

2. Transforming the Banking Sector and Role of Financial Markets

With financial resources shifting into non-state sectors, i.e., the growth of personal income in urban and rural areas, the growth of non-state enterprises, as well as the growth of retained profits in SOEs, reforming the state banking sector became a necessity. The objectives of the reforms of the state banking sector for the purpose of resource mobilisation included: to absorb savings from households and enterprises, in urban and rural areas; to channel funds into sectors or branches or enterprises according to a market-based valuation; to commercialise to a degree state banking institutions to improve their

[12] It has been observed, "many [Chinese] enterprises prefer to spend their retained profits on collective welfare and workers' bonuses rather than on investment, and they do so to the extent that they can get away with it." William Byrd and Gene Tidrick, "Factor Allocation and Enterprise Incentives", in Gene Tidrick and Chen Jiyuan, eds. China's Industrial Reform, New York: OUP, 1987, p.88

operational efficiency; to allow to a modest degree development of non-state financial institutions[13]; and to increase access to foreign financial markets[14]. These objectives have been pursued with different degrees of success.

Table 3-7. Sources of bank deposits

	1983	1985	1988	1992
All sources	100.0	100.0	100.0	100.0
fiscal deposit	18.0	8.6	3.6	1.2
enterprise deposit	33.4	48.5	39.5	36.1
household deposit	34.9	35.3	44.8	53.4
other	13.7	7.6	12.1	9.3

Source and note: TJNJ 1991, p.642; TJNJ 1993, p.664

The most notable is the growth of household deposits as a source of bank deposits(Table 3-7). The level rose from 34.9% in 1983 to 53.4% in 1992, outstripping all other sources of bank deposits. Even when observers have cautioned, in 1990-1992, that creeping inflation in China has threaten the growth of personal savings[15], urban and rural households' savings with the banking institutions have increased rapidly. Though the underlying causes need to be examined further, it seems likely that the state banking institutions

[13] See for example, On Kit Tam, "A Private Bank in China: Hui Tong Urban Co-Operative Bank", CQ, No. 131 (September 1992)

[14] For an overall account, see: Mei Xia and Phillip D. Grub, The Re-Emerging Securities Market in China, Boston: Quorum Books, 1992, Ch. 3. The authors conclude: "The growth and diversification of financial institutions now taking place in China has been a positive development, enhancing the financial sector's ability to mobilize savings and to direct them efficiently to high-value investment."(p.47). Also pointed out by Peter Nolan: "As a result of the growth of alternative sources of investment fiance... the old Stalinist system of finance was transformed."(Peter Nolan, State and Market in the Chinese Economy, op.cit., p.274)

[15] See WB, op.cit., p.103.

have been able to adjust interest rates to attract personal savers.

Reforms and developments in the financial sector were, however, unbalanced in some aspects. Notably, there are three major problems still existing in post-reform China's funding system, or financial markets. First, the growth of banking sector is still behind what might have been made possible by the growth of enterprise financial resources. We may note from Table 3-3 that, in 1978-1992, the banking sector as a source of investment has risen from 1.7% to 27.1%. Though this is a remarkable increase, the size of banking sector, in terms of its channelling of total investment, is still much smaller than the enterprise self-raising sector, which accounts for 51.2% of total investment in 1992. The size of the enterprise self-raising sector implies that over a half of investment projects were neither in the arms'-length control of the central government nor in the nexus of the banking sector[16]. The activities of enterprise self-raising investment were apparently more locally oriented or less integrated with financial markets. Therefore, the gains from the integration of self-raising enterprise funding into financial markets are considered to be great.

Second, the commercialisation of state banking institutions has taken the form of decentralisation, i.e., specialised state banking institutions are being de-linked with their central headquarters. In the process of decentralisation, those banking institutions have found themselves, however, under the increasingly large influence of regional and local governments. Nonetheless, a degree of segmentation in the banking sector has occurred.

Third, in order to achieve macroeconomic stability, the central government has concentrated on controlling fixed capital investment through the regulation of state banking institutions. With this goal, more progress

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[16] For a detailed description of enterprise self-raising investment, see: Robert F. Dernberger and Richard S. Eckaus, op.cit., pp.51-52

has been made in deregulating circulating capital operation in state banking institutions. For Chinese enterprises, the difference in this relative degree of state control has actually been perceived as a reflection of differentials in borrowing costs. This has led Chinese enterprises to use more circulating capital relative to their use of fixed capital. This fast-increasing use of circulating capital has brought about some profound implications for China's industrial growth. We will come to this issue in more detail particularly in Chapter Seven(Section II).

III. State Investment versus Enterprise Investment

The above discussion deals with one aspect of the transformation of traditional centralised funding system: financial resources have been allowed to grow faster in the non-state sector and more use has been made of financial markets in mobilising and channelling financial resources. The transformation of the funding system also involved development in another important aspect: allowing non-state enterprises and state enterprises to initiate investment activities, thereby allowing market forces to play an increasingly important role in investment decision-making. Meanwhile, within the state sector, regional/local governments were encouraged to seek their own development initiatives through regional- and local-oriented investment activities.

In this section, we will focus on the issue of how state and non-state investment goals are influenced by market forces, and so determine the allocation of investment funds concerning industry. We will compare the investment behaviour of enterprises of different ownership status later on. Here we firstly give a brief description of changes which have happened to the ownership composition of gross investment in post-reform China.

Table 3-8. Share in gross investment by form of ownership, %

	State	Collective	(TVEs)	Individuals
1980	81.9	5.0	(2.5)	13.1
1985	66.1	12.9	(7.8)	21.0
1988	61.4	15.8	(10.2)	22.7
1990	65.6	11.9	(8.2)	22.5
1992	67.1	17.3	(12.7)	15.6

Source and note: TJNJ 1991, pp.18 and 26; TJNJ 1993, p.26.

As summarised in Table 3-8, the ownership composition of China's gross investment has undergone a great deal of changes over 1980-1992. First, the share of state enterprises has declined considerably, from over four-fifths at the beginning of the period to about two-thirds at the end of the period. Second, the collective enterprises especially rural collective enterprise (TVEs) have become an increasingly important actor in investment activities. Third, investment by individuals achieved a larger share in gross investment than collective investment during the 1980s, but this trend has reversed since 1990. In 1990, when the economy was under retrenchment,the relative relationship between state and non-state in investment became subject to some strong "adjustments", i.e., the state re-emphasised its bias towards state enterprises through various forced means including re-orientating the state bank lending behaviour. Overall, however, the basic underlying trend has been the relative decline of state investment, though it still occupies a dominating position in 1992.

Two things may be noted with regard to the situation described in Table 3-8. First, within the state (or non-private) sector, changes have occurred to the balance between central and regional/local investment projects. As shown in Table 3-9, the share of regional/local projects in total state investment increased from 54.6% in 1980 to 56.3% in 1988. The steadily

rising trend was interrupted again in the 1989-1990 retrenchment. The change of two percentage points seems relatively insignificant, but if we include collective investment, the relative change in the position of regional/local investment becomes more conspicuous(rising from 57.4% in 1980 to 69.3% in 1992).

Table 3-9. Central and regional/local investment, 100 mil yuan

	1980	1985	1988	1990	1992
Basic construction: central	292.6	575.2	873.7	919.2	1341.7
regional	266.3	499.1	700.6	784.7	1671.0
Technical innovation: central	23.8	104.8	211.9	228.5	
regional	113.6	344.3	768.9	601.7	
Other investment: central			98.1	132.6	
regional			57.3	66.5	
Collective investment	46.0	327.5	711.7	529.5	1359.4
Share in investment(%): central	45.4	44.6	43.7	46.8	44.5
regional	54.6	55.4	56.3	53.2	55.5
regional(incl. collective)	57.4	63.3	65.4	60.8	69.3

Source and note: Central investment includes ministerially-administrated and ministerially-supplied investment. See: ZGGDZCTZTJZL, various issues, and TJNJ 1993. For 1980, 1985 and 1992, estimates of the composition make-up are incomplete because of data unavailability.

Second, in investment undertaken by individuals (including private enterprises), the funding directed towards industry was very small(Table 3-10 compared to Table 3-11). In urban areas, all investment by individuals(in fixed assets) went on housing investment(TJNJ 1993, p.208). Investment by individuals in industry reported in the ZGGYJJTJNJ is therefore presumably all undertaken in rural areas. For rural areas, housing has also been a top priority in the allocation of investment by individuals, accounting for over four-fifths in 1982 and over two-thirds in 1992(TJNJ 1993, p.206). The main

implications of this housing-focused tendency in investment by individuals are: firstly, it relieves to a degree the burden on urban and rural collective enterprises in housing investment(see below), and secondly, that it implies that industrial markets are yet not open to individual or private enterprises as much as to collective enterprises.

Table 3-10. Investment by individuals, 100 mil yuan

	All investment	Investment in industry	% of industry in all investment
1987	795.9	14.7	1.9
1988	1022.1	24.3	2.4
1989	1032.3	27.0	2.6
1990	1001.2	18.6	1.9
1991	1182.9	18.3	1.6
1992	1222.0		

Source and note: All investment undertaken by individuals from TJNJ 1991 and 1993; the investment by individuals in industry from ZGGYJJTJNJ, various issues since 1989.

In what follows we will focus on investment undertaken by state enterprises, and urban and rural collective enterprises. Investment by state enterprises is further broken down into basic construction, renovation investment, and other. It is believed that considerable differences existed between basic construction and renovation investment, albeit the fact that they both operated in the state sector. Institutionally, renovation investment was a device which enabled existing state enterprises to initiate their own

Table 3-11. Share in industrial investment, %

	1980	1982	1985	1988	1990	1992
Industrial Investment (100 Mil. Yuan)	408.8	540.4	1101.1	2209.3	2123.6	3716.0
State investment						
basic construction	67.4	48.2	40.5	36.8	44.9	39.2
other	-	6.7	10.5	6.3	9.9	6.0
Enterprise investment						
renovation	27.9	31.6	31.9	35.0	30.5	30.0
urban collective	4.7	6.1	7.8	8.8	5.8	7.1
rural collective	-	7.4	9.2	13.0	9.0	18.6

Source and note: For 1980 to 1985, ZGGDZCTZTJZL 1950-1985; for 1988 to 1992, TJNJ various issues and ZGGYJJTJNJ 1992. For 1980, investment in state industry contains the basic construction and renovation investment only, and data for rural collective industrial investment were not available. For the remaining years, investment in state industry was larger than the sum of basic construction and renovation investment, and the differences are listed here as "other", that contains mainly the special investment fund for oil field maintenance and development etc. For state industrial investment, the figures for 1988 and 1990 provided in TJNJ and ZGGYJJTJNJ were different. Figures in TJNJ are used. The investment by individuals in industry listed in Table 3-10 seems incompatible with the figures listed here and is therefore excluded.

investment activities[17], whilst basic construction remained a form of investment that state planning authorities and state enterprises both could make use of. Generally speaking, state planning authorities had more power or influence on basic construction investment than on renovation investment. To be more sensible, we will from now on refer to basic construction investment as state investment, and renovation investment, together with collective investment, as enterprise investment.

As shown in Table 3-11, in 1980-1988, the share of basic construction

[17] In official Chinese statistics, industrial renovation investment starts in 1980(ZGGTJJTJNJ 1993, p.27) but renovation investment for all sectors dates back to the early 1950s(TJNJ 1993, p.149).

in total investment became smaller and that of renovation investment became larger. Overall, enterprise investment consisting of renovation investment, urban and rural collective investment, has increased its share in total industrial investment, from 32.6% in 1980 to 55.7% in 1992. The share taken by basic construction investment rose in 1990 compared to 1988, and reverted back to a declining trend in 1990-1992. This fact reflects the view that basic construction investment has a closer relationship with the state, and the state policy inclination for basic construction investment became more evident in the period of retrenchment.

Table 3-12. Industry as a % of investment outlets

	State basic construction	State enterprise renovation	Urban collective enterprises	Rural collective enterprises
1980	49.3	82.9	84.1	
1982	46.9	68.2	77.0	30.4
1985	41.6	78.2	67.2	50.9
1988	51.8	79.0	76.3	63.1
1990	55.9	78.0	75.1	52.2
1992	48.4	73.7	72.3	69.6

Source and note: For 1980-1985, see ZGGDZCTZTJZL 1950-1985; for other years, see TJNJ various issues.

Now we consider to what extent investment by these different sources has been allocated to industry in the post-reform period(Table 3-12). There are several points to note. First, compared to the state basic construction investment, investment undertaken by enterprises, SOEs, urban COEs and TVEs has had a higher tendency towards being allocated to industry since the mid-

1980s. By 1992, the difference in the proportion of total investment being allocated to industry by state basic construction and enterprise investment was about one-fifth(lower end) and one-quarter(high end). Second, for SOEs' renovation investment and urban COEs' investment, there was a declining tendency towards investment in industry in 1980-1985 and 1988-1992. Third, unlike the other three sources, TVEs investment has steadily shifted towards industry throughout the period, except for an interruption in 1990. To explain differences and similarities implied by these trends in the investment patterns of these in different sources, we consider it necessary to refer to some underlying factors. These are the comparative positions of non-industry sectors, and the different constraints facing each source of investment. Of them, we will particularly look at the issue of housing investment.

The proportion of total investment devoted to housing by the different sources are shown in Table 3-13. The first striking feature displayed is that housing accounts for a larger share in state basic construction investment than in all other investment throughout the period, and in TVEs' investment housing took only a small proportion. The chief reason for state basic construction investment shifting towards housing, especially in the late 1970s and the early 1980s, was to meet the huge and previously pent-up need for housing in the urban-industry sector. In a period of spanning almost a generation, from the late 1950s to the late 1970s, housing investment was only about 5% of total state basic construction investment, which itself was the only major form of investment during that period. The sharp rise of the share of housing in state basic construction investment was in one sense a compensation to the employees in the state sector. In contrast in rural areas, employees of TVEs would usually own their houses in the villages. TVEs therefore faced lighter burdens in housing investment, and were thus able to increase their non-housing investment. The main constraints facing TVEs in

Table 3-13. Housing as a % of investment

	Basic construction	Renovation	Urban collective	Rural collective
1980	20.0	6.1	14.3	6.9*
1982	25.4	11.5	21.5	7.1
1985	20.0	5.6	13.2	6.9
1988	13.0	8.0	10.3	6.0
1990	10.0	7.1	10.9	4.5
1992	10.9	5.7	8.3	2.5

Source and note: ZGGDZCTZTJZL, 1950-1985 and 1988-1989; TJNJ, 1991 and 1993. Figure with * is for 1981.

allocating investment towards industry would not be the need for housing, but would more of a problem of access to industrial markets and technology.

The reason why renovation investment undertaken by SOEs has had a much lower proportion devoted to housing investment than the state basic construction investment, is mainly that renovation investment was designated by regulation to be used for technical updating for productive purposes, rather than for non-productive purposes that would include housing. However, the fact that SOEs did increase the housing investment ratio several times in the period(e.g., 1982 and 1988 in Table 3-13) seems to imply that SOEs have an inbuilt bias towards increasing housing investment, to meet the requirements of their employees. Their inability to increase the housing investment ratio more than they did appears due to the state restrictions imposed on their investment projects.

Urban COEs industrial investment seems to have had some peculiar underlying factors. In the first half of the 1980s, the industrial investment ratio declined(Table 3-12), and so did the housing investment ratio(Table 3-13). What did increase was urban COEs investment in the commerce and service

sector, which may have been associated with deregulation and development in this sector. Whether it is a relative improvement in industrial profitability that has led to the bounce-back of the industrial investment ratio by urban COEs since 1985 is a question to be studied(the actual profit rate in industry has declined in the period but profit rates or their changes in non-industry sectors are yet unknown from existing statistics).

The main conclusion that we may draw from the above discussion is that even facing different constraints, exemplified by a discussion of the housing investment ratio, enterprises, including SOEs, urban COEs and TVEs, have been able to maintain a high tendency towards industrial investment; among them, TVEs in particular demonstrated a spectacular trend of shifting investment towards industry. Our discussion here is incomplete in the sense that there may be other relevant and important factors concerning the industrial investment ratio and its change. For instance, the relative position of the service sector in the economy. However, instead going into these questions for which we may encounter data problems and go beyond the scope of the present study, we would like to discuss further the issue of behaviourial differences between state investment and enterprise investment in industry.

We take the energy industry as an example here. As shown in Table 3-14, there were substantial differences in the energy industry investment ratio(the share of the energy industry in industrial investment) between funding from state basic construction investment, state enterprise renovation investment, and urban COEs investment, over the period 1980-1992. State basic construction investment had the highest ratio, the next highest was the state enterprise renovation investment, and the lowest was the urban COEs investment. We have no similar data for TVEs but from their production data, it seems that their situation is close to that of urban COEs(the energy

industry accounted for less than 5% of TVEs gross industrial product in 1985, 1989 and 1992, see ZGGYJJTJZL 1986, TJNJ 1991 and 1993). Interestingly, both in the state sector, basic construction investment and renovation investment show a different trend: in the former, the main trend has been a rise, but in the latter, the main trend has been a decrease except for an interruption in 1990(again associated with the economic retrenchment in 1989-1990). Here again, renovation investment displayed features close to those of non-state enterprises.

Table 3-14. Energy industry as a % of industrial investment

	Basic construction	Renovation	Urban collective
1980	42.0	32.9	3.1*
1982	39.2	24.7	2.2*
1985	46.0	15.3	2.1*
1988	50.6	14.7	4.6
1990	58.6	19.3	9.9
1992	55.1	13.8	5.8(1991)

Source and note: ZGGDZCTZTJZL, 1950-1985, 1988-1989, and 1990-1991; TJNJ, 1990 and 1993. The energy industry consists of five branches out of the forty in a new industrial classification, i.e., coal mining, petroleum mining, power generation, petroleum refinement, and coking. Figures with * are those for which the energy industry consisted of three branches out of the fifteen in the older industrial classification, i.e., power generation, coal, and petroleum. Similar breakdown data for rural collective industrial investment are not available.

The main differences between the energy industry and non-energy industry in China are that energy industry products are usually priced low compared to non-energy industry products, especially some of the light manufacturing goods; also, in general, the energy industry requires a longer

gestation period for any large lump sum funding before yielding returns to investment[18]. It seems that these two important differences have affected the state and enterprises' inclination towards investment in the energy industry.

As SOEs renovation investment, urban COEs investment, and TVEs investment all tended to become more market-oriented in the period 1980-1992, they have been less willing to invest in energy industry. In addition, as they expanded more rapidly than basic construction investment in industry(Table 3-11), this inevitably resulted in the fall of the energy industry investment ratio(the share of energy industry in total industrial investment, Table 3-15). As can be seen from the table, in 1980-1985, the ratio given by state basic construction investment did not reduce significantly, but it declined sharply in total industrial investment. In 1985-1988, the state reaffirmed its commitment to the energy industry by increasing the investment ratio substantially(from 19.1% to 26.1%), although this increase had little influence on the overall ratio in industry (an one percentage-point increase) because of the shift away by enterprise renovation investment from the energy industry(Table 3-14). The rise in the energy industry's investment ratio in 1990 is mainly due to the fact that the other forms of investment all increased their funding towards the energy industry, perhaps resulting from heavy pressure by the state. In 1992, when state basic construction investment accounted for just 38.4% of total national investment and 39.2% of total industrial investment, it nevertheless contributed over 80% of energy industry investment. We can therefore say that investment in the energy industry was mainly supported by state basic construction investment.

Overall, the fall in the energy industry's investment ratio, especially in 1980-1988, has been a fundamental factor causing the recurrent

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[18] A detailed survey of China's energy industry can be found in Tatsu Kambara, "The Energy Situation in China", CQ, No. 131 (September 1992)

Table 3-15. **Energy industry investment ratios**

	Energy industry as a % of total industrial investment	Energy industry as a % of basic construction investment
1980	37.6	20.7
1982	27.0	18.4
1985	23.9	19.1
1988	24.8	26.1
1990	33.6	32.8
1992	27.1	26.7

Source and note: First column from Table 3-11 and 3-14 (TVEs' energy industry investment ratio is assumed the same as urban COEs); second column from TJNJ 1993, p.158.

shortages of energy industry products(coal, petroleum and electricity power, etc) in post-reform China[19](other important factors include the similar bias within the transport sector in that energy industry products could not be effectively and promptly delivered from production locations to consumption locations). We have shown that these problems are mainly caused by the bias against the energy industry existing within enterprise investment sources. It is clear that the problems of imbalance in China's industry are closely associated with enterprises' investment behaviour.

Overall, the actual significance of the behaviourial differences between state basic construction investment and enterprises' investment is a question that may be answered by reference to differences in their response to some common factors such as profit rate and capital intensity. In order to consider this question of significance, we propose to look at a regression

[19] See Tatsum Kambara, ibid.

analysis of industrial branch data(the results are reported in Table 3-16). It is hypothesised that if state basic construction investment and enterprise investment were the same in principle, the effects of common factors on their allocation of investment would be similar. For instance, we may expect, under this indifference hypothesis, that both state basic construction investment and enterprise investment would be positively related to profit rate.

Included in the regressions are the profit rate, the level of retained profits and fixed capital per worker. The dependent variable is the share of branches in total investment divided by the share of branches in fixed capital stock. The use of the relative term is to eliminate the size effect of existing capital stock. For example, enterprises would be less willing to invest in the coal industry because of its low profit rate, but actual investment in the coal industry would be a large amount because the coal industry is among the largest industrial branches in China[20]. The year 1988 is chosen because this is the year enterprise investment reached its peak level in the post-reform period that we are studying(Table 3-11).

The results reported in Table 3-16 may be explained as follows. (1) Renovation investment tended to respond positively to the profit rate of return and the level of retained profits, and negatively to the level of capital intensity: the higher the profit rate or level of retained profits in a branch, the greater would the shift of renovation investment into the branch be, compared to its position in the existing total capital stock; on the other hand, when the capital-labour ratio was high in a branch, renovation investment would be smaller, compared to the branch's position in the existing

[20] By using this measure, differences between state basic construction investment and enterprise investment can be revealed immediately in some cases. For example, in 1988, when the coal industry and the textile industry accounted for 7.2% and 7.4% of total industrial fixed capital stock respectively, their shares in basic construction investment were 7.8% and 2.9% respectively, and their shares in renovation investment 4.5% and 11.0% respectively(from the same source to Table 3-16).

Table 3-16. Regressions of industrial investment

	Enterprise investment		Basic construction investment
	Renovation	Urban collective	
Profit Rate	.435	.005	-.001
	(7.902)	(.323)*	(-1.676)*
Capital-labour ratio	-.107	-.007	.002
	(-1.952)	(-2.738)	(2.939)
Retained profit	.292	-.004	.002
	(3.040)	(-1.360)*	(1.216)*
Constant term	39.902	2.396	.491
	(2.860)	(6.266)	(2.791)
R^2	.725	.270	.308
F statistic	30.713	4.309	5.182
D-W statistic	2.254	1.481	1.457

Source and note: The dependent variables are the shares of 39 branches in total industrial investment(i.e., either in industrial renovation investment, urban collective industrial investment, or industrial basic construction investment) divided by the share of the 39 branches in total fixed assets, using 1988 data; the profit rate is the sum of profit and taxation as a % of total capital(fixed assets and circulating capital); the capital-labour ratio is fixed assets per worker; retained profit is also at per worker level. All variables are in percentage form. Figures in parenthesis are t-values and figures with * are not statistically significant at a critical level of 5%. The F statistic for renovation and basic construction are significant at a 1% critical level, but that for urban collective is significant at 5% only. Investment data at branch level are from ZGGDZCTZTJZL 1988-1989, and all other data from ZGGYJJTJNJ 1992.

total capital stock, ceteris paribus. (2) The statistical results for urban collective industrial investment are not as robust as those for renovation investment. It seems however that collective investment shares common features

with renovation investment[21]. (3) For basic construction investment, the results seem quite different. Statistically, the profit rate and retained profits had no significant effect on the allocation of state basic construction investment, and its response to the capital-labour ratio was positive, i.e., the more capital intensive a branch was, the greater would be the amount of state basic construction investment flowing into the branch. A basic conclusion we may draw is that there seem to be some systematic differences existing between state basic construction investment and enterprise investment, concerning the allocation of investment among industrial branches. In general, enterprise investment has been greatly influenced by factors such as the profit rate, the level of retained profits and the capital-labour ratio, in a manner which conforms to market forces; on the other hand, state basic construction investment has been less significantly affected by these factors.

There seems to be an important implication of the above conclusion which concerns overall investment expansion in post-reform China's industry. Insomuch as enterprise investment tended to flow into industrial branches with a higher profit rate, or those which were more accessible, the growth of investment became uneven among industrial branches: the bottleneck appeared in some areas such as the energy industry. When a positive response from state

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[21] We have conducted a revised regression for a similar category: using fixed capital stock of non-state enterprises (including urban COEs and TVEs) as the dependent variable, whilst dependent variables are defined the same as in Table 3-16 but three-year average values of 1988-1990 are used. The results are remarkably improved and quite close to those of renovation investment in Table 3-16:

	Profit rate		Retained profits		Capital-labour ratio
% of capital stock =	0.07	+	1.77	-	2.65
	(.185)		(3.513)		(-6.914)

R^2: 0.691; F(2, 25): 18.648; D-W: 1.817. Log form is used for all variables. Data of 30 industrial branches are used. Data sources: TJNJ 1991, p.401 and 407 and those for Table 3-16.

basic construction investment has helped to relieve the pressure in the areas neglected by enterprise investment, the continuing bias against these areas in enterprise investment tended to make the imbalances recur again. As long as state basic construction investment continued to support the industrial branches which were suffering investment supply shortages, such as the energy industry, the growth of total industrial investment was pushed up a step further. The overall growth of industrial investment in post-reform China was thus exaggerated[22].

To summarise our discussions about post-reform growth of industrial investment, we may note several key points again. (1) With state funding capacity declining in the post-reform period, the growth of household savings provided a space for accelerated gross investment. (2) In parallel, enterprise investment expanded rapidly as enterprises, both state enterprises and collective enterprises, had more accessible financial resources. (3) Facing different constraints, enterprises, especially rural collective enterprises, invested less in housing than state investment, which made it possible for them to invest more in other areas including industry. (4) Industrial investment initiated by enterprises was significantly guided by market forces, i.e., they were likely to invest more in industrial branches with high profit rates and invest less in branches with more intensive capital requirements. Such an investment tendency however engendered a problem of shortages under the partially reformed planned pricing system. The commitment to the balanced growth made it imperative for the state to increase investment in the neglected branches, such as the energy industry, which would usually be those with a lower profit rate and more intensive capital requirements. Overall, industrial investment was therefore exaggerated.

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[22] A similar conclusion has also been arrived at by Oktay Yenal, "Chinese Reforms, Inflation and the Allocation of Investment in a Socialist Economy", World Development, Vol. 18, No. 5 (1990)

PART TWO

PRODUCTIVITY CHANGE

Chapter Four

Productivity Analysis For China's Industry: Methodology and Data Scope

In Part One, Mobilising Resources, we have demonstrated that reforms have helped China's industry to pursue market expansion and investment expansion since the late 1970s. China's linkages of industrial production with markets have been restored and strengthened by the transformation of the old centralised planning system. By actively responding to the growing market demand, post-reform China's industry has been able not only to achieve a high output growth rate, but also to transform its institutional and production structure, e.g, the faster growth of non-state enterprises and the faster growth of manufactured exports. Over this periof of rapid economic growth, China's industrial enterprises including SOEs, urban COEs, and TVEs, have also been able to gain greater access to the financial resources that were made available by the fast growth of the household sector and the enterprise sector, as well as foreign capital inflow. Though it has partially withdrawn from industrial funding, the state maintained its commitment to the balanced growth by supporting the basic industrial branches, including the energy industry. Such state support has played an important role in sustaining the overall industrial growth.

From the resource mobilisation point of view, post-reform China's industry has therefore performed successfully, although not without certain

setbacks characterised by some unbalanced reforms or unbalanced impacts of reforms. Having arrived at this stage of economic performance analysis, we come to the question of productivity change. The question can be addressed as: whether and if so to what degree the faster industrial growth has been accompanied by productivity improvement in general, and exactly how the industrial growth has been interrelated with productivity change in particular. In Part Two, we will concentrate on the first aspect. The interrelation of industrial growth and productivity change will be dealt with in Part Three.

Productivity change in post-reform China's industry has become an area that has attracted great attention from analysts and observers. In many aspects our empirical investigation of the issue has benefited from the previous studies. However, it is felt that a few issues concerning productivity analysis for post-reform China's industry need mroe analysis. (i) Theoretically, it seems that the relevance and limitations of the use of total factor productivity analysis may need to be clarified, with regard to its application in post-reform China's industry. (ii) Empirically, productivity analysis here involves quite a few data-related problems, some arising from the original data sources and some others from analysts' data processing. Based on progress made in official Chinese statistical publications and in academic discussions, we are now able to pursue the empirical investigation into sectoral levels on a more consistent base. (iii) The interpretation of the results of total factor productivity analysis seems to be not so straightforward as how it looks at first sight. We believe that the interpretation should be at least related to the structural transformation that has occurred in post-reform China's industry.

The organisation of Part Two is as follows. Chapter Four discusses the theoretical aspect of the use of total factor productivity analysis with

regard to its application in China's industry. The issue of data scope will also be highlighted in the chapter. Chapter Five presents the results of our effort to estimate output and input growth in China's industry at sector level during 1980-1992. Chapter Six tries to interpret these results in the light of the structural transformation in post-reform China's industry.

The main theoretical points that we will make in the present chapter are: (i) As the conventional total factor productivity analysis is derived from the production function under competitive conditions, it appears necessary to reconsider its implication when the market conditions are different or when they have changed over a course of economic development. (ii) Aggregate total factor productivity is an outcome of productivity change at sectoral levels. Existing sectoral relations and their change over the period under study should be therefore taken into account when interpreting the results of total factor productivity estimates. (iii) Strictly speaking, total factor productivity may not necessarily reflect technological progress. To accommodate this conceptual difference, we will seek to establish appropriate principles for the empirical treatment of output and input series.

I. Total Factor Productivity Analysis and Market Conditions

Broadly speaking, the purpose of total factor productivity [TFP] analysis is to identify the physical contributions of productive factor inputs to output growth and treat the residual of output growth (subtracting from the contributions of input growth) as an indication of productivity growth. In formulating the analysis, economists usually make an assumption about the market conditions under which the analysis applies: perfect competition. Under perfect competition, factor prices are equal to their marginal products, and therefore factor shares in output reflect the relative importance of factor

inputs to output growth.

The TFP approach to economic growth accounting has received a good deal of criticism and revision[1]. For our analytical task that deals with a transitional economy in post-reform China, a most crucial issue is this reliance of TFP analysis on the assumption about underlying market conditions: would non-competitive conditions or a change in market conditions over time affect the applicability of the method or require a distinctive interpretation of the analysis? The question has been raised by some economists[2]. Most importantly, this question seems unlikely to disappear even if the validity of applying the analysis into a non-competitive environment were justified[3].

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[1] Criticisms and/or revisions have often been made in these areas: factor substitutability(between labour and capital), returns to scale, and homogeneity of factors(particularly capital) and aggregate output. See for example, Richard Nelson, "Recent Exercises in Growth Accounting: New Understanding or Dead End?", AER, Vol. 63 No. 3 (June 1973); C. Kennedy, and A.P. Thirlwall, "Technical Progress", Economic Journal, March 1972; Richard Nelson, "Research on Productivity Growth and Productivity Differences: Dead Ends and New Departures", Journal of Economic Literature, Vol. 19 (1981)

[2] In one case, it has been pointed out that, if TFP analysis is used in an economy where monopolistic conditions prevail, it would measure, among other things, effects associated with the monopolistic conditions. See Ben Fine, "Total Factor Productivity versus Realism: the Case of the South African Coal Mining Industry", in South African Journal of Economics, Vol. 60, No. 3 (September 1992). Similar criticism has also been made in more general terms: "The justification of the weighting schemes in growth accounting have never been convincing nor have they been well defended. For example, in short-run and long-run equilibrium under competitive conditions, factor shares do measure the contributions of each input, but the real world hardly conforms to the model of perfect competition, whether in or out of equilibrium. What kind of bias this weighting procedure might introduce has never been made clear." John Cornwall on TFP, in The New Palgrave: A Dictionary of Economics, Vol. IV

[3] Some economists have argued that perfect competition is not necessary, though is convenient, for TFP analysis in the Cobb-Douglas form of the production function. See: Pan A. Yotopoulos and Jeffrey B. Nugent, Economics of Development: Empirical Investigations, New York: Harper & Row, 1976, p.52. Their main argument is that, by treating factor inputs as an endogenous variable and factor prices as an exogenous variable, one would expect that factor shares in output would remain same even if factor prices were distorted. For example, supposing that wages were fixed at a level lower than the marginal products of labour, the share of labour in income would not necessarily change because more labour would have been put in use. Empirically, it has been suggested that when dealing with a monopolistic

To illustrate this point, let us see what bias would be entailed in conventional TFP estimates under monopolistic conditions.

The following illustration is a quick look at the outcome of introducing factor price inequality with marginal products under monopoly, and has necessarily overlooked some detailed descriptions of the usual TFP formulation(e.g., assumptions about factor substitutability and returns to scale etc). Starting with a production function in a general form,

$$Q = A(t)f(L, K) \tag{1}$$

where Q is output, and L and K are labour and capital, respectively; A(t) is a term indicative of TFP, separable from the f(L, K). Taking the total differentiation with reference to time, t, (1) becomes

$$dQ/dt = (dA/dt)f + (\partial Q/\partial L)(dL/dt) + (\partial Q/\partial K)(dK/dt) \tag{2}$$

Note that $\partial Q/\partial L = A(\partial f/\partial L)$, and $\partial Q/\partial K = A(\partial f/\partial K)$. They are the marginal products of labour and capital, respectively. Under competitive conditions, the marginal products of labour and capital are equal to their prices, w(wage rate) and r(profit or interest rate in broad sense), respectively[4].

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economy, the contributions of factor inputs to output growth may be estimated by referring to the output elasticity of factor inputs, instead of using factor shares. See, M. Nishimizu and J. M. Page, Jr. "Total Factor Productivity Growth, Technological Progress, and Technical Efficiency Change: Dimensions of Productivity Change in Yugoslavia, 1965-1978", Economic Journal, Vol. 92 (1982).

[4] It can be derived from a simplistic profit function under competitive conditions in a two-factor case:

$$\pi = Q - (wL + rK)$$

where π stands for profit. The first-order conditions leading to profit maximisation yield:

Introducing these two equalities into (2), dividing both sides by Q, we can obtain:

$$\dot{Q}/Q = \dot{A}/A + (s_l\dot{L}/L + s_k\dot{K}/K) \tag{3}$$

where $\dot{Q}/Q$, $\dot{K}/K$ and $\dot{L}/L$ are the growth rates of output, capital and labour, respectively; and $s_k(\equiv rK/Q)$ and $s_l(\equiv wL/Q)$ are the share of labour and capital in output, respectively. The part $(s_l\dot{L}/L + s_k\dot{K}/K)$ may be interpreted as the contribution of factor inputs to output growth. The part $\dot{A}/A$ is indicative of productivity growth, i.e., TFP. It is not directly observable but can be expressed as a residual term:

$$TFP_{(competition)} = \dot{A}/A = \dot{Q}/Q - (s_l\dot{L}/L + s_k\dot{K}/K) \tag{4}$$

It is apparent that, under monopoly, the equality relations($\partial Q/\partial L=w$, and $\partial Q/\partial K=r$) can no longer hold. It can be shown that factor prices under monopoly would be equal to the marginal products multiplicative to some price elasticities, which may be expressed as[5],

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$$\begin{cases} \partial\pi/\partial L = \partial Q/\partial L - w = 0 \\ \partial\pi/\partial K = \partial Q/\partial K - r = 0 \end{cases} \qquad \begin{cases} \partial Q/\partial L = w \\ \partial Q/\partial K = r \end{cases}$$

[5] Take the same case in the ft. 4 but add a term of output price (because price is a function of output under monopoly)

$$\pi = pQ - (wL + rK)$$

The first-order conditions leading to a profit maximisation yield:

$$\begin{cases} \partial\pi/\partial L = \{Q(\partial p/\partial Q)(\partial Q/\partial L) + p(\partial Q/\partial L)\} - w = 0 \\ \partial\pi/\partial K = \{Q(\partial p/\partial Q)(\partial Q/\partial K) + p(\partial Q/\partial K)\} - r = 0 \end{cases}$$

Rewriting them as

$$\begin{cases} w/p = (\partial Q/\partial L)(e_{pq} + 1) \\ r/p = (\partial Q/\partial K)(e_{pq} + 1) \end{cases}$$

where $e_{pq} \equiv (Q/p)(\partial p/\partial Q)$, the price elasticities.

$$\begin{cases} \partial Q/\partial L = (w/p)(e_{pq} + 1)^{-1} \\ \partial Q/\partial K = (r/p)(e_{pq} + 1)^{-1} \end{cases}$$

The new equalities mean that under monopoly payments to factors are made not only according to their marginal products, but are also subject to price elasticities. As e_{pq} is usually in the range of 0 and -1, factors are underpaid to the degree to which the monopoly profits are generated. Existence of the monopoly profit does have implications for a conventional calculation of TFP. Substituting the above expressions for $\partial Q/\partial L$ and $\partial Q/\partial K$ into (2), we end up with a distinctive expression of TFP under monopoly:

$$TFP_{(monopoly)} = \dot{Q}/Q - (s_l\dot{L}/L + s_k\dot{K}/K) = \dot{A}/A - e_{pq}(\dot{Q}/Q - \dot{A}/A) \qquad (5)$$

It thus becomes clear that TFP under monopoly contains an additional term embodying price elasticities. Moreover, comparing (5) with (4), it is evident that

$$TFP_{(monopoly)} > TFP_{(competition)}$$

Because it is usually the case that e_{pq} is in the range of 0 and -1, and $\dot{Q}/Q$ is larger than $\dot{A}/A$[6].

The reason for the TFP estimate under monopolistic conditions being larger than the TFP estimate under competitive conditions is that, under monopoly, output growth has embraced an additional source: the gain of monopoly profits. The existence of monopoly profit indicates that part of the consumer surplus is being taken by monopolistic producers. Capture of the

[6] The comparison is made in a static sense as it assumes that $\dot{A}/A$ is same in quantity under monopoly and competition. Under which of the market conditions $\dot{A}/A$ would be larger is a separate question.

consumer surplus means that gains to monopolistic producers have increased but they do not incur additional factor inputs. In statistics, this would be reflected as an increase in productivity. However, when competition prevails in the market, monopolistic prices tend to give way to equilibrium prices, the consumer surplus will be accordingly returned to consumers, and as a result, monopoly profits will gradually die down. In this process, the productivity of monopolistic producers would tend to become lower because of the loss of the additional source of gain. Statistically, this implies that in the period of transition, TFP estimates tend to converge towards $\dot{A}/A$, an indicator of the true total factor productivity.

The change in market conditions may be termed de-monopolisation. It is clear that in a process of de-monopolisation, TFP estimates would not be necessarily positive or positively larger even if $\dot{A}/A$ is positive or positively large. The difference we can identify between the $TFP_{(monopoly)}$ and the $TFP_{(competition)}$ is very helpful for us to give an appropriate interpretation of TFP estimates of post-reform China's industry. De-monopolisation has became a everpresent feature of post-reform China's industrial development, which has been characterised by a diffusion of new technology and production expansion over regions, as well as increased competition between state and non-state enterprises(we will come to these issue later in Part Three). With this theoretical background, we should interpret TFP estimates with due regard to the changes in market conditions(Section II in Chapter Six).

II. TFP Analysis and Sectoral Relations

As revealed in equations (3) and (4), the TFP estimate of $\dot{A}/A$ measures the rate of productivity change in output growth over a certain period of time. If we are dealing with an economy comprising several sectors, disparities in

sectoral TFP estimates would imply unevenly occurring productivity change among the sectors, but they do not necessarily indicate which of the sectors has a higher or lower productivity or whether production has tended to shift into a sector with higher productivity.

The question of whether production tends to shift into sectors with higher productivity is particularly interesting for the analysis of a transitional economy. If we admit that a centrally planned system is characterised by the state control of inter-sectoral flows of productive resources and that such flows have weak linkages with the market, a transition towards a market-type economy would therefore be represented by an increasingly large proportion of the inter-sectoral flow of productive resources coming out of state control, and linkage between the flow and the market becoming stronger. In other words, production or productive resources under the transitional economy tends to shift towards sectors with a higher productivity. If this is the case, the sectoral shift may contribute to the overall growth of productivity significantly[7].

How a TFP analysis could be incorporated with the sectoral perspective is an issue still awaiting development, theoretically and empirically. Here we intend to show that an aggregate TFP estimate is a combination of sectoral TFPs weighted by sectoral shares in aggregate output. This result may help us to clarify the relationship between aggregate TFP and sectoral TFPs and furthermore, to give a more appropriate interpretation of aggregate TFP estimates.

What follows is a formal demonstration of the relationship between aggregate TFP and sectoral TFPs using a simplified case: a two sector(good)

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[7] This is similar to saying that the positive effect of a reallocation of productive resources among sectors would be substantial in a transitional period, a suggestion made in Moshe Syrquin, "Productivity Growth and Factor Reallocation", in Hollis Chenery, ed. Industrialization and Growth: A Comparative Study, New York: OUP, 1986

economy. We assume that each sector has its own production function and sectoral TFPs are in the same form as expressed in equations (3) and (4) such that,

$$\dot{Q}_i/Q_i = \dot{A}_i/A_i + (s_{li}\dot{L}/L_i + s_{ki}\dot{K}/K_i) \text{ and}$$
$$TFP_i = \dot{A}_i/A_i = \dot{Q}_i/Q_i - (s_{li}\dot{L}/L_i + s_{ki}\dot{K}/K_i) \quad (i = 1, 2) \tag{6}$$

where subscript i indicates an individual sector, and s_k and s_l here stand for the shares of capital and labour in sectoral output, respectively. All other symbols remain the same as in the previous definition. Here we ignore the issue of market condition by simply assuming that competitive conditions prevail in each of the two sectors. One way to establish the relationship between the sectoral TFPs and aggregate TFP is to start with decomposing the aggregate output as:

$$Q = p_1Q_1 + p_2Q_2 \tag{7}$$

This expression implies that aggregate output is a sum over sectoral output through a price mix, p_1 and p_2. Without a price mix, sectoral output cannot be aggregated.

Now we consider the change of aggregate output over time by taking total differentials of (7) with respect to time, t,

$$dQ/dt = p_1dQ_1/dt + p_2dQ_2/dt \tag{8}$$

Implied in the differentiation is also that the price mix, p_1 and p_2, does not change over time, either individually or relatively. In empirical studies of TFP, the use of constant prices of output has actually excluded(though may not

accurately) any change in the price mix. Dividing both sides of (8) by the aggregate output, Q, and denoting $h_i \equiv p_iQ_i/Q$, (sectoral share in aggregate output), we can have an expression for aggregate output growth in terms of sectoral output growth:

$$\dot{Q}/Q = h_1(\dot{Q}_1/Q_1) + h_2(\dot{Q}_2/Q_2) \tag{9}$$

This reveals that aggregate output growth is a sum of sectoral output growth weighted by sectoral shares in aggregate output which contain a price mix over sectors. We can now substitute the expressions in (3) for aggregate output growth and that in (6) for sectoral output growth into equation (9),

$$\begin{aligned} &\dot{A}/A + (s_l\dot{L}/L + s_k\dot{K}/K) \\ &= h_1(\dot{A}_1/A_1 + s_{l1}\dot{L}_1/L_1 + s_{k1}\dot{K}_1/K_1) + h_2(\dot{A}_2/A_2 + s_{l2}\dot{L}_2/L_2 + s_{k2}\dot{K}_2/K_2) \end{aligned} \tag{10}$$

It can be shown that in (10)[8],

$$s_l\dot{L}/L = h_1(s_{l1}\dot{L}_1/L_1) + h_2(s_{l2}\dot{L}_2/L_2); \text{ and}$$

$$s_k\dot{K}/K = h_1(s_{k1}\dot{K}_1/K_1) + h_2(s_{k2}\dot{K}_2/K_2)$$

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[8] Note that, in the case of capital, on the left-hand side of equation (10),

$$\begin{aligned} s_k\dot{K}/K &= (rK/Q)(\dot{K}/K) = (rK/Q)(k_1\dot{K}_1/K_1) + (rK/Q)(k_2\dot{K}_2/K_2) \\ &= (rK_1/Q)(\dot{K}_1/K_1) + (rK_2/Q)(\dot{K}_2/K_2) \end{aligned}$$

because $\dot{K}/K = k_1(\dot{K}_1/K_1) + k_2(\dot{K}_2/K_2)$, where $k_i = K_i/K$; and also on the right-hand side,

$$\begin{aligned} &h_1(s_{k1}\dot{K}_1/K_1) + h_2(s_{k2}\dot{K}_2/K_2) \\ &\quad = (p_1Q_1/Q)(rK_1/p_1Q_1)(\dot{K}_1/K_1) + (p_2Q_2/Q)(rK_2/p_2Q_2)(\dot{K}_2/K_2) \\ &\quad = (r\dot{K}_1/Q)(\dot{K}_1/K_1) + (r\dot{K}_2/Q)(\dot{K}_2/K_2) \end{aligned}$$

A similar equality exists for terms concerning labour.

Removing the corresponding terms from both sides in (10), we come to a result,

$$TFP_{(aggregate)} = \dot{A}/A = h_1(\dot{A}_1/A_1) + h_2(\dot{A}_2/A_2) \qquad (11)$$

It becomes clear that aggregate TFP depends not only on sectoral TFPs individually, but also on sectoral shares in aggregate output measured in a price mix at an initial period(holding the price mix unchanged over a period of time is nothing more than anchoring the price base to the initial period). An implication of this relationship is that when we are interpreting aggregate TFP estimates in terms of sectoral TFP estimates, we should also take into account the underlying sectoral weights or price mix. In a transitional period, it is possible that a reforming sector achieves a relatively high TFP but because of its relatively small share in aggregate output it has a relatively small impact on aggregate TFP. On the other hand, it is also possible that the price mix, if used differently, would affect estimates of aggregate TFP. For example, in China's industry, the shares of light and heavy industry in total GVIO in 1980 were 47% and 53%, respectively, when measured in current prices, but were 43% and 57% in the same year, respectively, when measured in comparable prices. Given the fact that TFPs in light and heavy industry were different in the 1980s(Section Two in Chapter Six), the results of an aggregate TFP estimate would be apparently affected by the choice of price mix[9].

We should however note that there is a deficiency in the aggregate total factor productivity formulation as revealed in equation (11). From this expression, we would hardly know exactly how much sectoral shifts have

[9] Because we will mainly use the data provided in ZGGYJJTJNJ which give no sectoral data prior to 1980(see the next section) for our TFP analysis, we have to use the 1980 price base. As shown in the text, this base exaggerated the share of light industry(4 percentage points more in the TJNJ data-set and about 2% percentage points more in the ZGGYJJTJNJ data-set).

affected aggregate productivity growth because it gives no account of the effect of sectoral shifts on total factor productivity(i.e., h_1 and h_2 are held unchanged and only $\dot{A}_1/A_1$ and $\dot{A}_2/A_2$ are allowed to change over a period of time)[10]. Foa study of the reallocation effect, it would be much more easy to focus on, say, labour productivity. Similarly, aggregate labour productivity in a two-sector case can be expressed as:

$$Q/L = (L_1/L)(Q_1/L_1) + (L_2/L)(Q_2/L_2) \tag{12}$$

If we use s_i to indicate the sectoral share in total labour, and l_i sectoral labour productivity(i = 1, 2, here), the change of aggregate labour productivity over time would be a sum over change in the sectoral weights and change in the sectoral labour productivity[11]:

$$d(Q/L)/dt = \Sigma(s_i*dl_i/dt) + \Sigma(l_i*ds_i/dt) \tag{13}$$

And

$$d(Q/L)/dt)/(Q/L) = \Sigma(q_i*(\dot{l}_i/l_i)) + \Sigma(q_i*(\dot{s}_i/s_i)) \tag{14}$$

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[10] This means that the sum of $h_1(\dot{A}_1/A_1)$ and $h_2(\dot{A}_2/A_2)$ has exhausted the aggregate total factor productivity, $\dot{A}/A$. To some authors, this relationship has been expressed differently. For example, Moshe Syrquin envisages a residual existing between $\dot{A}/A$ and the sum of $h_1(\dot{A}_1/A_1)$ and $h_2(\dot{A}_2/A_2)$, and it being named the factor reallocation effect("Productivity Growth and Factor Reallocation", in Hollis Chenery, S. Robinson, and M. Syrquin, op.cit., Ch. 8. To our understanding, the residual would possibly exist or the reallocation effect may be studied in two ways: One: artificially alter the sectoral weights, h_1 and h_2, based on some assumptions outside the model; Two: instead of focusing on the total factor productivity, one may examine labour productivity for which the formulation proposed by Syrquin is formally applicable.

[11] The discussion follows Syrquin, op.cit.

The dot "·" indicates a time derivative, and q_i sectoral share in total output. The second part in the right-hand side, $\Sigma(q_i*(\dot{s}_i/s_i))$, measures the effect of sectoral shifts on aggregate labour productivity growth, i.e., the reallocation effect. Viewed from this expression, it is possibly the case that even if labour productivity did not grow in individual sectors(i.e, $\Sigma(q_i*(\dot{l}_i/l_i))$ was zero or negative), aggregate labour productivity could increase as long as the labour force moved into sectors with a higher labour productivity and such shifts were sufficiently large(i.e, $\Sigma(q_i*(\dot{s}_i/s_i))$ was positive and sufficiently large). More generally, the two sources of aggregate productivity growth may not necessarily move in same direction in the same period of time. As we will show later in Chapter Six(Section Three), this has sometimes been the case in post-reform China's industry. We need to examine underlying factors in such a pattern of productivity growth.

III. TFP Estimates as an Indicator of Productivity Change

Our discussions in the previous two sections have revealed that aggregate TFP estimates would be possibly affected by a change in market conditions and by sectoral relationship in an economy. These findings strongly suggest that we should be more careful in interpreting TFP estimates especially when dealing with a transitional economy. The usual interpretation of TFP as technological progress should therefore be subject to scepticism. However, in the sense that TFP does measure the part of output growth that is not due to an increase in factor inputs, the TFP estimate can still be taken as an indicator of productivity change[12]. Of sources of productivity change, technological

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[12] Mathematically, we may rewrite TFP in equation (4) after retrieving the definitions of $s_l(\equiv wL/Q)$ and $s_k(\equiv rK/Q)$ into it,

$$TFP = \dot{Q}/Q - (s_l\dot{L}/L + s_k\dot{K}/K) = \{\dot{Q} - (w\dot{L} + r\dot{K})\}/Q$$

progress may be a most important one but by no means the only one. This broad view towards TFP analysis has been taken by several authors, as they put it:

> Our empirical results on TFP change thus should not be interpreted as measuring technical change only in the sense of a shift in the frontier of production possibilities because of the implementation of a new generation of technical knowledge. Instead, the measures must be interpreted quite broadly to include such factors as industrial and plant organization, engineering know-how, or changes in response to disruptions in the production process that affect capacity utilization in the short run. The measures really treat production units as a black box.[13]

What would be in the "black box" is exactly those factors which would affect productivity or its change in the course of economic growth. Besides technological progress, market conditions and sectoral relations which we have mentioned above, there is notably another important source of TFP: technical efficiency. This refers to the question of whether enterprises have operated on their production frontiers. Studies on this issue tend to confirm that technical efficiency would be in general positively associated with a change in market conditions from monopoly to competition but may not necessarily be associated with technological progress[14].

The part $\{\dot{Q} - (w\dot{L} + r\dot{K})\}$ determines the sign of the TFP estimate. The component $(w\dot{L} + r\dot{K})$ may be regarded as returns to increased factor inputs(the return rates, w and r, are fixed because of the use of constant prices). Therefore, TFP is positive only if an increase in output is sufficiently larger than an increase in total returns to factor inputs measured in constant return rates. TFP is thus related to the change in total returns to factors.

[13] Mieko Nishimizu and Sherman Robinson, "Productivity Growth in Manufacturing", in Hollis Chenery, Sherman Robinson and Moshe Syrquin, op.cit., p.288

[14] See R.S. Frantz, X-Efficiency: Theory, Evidence and Application, Boston: Kluwer Academic, 1988

In the present study of productivity change in post-reform China's industry, we will focus on the TFP defined in the broad sense rather than the TFP defined as technological progress. This is not only because the use of the TFP method for studying technological progress may encounter a number of theoretical and empirical problems that may affect the accuracy of the estimates, but also because, as we have shown above, TFP defined in the narrow sense may not be sufficient to embrace other factors that may also affect productivity. Generally speaking, the two approaches have their own merits, though at this stage of study an integration of the two approaches still awaits development.

It may be noted that there are some measurement issues associated with the two concepts of TFP, i.e., TFP being taken as an indicator of productivity change in the general sense or as an indicator of technological progress in the strict sense. The focus of analysis may be either TFP as an indicator of productivity change or TFP as an indicator of technological progress, but for each different focus the choice or treatment of output and input variables would be accordingly different.

In statistics, output can be a gross term or a net term. A difference that arises here is whether we should include intermediate inputs when estimating TFP[15]. If choosing gross output, it seems that intermediate inputs should be taken into account(using gross output without including intermediate inputs would generate a bias in the estimate). Intermediate inputs are a component of gross output and may be also a carrier of technological progress[16]. In the sense that TFP is an indicator of productivity change, the

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[15] The question has been raised in Julia Hebden, Application of Econometrics, London: Philip Allen, 1983, p.99, who however gives no clear-cut answer to it.

[16] See Hollis Chenery and M. Syrquin, "Typical Patterns of Transformation", in Hollis Chenery et al, op.cit, p.57

use of net output seems more appropriate for the analysis. Firstly, it is the net output that concerns total returns to factors and therefore is closer to the concept of productivity defined in productive gains. Secondly, the use of net output actually "neutralises" the role of intermediate inputs and therefore enables analysts to focus on the role of labour and capital. We will compare the results of the estimates using both gross output and net output in our empirical study in Chapter Six.

A question over the treatment of input variables is whether we should exclude those elements that have not been in effective use? In any economy there may exist some under-utilised capital stock and labour supply due to business fluctuations, monopolistic positions or technical inefficiency problems. Should the excessive factor inputs be removed from the input series when estimating TFP? The answer seems to be dependent on the purpose of analysis. If it is to determine technological progress, the series of factor inputs should not include any element that has no de facto contribution to production, for otherwise estimates of technological progress would be biased. On the other hand, if the purpose of analysis is TFP as defined in a broad sense, or to ascertain technical efficiency, it seems unnecessary to exclude the excess part of the factor inputs. The main reason is that any part of the factor inputs, being in service although effectively unused, have equally de jure entitlement to claim compensation from the net output, and therefore will affect productivity or any change in productivity. Disregarding the excess part of the factor inputs would be helpful to estimate a true shift of the production function, but may also lead to an exaggeration of improvement in production or technical efficiency. In short, any treatment of factor inputs should be justified by the relevant purpose of analysis.

For China's industry, a question that has been raised in empirical studies is whether non-productive fixed assets should be excluded from capital

series. On the one hand, the non-productive fixed assets are not actually part of productive capital inputs; on the other hand, however, this part of factor use does claim a portion of net output(depreciation charges). For these reasons, we will treat the non-productive fixed assets differently: removing them from the existing capital series but including depreciation charges drawn on them in labour income accordingly(Chapter Five).

IV. Data Sources and the Scope of the Subject Matter

Statistical data sources that we will use extensively are mainly some official Chinese publication series, i.e, Zhongguo gongye jingji tongji nianjian (Statistical Yearbook of China's Industrial Economy) [ZGGYJJTJNJ], and Zhongguo tongji nianjian (Statistical Yearbook of China) [TJNJ]. The forerunner of ZGGYJJTJNJ is Zhongguo gongye jingji tongji ziliao (Statistical Data of China's Industrial Economy) [ZGGYJJTJZL], which appeared in 1985 and has been subsequently replaced by ZGGYJJTJNJ since 1988. These publications provide a detailed statistical description of China's industry for the period 1980-1992 and are therefore a main data base for our empirical study.

Because statistical practice in China has been experiencing some changes in line with the economic transformation from the planning system to a market-oriented economy, there are a number of issues of statistical data that should be noted. Some of them restrict the scope of our empirical study on China's industry. Data coverage and statistical classification are worthy of particular attention.

Under the current legislation, all China's industrial enterprises, regardless of their forms of ownership, are divided by a particular status criterion, independent accounting or non-independent accounting. By definition, independent accounting units are those that have a separate

administrative body and independent banking status, and are financially self-accounting. In practice, independent accounting units excluded all individual and private industrial entities[17]. On the other hand, all collective enterprises below township level were regarded as non-independent accounting units. Moreover, there are some other problems in the overlapping relations between forms of ownership and divisions of independent-accounting status. For example, as can be seen in Table 4-1, for the category of "the other"(official Chinese title mainly for the joint-ownership enterprises[18]), the figures for output by independent-accounting enterprises are larger than the figure for all enterprises, including non-independent-accounting enterprises, for some years. This may imply that consistent grouping standards might have not be complied with all the time.

In the statistical series publications mentioned above, many more data, especially those of output and financial indicators, are available for independent-accounting enterprises than for non-independent-accounting enterprises. For this reason, we will have to restrict the scope of our empirical study to independent-accounting industrial enterprises only. They account for over 90% of total GVIO in China's industry in 1980, and about 75% in 1992 (Table 4-1). The coverage of our subsequent empirical study(in Part II and Part III) is fairly large. However, we should bear in mind that non-independent-accounting industrial enterprises grew far faster than

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[17] Individual household industrial enterprises began to grow in China in 1980. The status of private industrial enterprises was legalised in 1988. The difference between the two is that an individual household enterprise may be classified as a private enterprise when it has over eight employees. In 1990, the average number of employees in individual household industrial enterprises was two, and that in private industrial enterprises was about nineteen. See: SSB, TJNJ 1991, pp.134-137.

[18] They include joint state-collective, joint state-individual, joint collective-individual, joint Chinese-foreign, and foreign-owned enterprises, etc. See, Robert M. Field, "China's Industrial Performance since 1978", CQ, No. 131 (September 1992)

independent-accounting industrial enterprises over 1980-1992, as revealed by their rising share in the total GVIO in China's industry(Table 4-1). Of those non-independent-accounting enterprises, most are rural collective enterprises below the village level[19].

Table 4-1. Percentage share of independent accounting enterprises in GVIO

	All industry	State	Collective	The other
1980	91.2	97.0	71.8	135.0
1985	86.8	97.8	69.0	100.8
1988	80.0	96.1	64.1	84.8
1992	74.8	95.9	57.5	95.9

Source and note: TJNJ 1993, p.412; ZGGYJJTJNJ 1992, p.142. All in current prices. For "the other", a problem with grouping standards may have existed in original compilation.

For the statistical classification of industry by branch, there are two systems that are currently being used individually in Chinese publications. One is the old system that comprises fifteen industrial branches(left column in Table 4-2). Data of GVIO in 1980 constant prices with some financial indicators are published in ZGGYJJTJNJ up to 1990(ZGGYJJTJNJ 1991, pp.71-77). At present, price indexes that are published at branch level are still of the fifteen branches[20]. In 1985, a new system that comprises forty industrial branches(right column in Table 4-2) was introduced. As Robert M. Field notes, the new classification system is a step in Chinese statistics towards international compatibility since it provides a more detailed

[19] A comprehensive study focusing on rural collective industrial enterprises(TVEs) including those below the township level has been conducted in William Byrd and Q. Lin, eds. China's Rural Industry, Oxford: OUP, 1990.

[20] See: TJNJ 1993, p.268; and Zhongguo wujia niangjian (Price Yearbook of China) [WJNJ], various recent issues.

Table 4-2. Fixed assets under old and new systems, year-end original value, 100 mil. yuan, 1986

Branches in old system	Fixed assets	Corresponding branches in new system	Fixed assets
Metallurgical industry	998.6	Ferrous and non-ferrous metal mining(3,4), ferrous and non-ferrous metal processing(32,33)	998.5
Power	985.7	Power(23)	985.7
Coal and coke	674.5	Coal mining(1), coal processing and coking(25)	676.9
Petroleum	558.6	Petroleum extracting(2), petroleum processing(24)	558.6
Chemicals	759.5	Chemicals(26), pharmaceutical(27), rubber(29), plastics(30)	790.5
Machinery	1728.4	Metal products(34), machinery(35), transport equipment(36), electric machinery(37), electronics(38), instruments(39)	1727.1
Building materials	453.4	Building materials mining(5), building materials manufactures(31)	520.8
Forestry industry	171.7	Timber & bamboo(8), timber manufactures(17), furniture(18)	175.2
Finished food	448.6	Finished food(10), beverage(11), tobacco(12), forage(13)	438.5
Textile	606.3	Textile(14), chemical fibres(28)	606.3
Clothing	52.1	Clothing(15)	52.1
Fur and leather	35.8	Fur and leather(16)	35.8
Paper-making	106.6	Paper-making(19)	120.7
Cultural goods etc	105.4	Printing(20), cultural goods etc(21), arts & crafts(22)	105.4
Other	236.2	Salt mining(6), other minerals(7), running water(8), other(40)	129.3
Total	**7921.4**	**Total**	**7921.4**

Sources and note: ZGGYJJTJNJ 1991, pp.74-77 and 108-114. Fixed assets in the fourth column are a sum over new branches in the same set. Numbers in parenthesis indicate the sequence in the new system.

decomposition roughly corresponding to the International Standard Industrial Code[21]. The earliest date when data on the forty branches are available is 1980. Data of many financial indicators are readily available at this forty

[21] Robert M. Field, op.cit., p.580

branch level, but all value indicators for the forty branches are in current prices. To take advantage of the price indexes published for the old system of fifteen branches, we need to establish links between the branches of the old system and those of the new system. Any correspondence between the old and new systems has not been made clear, however, in official Chinese statistics. It seems plausible to establish the relationship by looking for actual equality in some indicators commonly shared by the old and new system. We looket at fixed assets of 1986[22], and the results are presented in Table 4-2. Exact or almost exact correspondence is found for eleven out of the fifteen old branches: metallurgical industry, power, coal, petroleum, machinery, forestry industry, foodstuff, textiles, clothing, furs and leather, and cultural etc articles; approximate equality seems to exist for three branches: chemicals, building materials, and paper-making; and for only one branch("other") does the equality relation break down, but this is a rather small branch(less than 3% in total fixed assets). With these equality relations, the conversion that we will use in the next chapter seems fairly sound.

Relations between branch classification and classification by major commodity group are a bit more complicated. Division by major commodity group at the primary level means into light and heavy industry, approximately equivalent to that of consumer goods and capital goods. Under the old system, there are four out of the fifteen branches that produce both consumer goods and capital goods, with the other nine exclusively belonging to either light or heavy industry. Under the new system of forty branches, sixteen exclusively belong to light industry, and twelve to heavy industry, with the other twelve

[22] The year 1986 is chosen because it is the first year when the annual Chinese statistical reports took use of the new classification system. Data of forty branches for years prior to 1986 are from a different source, i.e., the industrial general survey conducted in 1985. See below.

split between the two[23]. At the second level of division by major commodity group, light industry is divided into those using agricultural materials and those using non-agricultural materials, and heavy industry into extracting (mining), materials-producing, and finished-good processing. It is clear that sub-branch data are needed for these groupings, either at the primary level or second level. Approximation has to be made when sub-branch data are unavailable, and that is what we will do later on in the next chapter with price indexes processing.

Table 4-3. NVIO by annual reports(A.R.) and general survey(G.S.), bil. yuan

	1980		1984		1985	
	A.R.	G.S.	A.R.	G.S.	A.R.	G.S.
Total	**164.8**	**159.8**	**224.6**	**223.5**	**276.7**	**273.7**
State	131.9	130.3	172.1	172.9	205.8	203.9
Collective	32.2	28.5	50.6	48.5	67.9	66.6
Other	0.7	1.1	1.9	2.1	3.0	3.1
Light industry	67.3	64.2	89.1	86.1	108.8	106.0
Heavy industry	97.5	95.6	135.5	137.4	168.0	167.7
Large	53.3	65.0	76.0	86.4	97.8	99.3
Medium	32.0	34.2	43.7	42.6	52.9	51.6
Small	79.5	60.7	105.0	94.5	126.1	122.7

Source and note: For NVIO by annual report, see ZGGYJJTJZL 1986, p.137; for NVIO by general survey, see ZGGYJJTJNJ 1992, pp.142-45. All are in current prices and for independent-accounting industrial enterprises only.

[23] See ZGGYJJTJZL 1986, pp.126-27; ZGGYJJTJZL 1987, pp.38-45. We may also note that classification by light and heavy industry under the new system slightly enlarges the coverage of heavy industry. Measured in 1980 prices, the GVIO of heavy industry in 1985 is 41.8 billion yuan based on the old classification and 42.2 billion yuan based on the new classification, whilst GVIO of light industry changes from 41.1 to 40.7 billion yuan accordingly for the same year.

Table 4-4. Some financial indicators by annual report and general survey, bil. yuan

	1980		1985	
	A.R.	G.S.	A.R.	G.S.
Fixed assets				
State	373.0	378.3	595.6	598.4
Collective	39.7	35.9	88.9	89.4
Quota circulation fund				
State	113.6	112.4	162.3	161.2
Collective	26.1	25.1	61.6	60.1
Profit and tax				
State	90.7	92.0	133.4	132.7
Collective	14.9	13.8	31.1	31.0

Source and note: For figures from annual report, see ZGGYJJTJZL 1986, pp.177-78; for figures from general survey, see ZGGYJJTJNJ 1992, pp.103, 116, and 142. Fixed assets are year-end original value. All are for independent-accounting industrial enterprises only.

Finally, it should be pointed out that for the period 1980-1985, data sources in the ZGGYJJTJZL and ZGGYJJTJNJ are actually different. Data in ZGGYJJTJZL are all based on annual statistical reports, but data in ZGGYJJTJNJ for 1980-1985(in almost all cases for 1980 and 1985 only) are based on a nation-wide industrial general survey conducted in 1985. Results from the general survey are believed to be more reliable. The two data sources are compared in Table 4-3 and 4-4. Differences in some cases are quite substantial. Generally speaking, the net value of industrial output is over-estimated in annual reports compared to that in the general survey, and this is particularly true for small enterprises. It may not be the case that small enterprises overstated their NVIO, but rather that some of the small enterprises changed their status of size in the general survey. For financial

indicators listed in Table 4-4, we only have figures on state and collective ownerships, and it is found that problems of over-estimation and under-estimation both exist. Also because the ZGGYJJTJZL provides much less detailed data of different categories compared to the ZGGYJJTJNJ, we abandon attempts to construct, by using data in ZGGYJJTJZL, time series for the missing years in 1980-1985 in ZGGYJJTJNJ. Only in a few cases(e.g., estimating time series of capital stock) do we have to refer to the ZGGYJJTJZL.

Chapter Five

Output and Input Growth in China's Industry: 1980-1992

Obtaining reliable output and input series is important for studying productivity change. As we will show in the summary of TFP studies on post-reform China's industry in the next chapter, a good deal of disagreement among researchers occurs concerning how to measure the output and input growth in China's industry. There are several questions that have been raised: (i) which price deflator should be used to obtain output series in constant prices; (ii) should factor inputs be subject to the elimination of "non-productive" elements and to what extent should such elimination apply; (iii) which price deflator should be used to obtain fixed capital input series in constant prices; (iv) in recognition of the explosive growth in the use of circulating capital by post-reform China's industrial enterprises, should this form of capital input be taken into account when measuring capital input series and total factor productivity; (v) in attempting to assign or estimate relative weights to labour and capital regarding their contributions to output growth, should we consider the changes in factor distribution of post-reform China's industrial output.

In this chapter we intend to reply to these questions by trying to construct output and input series for China's industry over 1980-1992. What we are particularly interested in is to establish some consistent base for

sectoral output and input series within China's industry. Sectors in which we are interested, and where data are available from official Chinese statistics are: divisions by form of ownership, state, collective and joint-ownership; by type of activity, light industry and heavy industry(including mining, materials-producing and finished-goods processing); and by size of enterprise, large-scale, medium-scale and small enterprises. The results of these sectoral series will be used as a compatible base for our comparative study of productivity change in the next chapter.

A tabulated summary of our estimates of output and input growth for these various sectors in China's industry over 1980-1992 is attached in the appendix to this chapter(Tables A5-1 to A5-12).

I. Output Growth in China's Industry

Current Chinese statistics provide three series for industrial output: the gross value of industrial output(GVIO), the value added of industrial output(VAIO) and the net value of industrial output(NVIO). GVIO is VAIO plus intermediate input, VAIO is NVIO plus depreciation charges, and NVIO is the sum of factor incomes (e.g., the earnings of labour and non-labour remuneration). Most of the previous studies on TFP in China's industry have tended to use GVIO(see the next chapter) and main reason for this is that data for GVIO have been relatively accessible in official Chinese statistics compared to VAIO or NVIO.

To choose between VAIO and NVIO, both now available in recent official Chinese statistics, we encounter a problem which appeared in the 1992 data-set. In 1992, the scope of VAIO in China's industry changed and rendered the VAIO in 1992 incompatible with previous series. As shown in Table 5-1, the difference between VAIO and NVIO in 1992 became negative for light industry

and the processing sector of heavy industry, which would on the face of it imply that there were negative depreciation charges in the year(perhaps for this reason actual depreciation charges are not published in the TJNJ 1993 or ZGGYJJTJNJ 1993). It is fair to say, however, that the NVIO series published in ZGGYJJTJNJ seems set to remain on a statistically consistent basis. For this reason we will mainly use NVIO in the present study.

Table 5-1. VAIO and NVIO in 1992, 100 mil yuan

	VAIO 1992	NVIO 1992	VAIO - NVIO 1992	Depreciation charges in 1991
Whole industry	7665.5	7447.0	218.5	795.2
Light industry	2907.6	3068.1	-160.5	249.9
Heavy industry	4757.9	4378.9	379.0	545.3
Mining	827.3	661.8	165.5	105.5
Materials	1935.9	1651.8	284.1	252.8
Processing	1994.7	2065.2	-70.5	187.1

Source and note: TJNJ 1993, p.417. Depreciation charges in 1991 from ZGGYJJTJNJ 1992, pp.168-170. Depreciation charges in 1992 are not reported in TJNJ 1993 or ZGGYJJTJNJ 1993. All are in current prices.

There seem to be some adjustments that may be made to the existing data of NVIO in China's industry. First, an adjustment to the commodity value. Because NVIO is derived from the GVIO, it by definition also includes self-consumption products and incomplete or unsold products. To eliminate these elements, an adjustment can be made by applying the ratio of revenue from industrial sales to GVIO. As can be seen from Table 5-2, this ratio had some obvious fluctuations over the period of 1980-1992, especially in 1988-1989.

Another adjustment that we suggest for NVIO is to include depreciation charges drawn on non-productive fixed assets. This adjustment is considered necessary when deducting the non-productive element, such as housing, from existing fixed assets. This deduction has been advocated by some authors when measuring capital input growth in China's industry[1]. Part of reason for this is to reconcile the Chinese statistics of fixed assets with international standards since in most market economies this kind of non-productive element would usually be submerged under compensation to employees. However, to be consistent with the deduction, depreciation charges drawn on the non-productive element should be added to existing NVIO, i.e, no longer be treated as part of VAIO. As we will show later in Sec. IV, the depreciation charges drawn on the non-productive element should also be included in labour income. The impact of the non-productive fixed assets on NVIO growth, capital growth, and labour income growth is considered significant, as the ratio of this non-productive element to total fixed assets has increased in the post-reform period, especially in 1980-1987(Table 5-2).

Table 5-2. Adjustment indicators

	Industrial sales as a % of GVIO	Non-productive as a % in total fixed assets
1980	94.0	15.9
1985	93.7	17.2
1986	95.0	18.0
1987	95.7	18.9
1988	96.0	18.4
1989	90.7	18.2
1990	89.9	18.0
1991	93.3	18.2
1992	93.3	17.7

Source and note: ZGGYJJTJNJ 1993, pp.103, 129, and 142. For independent-accounting industrial enterprises only.

[1] See particularly Kuan Chen, et al, "New Estimates of Fixed Investment and Capital Stock for Chinese State Industry", CQ, No. 114 (June 1988).

Table A5-1 lists a series of NVIO, by sector, adjusted to commodity value and increased by depreciation charges on the non-productive fixed assets. The series in this table are still in current prices and so the next stage is to convert them into a constant price base.

The issue of which index of price deflators to use(i.e., that of GVIO, VAIO, or NVIO, provided in official Chinese statistics) to obtain output series in constant or comparable prices has become controversial. In one study, price deflators for VAIO are derived from the price index of GVIO adjusted to the price index of material consumption[2]. This method has however been criticised by others, who argue that price index derived in this way would be inadequate to deflate output series[3]. A crucial point in the debate, to our understanding, is how to treat the concept of net output with regard to the impact of relative changes in output prices and input(material consumption) prices.

There seems to be no disagreement about the difference between net output(VAIO or NVIO) and gross output(GVIO) in current prices, i.e., the net output(NV) in current prices(ignoring the difference between VAIO and NVIO) is the gross output(GV) in current prices minus intermediate inputs(MT) in current prices. Disagreement can occur however when applying the price indexes of gross output and intermediate inputs differently to obtain the net output in constant prices:

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[2] See Gary Jefferson, Thomas Rawski, and Yuxin Zheng, "Growth, Efficiency and Convergence in China's State and Collective Industry", Economic Development and Cultural Change, Vol. 40, No. 2 (1992)

[3] See, Wing Thye Woo, Wen Hai, Yibiao Jin and Gang Fan, "How Successful Has Chinese Enterprise Reform Been? Pitfalls in Opposite Biases and Focus", JCE, Vol. 18, No. 3, 1994. Their criticism of Jefferson, et al, ibid, has also been documented in a Chinese journal, Economic Research, April 1994. The counter-criticism by Jefferson, et al, appears in the same journal, October 1994.

A. NV(constant) = GV(constant) - MT(constant)

B. NV(constant) = (GV - MT)(constant)

Method A means that the constant net output is the difference between constant gross output and constant intermediate inputs, and Method B means that the constant net output is the difference between current gross output and current intermediate inputs when deflated by a gross output price index. The first method is that which has been used and defended by Jefferson et al. If the main concern is the analysis of technological progress, this Method A seems more appropriate than Method B because it eliminates the impact of price change in intermediate inputs on the growth of net output. However, if the main concern is productivity change or change in actual gains, the second method seems more appropriate because for this purpose the impact of any price changes in intermediate inputs on the growth of net output can no longer be disregarded. A faster rise in prices of intermediate inputs than in prices of gross output would render the net output as a diminishing series, and while this certainly affects any producer gains it may have nothing to do with technological change. Since our purpose here is productivity change rather than technological progress, we shall use the second method in the present study.

Because there are some disparities in the various price indexes for industrial output in post-reform China (Table 5-3), the results of using the different price deflating methods and price indexes would be more or less variable. There are two main reasons for us to use the producer price index(PPI), rather than the price index of NVIO or GVIO, in the present study. First, the price index of NVIO or GVIO is the aggregate price index for the whole of China's industry, and the PPI is considered closer to being specially applicable to the independent-accounting enterprises. Second, sectoral PPIs

Table 5-3. Index of price deflators, previous year = 100.00

	NVIO	VAIO	GVIO	PPI
1979	101.28	101.31	101.54	101.5
1980	99.92	100.10	100.74	100.5
1981	100.29	100.88	100.45	100.2
1982	99.88	99.77	99.82	99.8
1983	99.86	100.15	99.99	99.9
1984	102.52	102.18	101.37	101.4
1985	105.08	104.61	105.07	108.7
1986	103.07	104.95	103.14	103.8
1987	105.56	102.12	104.84	107.9
1988	108.24	109.26	109.22	115.0
1989	108.71	106.79	111.35	118.6
1990	100.39	102.29	100.80	104.1
1991	103.31	103.62	103.12	106.2
1992	104.85	103.93	102.91	106.8

Source and note: TJNJ 1993, pp.33, 35, 50, 52, 57, 59, and 268. All of these series are for the entire China's industry, i.e, including independent-accounting enterprises and non-independent-accounting enterprises. PPI is the producer price index based on surveys of selected major enterprises that are presumably from independent-accounting enterprises.

are now available in official Chinese statistics which are regarded as being particularly valuable for our study at sector or sub-sector level in post-reform China's industry.

Based on these data, we are able to construct approximate price deflators for various divisions of industrial output. These divisions that we refer to are listed on p.118. Attempts to construct price deflators for sub-sectors in light industry, i.e., those that uses agricultural materials and

those that uses non-agricultural materials, are abandoned because it is felt that with the data classified in the old system of classification, forced manipulation would be subject to a large degree of error.

The procedure we follow is as follows:

(1) Construct price deflators for heavy industry and its three sub-sectors for 1980-1987, and similarly for light industry for the same period, based on the PPIs of 14 branches. Referring to the old system as shown in Table 4-2, coal, petroleum, and forestry industry are regarded as mining branches; metallurgical industry, power, and building materials as material-producing branches; chemicals and machinery as finished-goods-processing branches; the remaining 6 as light industry branches. The regrouping of these branch seems the best way of achieving our purpose of maximally using sectoral PPIs in existing official Chinese statistics. With the branches-into-sector grouping, shares of the branches in GVIO in 1980 prices are taken as their weights in deriving the price indexes of the groups(sectors). Data of the shares are from the ZGGYJJTJNJ 1991, pp.72-73.

(2) Having obtained the price indexes of light and heavy industry, one way to obtain the price indexes for categories by form of ownership and that by size of enterprise may be to apply these price indexes to those categories(divisions) using the composition of output between light and heavy industry in these categories as a weight, i.e., $p(i) = p(l)*q(l) + p(h)*q(h)$, where $p(i)$ is the price index to be derived for a sector classified by form of ownership or size of enterprise, $p(l)$ and $p(h)$ are the price index that have already been obtained for light and heavy industry respectively, and $q(l)$ and $q(h)$ are the percentage share of light and heavy industry in the sector's output(the sum of the shares is 100).

There are however certain difficulties obtaining such information particularly for the whole period. Assumptions have to be made. Table 5-4

Table 5-4. Light industry as % of GVIO, current prices, independent-accounting enterprises

	State	Collective	Joint-ownership
1985	43.5	60.2	60.1
1988	40.4	71.7	
1990	40.9	59.3	
1992	36.7	56.0	

Source and note: ZGGYJJTJZL 1986; TJNJ 1991, and 1993. No direct figures are available for the output compositions in individual GVIO by the forms of ownership. They are obtained by using several finance indicators such as fixed assets and ratio of fixed assets to GVIO(for 1985 and 1990), profit and tax and ratio of profit and tax to GVIO(for 1992). For 1988, 1990 and 1992, figures for non-state(collective and joint-ownership) are obtained after that for state.

shows that the composition of light and heavy industrial output was quite different for state and non-state industry. We therefore assume a constant ratio of output composition respectively for state(60% heavy industry and 40% light industry) and non-state industry(40%:60%).

For categories by size of enterprise, data of the composition of output between light and heavy industry are not directly available either. Table 5-5 presents the results of our attempts. Corresponding figures prior to 1988 cannot be found. Based on the results, approximate ratios of heavy-to-light industry for three categories by size of enterprise are used to derive the price deflators for these categories: 70%:30% for large-scale industry, 55%:45% for medium-scale industry, and 45%:55% for small industry.

(3) Table A5-2 and A5-3 list our estimates of PPIs for various categories of output(annual and cumulative series respectively).

Table 5-5. Heavy industry as % of GVIO, by size of enterprise

	Large-scale	Medium-scale	Small-scale
1988	74.6	54.8	44.9
1990	73.4	51.6	43.8

Source and note: ZGGYJJTJNJ 1989, pp.361-68; ZGGYJJTJNJ 1991, pp.369-77. The figures are obtained using 40 branch data of grouped GVIO by the level of fixed assets at original value. As we have indicated earlier, of the 40 branches, 12 exclusively belong to heavy industry with another 12 producing both heavy and light industry goods. For these 12 branches, we classify their status by looking at the shares of heavy industry products in branch GVIO using 1986 data(see ZGGYJJTJZL 1987, pp.38-45). For example, building materials production is identified as a heavy industry branch because of its GVIO the proportion taken by heavy industry is over 80% in that year, whilst metal finished goods is treated as a light industry branch because the proportion is only about 40%, i.e., less than a half. Nine divisions are listed for groups by size of enterprise, from a bottom level of less than 100 thousand yuan fixed assets to a top level of over 100 million yuan fixed assets. The top three divisions are taken as large-scale enterprises, the middle two as medium-scale, and the last four as small enterprises. This however would be somewhat different from the criterion of enterprise size that has been used in compiling data. For the prescribed criterion of enterprise size, see Chen Shenchan, 'Qiye guimu jiegou he qiye zhuzi jiegou tuize' (Structure in Size of Enterprises and Policy towards Enterprises' Organizational Structure),in Sun Shangqing, ed. Leng jingji jiegou duize (On Policy towards Economic Structure), Beijing: Zhongguo shehui kexue chubanshe, 1984.

II. Labour and Capital Growth in China's Industry

1. Labour

When dealing with labour input, a more customary practice would take into account variables such as: the yearly average number of employees, including full-time and part-time employees; the average working hours per week and

average working weeks per year per employee; and the average quality of labour employment as defined by the educational or working experience of a typical employee[4]. Due to the limits of data availability, we can only use the yearly average number of employees as an indicator of labour input in China's industry in the present study.

A question that has been raised is whether we should adjust the labour employment to reflec only the productive element, i.e., excluding those employees working on housing, schooling, medical care, etc. Several authors have applied the ratio of the non-productive element obtained in fixed assets to labour employment[5]. This is in principle similar to Solow's approach of using the unemployment rate to deflate the existing capital stock[6]. The essence of the approach seems unquestionable as it is based on a two-way relationship between capital and labour(i.e., if labour suffers or changes in use, capital must have suffered or changed in use as well, and vice versa). It is clear that, if the purpose of analysis is to measure technological progress, it is deemed necessary to eliminate any non-productive or unused(idle) elements from the existing labour and capital stock series as much as possible. However, since our purpose here is to measure productivity which we have shown conceptually is different from technological progress, this premise is not warranted: workers working on non-productive activities are still part of employment and entitled to compensation or remuneration, therefore affecting the productivity measured in the total labour employment

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[4] Some other relevant factors may be easily added to this list if data required are available, for example, age and sex of employees(See E.F. Denison, Why Growth Rates Differ, Washington, D.C.: the Brookings Institution, 1967).

[5] See Kuan Chen et al, "Productivity Change in Chinese Industry", JCE, Vol. 12, No. 4 (1988). Also see Jefferson, et al, op.cit.

[6] R.M. Solow, "Technical Change and the Aggregate Production Function", AER, Vol. 52, 1957

base. For this reason, we shall continue to use total employment figures without adjusting to exclude the non-productive elements.

Yearly-average numbers of labour employment for various sectors are listed in Table A5-4.

2. Capital input

Chinese statistics of the fixed capital stock in industry provide two series: fixed assets at their original value(i.e., at purchase costs) and at net value(net of depreciation charges etc). Both are in current prices and include those that were built for non-productive purposes, such as housing and schooling, etc. Several authors have pointed out that the inclusion of non-productive fixed assets is not compatible with international accounting practice, and would generate an untrue trend for capital stock in industry over the period when reforms exerted a great influence on the allocation of fixed assets among productive and non-productive purposes[7]. To our understanding, the removal of the non-productive element from the existing capital stock can be justified in two ways: first, it clarifies the productive base for analysis of technological progress; second, in essence non-productive fixed assets are part of compensation or remuneration to labour, i.e., a form of labour workers' long-term consumption. The second perception seems closer to our purpose of productivity analysis here, and we will follow a coherent treatment of the term: removing it from existing fixed assets(below in this section) and adding the depreciation charges drawn on it to labour income(later in the next section).

In addition, it has been found that during the post-reform period

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[7] See Kuan Chen, G.H. Jefferson, T.G. Rawski, H. Wang and Y. Zheng, "New Estimates of Fixed Investment and Capital Stock for Chinese State Industry", CQ, No. 114 (June 1988)

industrial enterprises in China increased their use of circulating capital considerably. It seems that we should also take this issue into account when attempting to measure capital growth.

Our tasks in this section are therefore (i) to remove the non-productive element from existing fixed assets; (ii) to give an explicit treatment of circulating capital; and (iii) to find appropriate price indexes for fixed assets and circulating capital, respectively.

A. Fixed Assets

For this part, our procedure runs in three steps: (i) to remove non-productive elements from the existing series of fixed assets in net value in current prices; (ii) to work out annual increments of fixed assets for productive purposes in net value in current prices; (iii) to find price deflators and apply them to the annual increments of fixed assets, and finally obtain a series of fixed assets for productive purposes in constant prices for 1980-1992.

The first step is a straightforward application of proportion figures, i.e., those of productive fixed assets as a percentage in total fixed assets. These figures are obtained from the fixed assets of original value and then applied to the fixed assets of net value. The results are presented in Table A5-5. Because the differences between productive and non-productive fixed assets were mainly composed of depreciation charges and both kinds of fixed assets were subject to the same rate of depreciation charges[8], this method is justifiable.

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[8] See the Statistics Department of the Shanghai Institute of Finance and Economics, Gongye tongjixue (Industrial Statistics), Shanghai: Zishi Press, 1984, p.48. This book contains near-official explanatory notes on Chinese statistical terms.

To obtain an annual increment of fixed assets we may apply a formula:

$$K_t = K_{t-1} + I_t - S_t \qquad (1)^9$$

where K denotes fixed assets of year-end original value, I increment of fixed assets, and S decommissioned or scrapped fixed assets. If S_t is omitted, I_t is the difference between K_t and K_{t-1}, which may be called the net increment of fixed assets(still net in gross terms, not in net terms, because the base is not yet subject to depreciation). When S_t is taken into account, what I_t measures may be called the gross increment of fixed assets, which is of course larger than the net increment of fixed assets. To be accurate we should take the term of gross increment of fixed assets. Since S_t is not available, we should look for an alternative. This may be referred to as that expressed in the formulation for fixed assets of net value:

$$NK_t = NK_{t-1} + I_t - D_t - S_t \qquad (2)$$

where NK denotes fixed assets of year-end net value, D depreciation charges; both I and S have the same meaning as in (1) but they differ with their counterparts in degree. In formula (1), I_t and S_t are both measured in their original value, but in (2) they are in net value, i.e., a term after depreciation charges. Therefore, S_t in (2) would be much less than its counterpart in (1) because it represents those fixed assets that are towards their end of physical life. Similarly, I_t in (2) would be smaller than I_t in (1) because even the newly-added fixed assets in the current period are also subject to depreciation charges. Based on these differences, we may plausibly

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[9] In Kuan Chen, et al, op.cit, S_t is not included but this is incorrect. For the definition of changes in fixed assets of original value, see Gongye tongjixue, ibid, p.250

hold that S_t in (1) cannot be assumed away but S_t in (2) may, and I_t that is derived from (2), even without counting S_t, would be approximately equal to I_t in (1), the true increment of fixed assets in the current period.

Statistical results confirm the differences, as shown in Table 5-6. It can be seen that, except for 1991, use of formula (1) understates the annual increment of fixed assets compared to that from use of formula (2). Some reasons for series II being smaller than series I in 1991 may be that S_t as defined in (1) was small in that year or that reported depreciation charges were understated, or both.

We shall therefore use formula (2) to derive an annual increment of fixed assets in China's industry. The reliability of results from the use of the formula is however particularly dependent on the accuracy of reported depreciation charges, among other things. ZGGYJJTJNJ reported depreciation charges together with the depreciation rate for all categories of industry up to 1991. However, the figures of 1992 are not, curiously enough, available in either TJNJ 1993 or ZGGYJJTJNJ 1993. We therefore have to make our own estimates for 1992[10].

Table A5-6 reports our estimate of the annual increment of productive fixed assets by using formula (2). To be consistent with the elimination of non-productive elements, depreciation charges that are used there are all discounted by the same ratios that are used to obtain productive fixed assets in Table A5-5.

Now the next thing to do is to find appropriate price deflators for the fixed assets. We refer to the price deflators for fixed asset investment. However, compilation of the price deflators for fixed asset investment started only recently in China and the results are first published in TJNJ 1993, and

[10] What we do in this case is to assume that the depreciation rates in various sectors remain basically the same as the level of previous year and apply the rates on the year-end original value of fixed assets.

Table 5-6. Annual increment of fixed assets, 100 million yuan in current prices

	Series I	Series II	I minus II
1986	995.8	1054.3	-58.5
1987	1236.8	1348.4	-111.5
1988	1482.9	1573.7	-90.8
1989	1832.8	1914.5	-81.7
1990	1916.0	2045.0	-129.0
1991	2766.3	2676.0	90.3

Source and note: ZGGYJJTJNJ 1992, p.103. Series I uses the formula $I_t = K_t - K_{t-1}$; and series II uses the formula $I_t = NK_t - NK_{t-1} + D_t$. The figures are for all independent-accounting industrial enterprises and including non-productive fixed assets(same for D_t).

only for 1991 and 1992. They are based on individual price deflators of three components of investment: construction and equipment installation, equipment and apparatus, and miscellaneous. It seems plausible to follow this procedure to work out the price deflators for previous years, back to 1980. We have implicit price deflators for the construction sector and the producer price index for the machinery industry, which may be taken as analogous to the price deflators for construction and equipment installation in investment and the price deflators for equipment and apparatus in investment, respectively. As shown in Table 5-7, however, both of the IPDs and the PPIs are lower than their counterparts in investment. For equipment and apparatus, the gaps may be caused by import prices, as China's industry used more imported equipment and apparatus in the post-reform period. By "import prices", we mainly mean the effects of devaluation of RMB over the period. From 1980 to 1992, the exchange rate of RMB against the US dollar in commodity trade fell by 11.4% annually. To use the analogous price deflators, some adjustments are

necessary.

Table 5-7. Investment price indexes, previous year = 100.0

	Construction		Equipment or Machinery	
	Investment PD	IPD	Investment PD	PPI
1991	109.7	108.4	106.1	102.8
1992	116.8	114.5	109.4	106.6

Source and note: TJNJ 1993; for investment price deflator(PD), p.269; for implicit price deflator(IPD) for construction sector, pp.50-51; for the producer price index, p.268.

We take a short-cut by simply assuming a constant difference existing between the IPDs or PPIs and their counterparts in investment. For construction and equipment installation, the difference is set to one percentage point; and for equipment and apparatus, it is set to three percentage-points. As we have found no way to obtain price deflators or their analogues for the miscellaneous part in investment, we have to leave that aside.

By applying the price deflators listed in Table 5-8, we obtain newly-added industrial fixed assets for productive purposes in constant prices listed in Table A5-7. Based on these results, productive fixed assets of year-end net value in constant prices can be obtained by using formula (2). Here, however, I_t has become a series in constant prices and D_t is for depreciation charges on productive fixed assets only. The estimates are reported in Table A5-8.

B. Circulating Capital

There are basically two reasons for us to consider the issue of the growth of

Table 5-8. Price deflators for fixed assets, previous year = 100.00

1981	103.44	1987	108.96
1982	103.51	1988	114.79
1983	104.67	1989	113.16
1984	106.01	1990	107.30
1985	111.42	1991	109.5
1986	108.34	1992	115.3

Source and note: The figures are the results of summing up adjusted implicit price deflators for construction and adjusted producers price indexes for machinery industry weighted by the shares of construction and equipment in total investment respectively. For the IPDs and PPIs, see Table 3-9; for adjustment, see the text; for the weights, see SSB, Zhongguo gudin zican touzi tongji ziliao (Statistical Data of China's Fixed Asset Investment) [ZGGDZCTZZL], consecutive issues since 1985. The last two years are directly from TJNJ 1993, p.269.

circulating capital and its role in post-reform China's industry. First, post-reform China's industrial enterprises tended to use more circulating capital in addition to their use of fixed capital. The ratio of circulating capital to fixed assets has risen considerably since the mid-1980s: from 48% in 1985 to 56% in 1992(this is a measurement of the quota of circulating capital only and for independent-accounting enterprises only(ZGGYJJTJNJ 1993, pp.103 and 116); a much higher change in the ratio is found when including the non-quota circulating capital: from 70% to 110% (Table A5-9)).

Second, an important factor that has contributed to the accelerating use of circulating capital is that industrial enterprises in post-reform China, facing financial constraints on expanding their investment in fixed assets, have been actually able, in one way or another, to use circulating capital to invest in fixed assets, albeit that the actual amount of such use

was hardly apparent to observers[11]. Statistics of fixed assets may not be able therefore to reflect fully changes in investment in fixed assets or fixed asset stock.

Table 5-9. Yearly-average balances of full circulating capital, 100 million yuan, 1992

	TJNJ figures	Our estimates	Difference
State	10096.4	10343.0	246.6
Collective	4058.0	4247.5	189.6
Joint-ownership	1338.7	1381.3	42.6
Light industry	6932.2	7280.6	348.4
Heavy industry	8560.9	8702.6	141.5
Large	5381.7	5493.2	111.6
Medium	3584.9	3692.7	107.8
Small	6526.5	6798.5	272.0

Source and note: All are for independent-accounting industrial enterprises only. TJNJ 1993, p.425; our estimates are based on figures in ZGGYJJTJNJ 1993, pp.116-119. The difference is Column Two minus Column One.

A characteristic of the use of circulating capital in post-reform China's industry is that the non-quota circulating capital increased far

[11] According to a provincial survey, there was 100 million yuan of circulating capital used on investment in fixed assets in 1985(See Wu Jinliang and Hu Ji, eds. Zhongguo jingjide dongtai fenxi he duize yanjiu (Studies on Chinese Economic Movements and Counter-policies), Beijing: Zhongguo renmin daixue chubanshe, 1989, p.108). This is about 3% of all circulating capital used by independent-accounting Chinese industrial enterprises in that year. Not coincidentally, in the "Ten Prohibitions" regarding the use of circulating capital, set in 1984 by the Commercial and Industrial Bank of China, a body regulating and allocating circulating capital for Chinese industry, number one is that no circulating capital should be used to conduct basic construction (see the People's Bank of China: Zhongguo jingrong nianjian (Almanac of China's Finance and Banking), Beijing: Zhongguo jingrong chubanshe, 1986, VI-43.

faster than the quota circulating capital. Our task here is therefore to estimate the growth of full circulating capital at yearly-average balances including both the quota and non-quota circulating capital, as official Chinese statistics do not provide the yearly-average full circulating capital prior to 1992. Available in the statistics are three series: (i) year-end balances of full circulating capital; (ii) year-end balances of quota circulating capital; and (iii) yearly-average balances of quota circulating capital. Our procedure is to obtain the ratio of the first two series and multiply it by the third series. The validity of this procedure can be checked by comparing the data of 1992 which is the first year when data of yearly-average full circulating capital are available(Table 5-9).

As Table 5-9 reveals, results based on our procedure over-estimate somewhat the full circulating capital for 1992, ranging from less than 2%(heavy industry) to 5%(light industry). However, because this procedure is actually used for years before 1992, our results might nevertheless under-estimate the true increasing trend of full circulating capital over the period.

The series showing our estimate of full circulating capital in current prices are listed in Table A5-9. They should of course be deflated by an appropriate price index. Conceptually, a price index for circulating capital should be a weighted sum of the price indexes of intermediate inputs and output since circulating capital is used for inventories of intermediate inputs and output. According to a survey, China's industrial enterprises tended to use about 55% of circulating capital on intermediate inputs and 45% on output inventory[12]. As we pointed out above, industrial enterprises in

[12] See, Yang Xitian, "Gongye qiye zhijing xiangchuang he xingdai diaozhen duize" (The Status Quo Capital Situation in Industrial Enterprises and Adjustment Policy towards Lending), in Zhongguo de jingrong kaige he hebi chenzhe (Financial Reforms and Monetary Policy in China), ed. by Shen Boliang, Beijing: Jingji guanli chubanshe, 1992, p.355

post-reform China have also used circulating capital to invest in fixed assets, so the price index of fixed assets should be taken into account as well, though to a much smaller degree. The weights we assign to intermediate inputs, output and fixed assets are accordingly: 50%, 40%, and 10%, respectively. We have already obtained the price index of output(i.e., PPIs in Table A5-2) and that of fixed assets(Table 5-8). The price index of intermediate inputs that has been published for China's industry elsewhere is considered suitable for our use[13]. The results are presented in Table 5-10. Based on these results, a series showing full circulating capital in constant prices are obtained and reported in Table A5-10.

Table 5-10. Price deflators for circulating capital, 1980=100.00

	Annual	Cumulative		Annual	Cumulative
1981	103.36	103.36	1987	109.45	148.43
1982	101.65	105.07	1988	117.31	174.12
1983	102.71	107.91	1989	121.29	211.19
1984	103.62	111.82	1990	105.26	222.30
1985	113.29	126.68	1991	108.00	240.08
1986	107.05	135.61	1992	109.02	261.74

Source and note: See the text.

[13] The price index published in the State Price Bureau: Wujia nianjian(Price Yearbook of China)[WJNJ], 1991, pp.538-39); and Zhongguo jingji nianjian (Almanac of China's Economy(recent issues since 1991) is (previous year = 100.0):

1985	118.0(to 1980)	1989	126.4
1986	109.5	1990	105.6
1987	111.0	1991	109.1
1988	120.2	1992	111.0

For the missing years of 1981-1984, we use the PPI of heavy industry and the procurement price index of agricultural products (weighted 0.8 and 0.2, respectively) to derive the price index of industrial intermediate inputs.

III. Labour and Capital Shares in Output

There are two reasons for us to measure the labour and capital shares in output in post-reform China's industry: first, considerable changes have occurred to the factor distribution of output over the period; second, to avoid arbitrariness in assigning weights to the labour and capital contribution to output growth, when measuring total factor productivity. As we will show in the next chapter, previous studies of TFP in China's industry often relied on some assumptions about the respective weights because of the lack of reliable estimates. Any estimation of factor shares indeed encounters a number of financial complications arising from Chinese statistical and accounting practice. Our elaboration here can be regarded as part of a clarification made of existing Chinese statistical data. Though the results of the work are still preliminary in nature, they may represent a significant step towards the development of empirical investigation of the issue.

Major financial complications concerning labour and capital income in Chinese statistics are associated with the terms wage and profit. Below are some illustrations of the issue.

First, wages bills in Chinese statistics are smaller than labour income. There will have been some payments to labour that were not included in wage bills. Most notable of these are bonuses and employees' welfare benefits. Enterprise reform legislation since 1980 stipulated that bonuses and employees' welfare benefits cannot be included on wage bills if they exceed a certain limit of the existing total wage bills of an enterprise, 30% for bonuses and 10% for welfare benefits. The additional bonuses and welfare benefits, i.e., those that cannot be discharged as a cost item, could therefore only be delivered from retained profits. Therefore, a complete

estimate of labour income would take into account any distribution of retained profits. In addition, as we pointed out earlier, under the current economic system, there has been a section of the total payments to labour that exists in the form of depreciation charges on non-productive fixed assets such as housing and schooling etc. Most important as evidence is the fact that depreciation charges on non-productive fixed assets increased faster than wage bills in 1980-1992(Table 5-11). This makes it imperative to include the depreciation charges on non-productive fixed assets as part of labour income.

Table 5-11. Wage bills and depreciation charges on non-productive fixed assets, 100 million yuan in current prices

	State enterprise		Collective enterprise	
	I	II	I	II
1980	275.5	21.3	84.6	2.4
1985	459.7	43.4	159.9	7.0
1988	792.3	72.0	253.4	17.4
1990	1031.2	89.0	304.3	24.6
1991	1151.4	102.2	341.6	28.1
1992	1335.9	121.1	379.8	36.6

Source and note: Column I is total wage bills, for all enterprises including non-independent-accounting enterprises, see TJNJ 1993, pp.126 and 128; Column II is depreciation charges on non-productive fixed assets, for independent-accounting enterprises only, see ZGGYJJTJNJ 1992, p.103. For 1992 depreciation charges on non-productive fixed assets, see note to Table 3-8.

Likewise, profits in Chinese statistics are not exactly a term equal to payment for capital use. This may be illustrated by one of its components, retained profits. According to the profit retention system that was introduced in 1979-1980, enterprises were obliged to allocate their retained profits

between remuneration to employees and production development, and to give priority to production development. In reality, however, enterprises tended to spend more of their retained profits on remuneration to employees such as

Table 5-12. Distribution of retained profits

	Retained profits(100 million yuan)	% of total retained profits		
		Production fund	Energy fund	The rest
1980	69.2	17.9		82.1
1981	84.9	12.3		87.7
1982	112.0	34.5		65.5
1983	154.3	24.7	10.0	65.3
1984	188.4	23.4	15.0	61.6
1985	240.5	38.6	15.0	46.4
1986	252.1	30.9	15.0	54.1
1987	274.9	44.1	15.0	40.9
1988	336.3	31.7	15.0	53.3

Source and note: The State Economic System Reform Commission, ed., Zhongguo qiye kaige shinian (The First Decade of Enterprise Reform in China), Beijing: Kaige chubanshe, 1990, p.646. The figures are for state in-budget industrial enterprises. The energy fund has had a fixed rate since it was introduced in 1983.

increases in bonuses and welfare benefits in addition to those that were disbursed under cost expenditures. As shown in Table 5-12, in the early years when the profit retention system was introduced, little of the retained profits were allocated for production development. In recognition of the problem, the state introduced a quasi-tax on retained profits, e.g, the energy fund in 1983. The state also used some other measures, and enterprises were forced to reduce payment of bonuses and welfare benefits from retained

profits. Nevertheless, these items as payment to employees were maintained at a high level. Another comprehensive survey reveals that from 1979 to 1988, about 55% of the total retained profits in China's industry as a whole were discharged in bonuses and staff welfare[14].

Another complication of profits in China's industry is that the difference between reported gross profits and the residual of output after subtracting costs became wider over the period(Table 5-13). The major components of revenue from industrial sales in China are total costs, product tax, and profits on sales. The total costs include the purchase of intermediate inputs, depreciation charges, wage bills, and part of any interest charges[15], etc. The product tax had a unique importance in China's industry, so that it has been always separately listed. Profits on industrial sales are the residual of the revenue of industrial sales after subtracting the total costs and the product tax. On the other hand, the reported gross profits are, by definition, the profits on industrial sales adjusted by the balance of non-operation revenue and non-business outlay. The difference between profits on industrial sales and reported gross profits is small when the non-operation balances are small. As can be seen from Table 5-13, the difference was indeed small in 1980. But since 1988, the difference has become substantial. Except for the inference that the increase of this difference must have been caused by an accelerating non-operation outlay, little is known about any details of this non-operation outlay, e.g., how much went to employees.

In the light of the above argument, it seems that directly measuring capital income would be more difficult than measuring labour. We therefore

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[14] See the same source to Table 5-12, p.264.

[15] The current Chinese practice is that interest payments on circulating capital loans are debited from the cost account, and interest payments on basic construction and some other loans are from the profit account instead.

Table 5-13. Profits in China's industry, 100 million yuan

	Total sales	Total costs	Product tax	Profits on sales	Reported gross profits
1980	4418.7	3304.2	364.1	750.4	701.1
1985	7899.3	6113.7	713.1	1072.5	929.4
1987	10890.1	8839.0	888.4	1162.7	1005.0
1988	14001.2	11267.6	1098.9	1634.7	1189.9
1989	15847.0	13065.9	1275.1	1506.0	1000.3
1990	16793.1	14219.8	1386.2	1187.3	559.8
1991	20597.5	17356.6	1590.5	1650.3	642.8
1992	25866.3	21565.7	1827.7	2473.0	972.4

Source and note: ZGGYJJTJNJ 1993, pp.129. Profits on sales are total sales minus total costs and product tax. See the text for detailed definitions of profits on industrial sales and reported gross profits, and explanation on the difference between the two terms.

attempt to measure labour income in the first instance. We have identified three major components of labour income in China's industry: wage bills, depreciation charges on non-productive fixed assets, and the part of retained profits that is spent on employees. Subtracting these items from NVIO, we may obtain the part of the net output which is due to capital, which includes the product tax, part of retained profits for non-labour use, as well as miscellaneous items submerged under the non-operation outlay or associated with capital use.

Data of wage bills are not published in ZGGYJJTJNJ and that published in TJNJ are for whole sectors by forms of ownership, i.e., including non-independent-accounting enterprises and excluding rural collective enterprises. The series of Zhongguo laodong gongzi tongji nianjian (Statistical Yearbook of China's Labour and Wages) published by SSB provide detailed data for wage

bills for various categories by forms of ownership or by sector/sub-sector, but again, the scope of data is different from what we have in ZGGYJJTJNJ. As an alternative, existing data in ZGGYJJTJNJ are used to estimate wage bills, based on data of the composition of total costs. Since the major components in total costs are purchases of intermediate inputs, depreciation charges, interest payments for circulating capital loans, and wage bills, we only need information on the first three to obtain the wage bills. Data of depreciation charges are readily available, and that of intermediate inputs can be obtained by deducting VAIO from GVIO. The data of interest payments for circulating capital loans in China's industry are not directly available, but we may make some conjectures since we have data of circulating capital. One source suggests that interest payments for the use of circulating capital have been quite stable in proportion to the yearly-average balance of quota circulating capital[16]. We therefore assume a constant ratio of interest payments to quota circulating capital for China's industry over the period. We may note from Table 5-14 that the results of our estimated wage bills are different from those published in TJNJ. The differences may be due to the scope of this data. For instance, our estimates for collective industry include rural collective enterprises which is however excluded in the TJNJ figures; for the joint-ownership enterprises differences in the coverage of TJNJ and ZGGYJJTJNJ are evidenced by the fact that there are wide disparities in the reported number of year-end staff workers[17].

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[16] In the state construction sector, from 1989 to 1992, interest payments as a percentage of yearly-average balances of quota circulating capital changed very little, from 3.6% to 3.1%, when the general interest rate for circulating capital loans fell by nearly three percentage-points(TJNJ various issues for construction sector). Note that the interest payments reported in the state construction sector included those for non-circulating capital loans.

[17] See TJNJ 1991, p.107, TJNJ 1993, p.109, and ZGGYJJTJNJ 1993, p.90. A statistical problem is that whilst TJNJ figures are supposed to cover all independent-accounting and non-independent-accounting enterprises and that of

Adding the depreciation charges on non-productive fixed assets and the retained profits that were distributed to employees, we then obtain total labour income, and this is tabulated in Table A5-11. The share of total labour income in the revised NVIO is listed in Table A5-12. Because retained profits for the years prior to 1986 are not listed in ZGGYJJTJNJ except for large- and medium-scale enterprises, labour income for the period of 1980-1985 may be slightly understated.

Table 5-14. Average wage bills per worker in China's industry

	State		Collective		Joint-ownership	
	TJNJ figures	Our estimate	TJNJ figures	Our estimate	TJNJ figures	Our estimate
1980	852	755	622	577		778
1985	1239	1245	969	857	1342	775
1987	1601	2036	1195	1165	1789	2039
1988	1931	2136	1419	1209	2292	2023
1989	2177	2413	1556	1372	2635	2938
1990	2409	2985	1670	1472	2908	3130
1991	2627	3295	1853	1626	3386	2946
1992	2995	3752	2094	1944	3872	3235

Source and note: TJNJ figures from TJNJ 1993, pp.136, 137 and 138; our estimates from Table A5-4 and A5-11. The collective in TJNJ is for urban collective enterprises only.

ZGGYJJTJNJ deal with independent-accounting enterprises only, the reported numbers of year-end staff workers in TJNJ were remarkably lower than that in ZGGYJJTJNJ. Either of the results is actually possible: the number of staff workers may have been understated in TJNJ or overstated in ZGGYJJTJNJ.

Appendix To Chapter Five

Output and Input Series in China's Industry 1980-1992

Table A5-1. Adjusted NVIO in current prices, 100 million yuan

	State	Collective	Joint-ownership
1980	1255.5	260.8	9.8
1984			
1985	1974.2	611.1	29.7
1986	2181.3	680.9	35.5
1987	2555.8	805.7	61.1
1988	3094.7	1037.7	98.0
1989	3317.0	1104.9	140.3
1990	3415.9	1110.1	181.4
1991	3998.9	1347.5	331.1
1992	4852.2	1730.1	560.4

	Light industry	Heavy industry	Mining	Materials	Processing
1980	589.6	944.7	185.9	380.2	378.6
1984					
1985	994.8	1617.2	266.0	610.2	741.0
1986	938.8	1747.1	305.8	688.6	752.7
1987	1365.5	2050.4	364.1	799.5	886.8
1988	1751.8	2473.0	401.8	953.1	1118.1
1989	1876.2	2685.7	438.0	1059.2	1188.5
1990	2013.0	2677.1	452.7	1058.1	1166.3
1991	2373.7	3281.2	513.9	1296.3	1471.0
1992	2802.4	4061.1	380.2	1694.9	1986.0

	Large	Medium	Small
1980	669.4	315.8	552.9
1984	872.0	403.0	
1985	991.4	484.1	1148.1
1986	1056.6	571.6	1275.3
1987	1306.8	658.9	1462.8
1988	1562.2	826.2	1843.3
1989	1756.9	871.9	1933.6
1990	1930.1	985.7	1885.2
1991	2365.2	1094.3	2218.6
1992	3376.8	1433.9	2562.5

Source and note: Adjusted NVIO is the results of existing NVIO multiplied by the ratio of revenue of industrial sales to GVIO plus depreciation charges on non-productive fixed assets. The last term is the results of total depreciation charges multiplied by the non-productive part as a % of total fixed assets in year-end original value. For NVIO, GVIO, revenue of industrial sales, and fixed assets, see ZGGYJJTJNJ 1993, pp.103-106, 129-132 and 142-145; for depreciation charges up to 1991, see ZGGYJJTJNJ 1992, pp.103-106. Depreciation charges for 1992 are our own estimates based on depreciation rates in earlier years.

Table A5-2. Producer price index in China's industry, previous year=100.00

	All industry	State	Non-state
1981	100.2	100.1	100.3
1982	99.8	99.9	99.7
1983	99.9	100.2	99.6
1984	101.4	101.7	101.1
1985	108.7	110.0	106.7
1986	103.8	103.8	103.2
1987	107.9	108.0	108.0
1988	115.0	115.1	115.8
1989	118.6	118.6	118.5
1990	104.1	104.1	103.9
1991	106.2	106.1	105.1
1992	106.8	106.9	105.6

	Light industry	Heavy industry	Mining	Materials	Processing
1981	100.5	99.9	102.5	101.7	98.1
1982	99.4	100.2	102.0	100.8	99.4
1983	98.6	101.2	103.7	102.6	99.9
1984	100.0	102.8	107.5	103.0	101.5
1985	104.3	110.4	108.8	110.9	111.7
1986	102.2	104.8	100.6	107.5	103.6
1987	108.2	107.8	114.1	106.9	107.2
1988	117.2	113.7	109.3	113.5	114.7
1989	118.2	118.9	114.2	116.4	121.8
1990	103.6	104.4	107.9	105.9	102.5
1991	103.2	108.0	112.8	111.8	103.8
1992	103.2	109.3	112.6	110.2	107.4

	Large	Medium	Small
1981	100.1	100.2	100.2
1982	99.9	99.8	99.8
1983	100.4	100.0	99.8
1984	102.0	101.5	101.3
1985	108.6	107.7	107.1
1986	104.0	103.6	103.4
1987	107.9	108.0	108.0
1988	114.8	115.3	115.6
1989	118.7	118.6	118.5
1990	104.2	104.0	104.0
1991	106.6	105.8	105.4
1992	107.5	106.6	106.0

Source and note: Figures for 1985-1992 light and heavy industry including its components are directly from the WJNJ 1991, pp.538-39, and TJNJ 1993, p.268; for heavy industry at sub-division level before 1985, the producer price index is weighted by the shares of individual branches in GVIO measured in 1980 prices; see TJNJ 1993, for the price index for 14 branches, and ZGGYJJTJNJ 1991, pp.72-73, for the shares. To be consistent with general producer price index, the light industry price index is derived using the formula: $p_l = (p_g - p_h * s_h)/s_l$, where p_g, p_l, and p_h stand for the price indexes of whole industry, light industry and heavy industry, respectively, and s_l and s_h for the share of light and heavy industry in GVIO(see ZGGYJJTJZL 1986, p.186). Collective and joint-ownership industry are treated as having the same price indexes here.

Table A5-3. Adjusted NVIO, 100 million yuan in 1980 prices

	State	Collective	Joint-ownership
1980	1255.5	260.8	9.8
1984			
1985	1795.6	567.2	27.6
1986	1912.1	612.2	31.9
1987	2075.2	670.5	50.8
1988	2183.1	745.7	70.4
1989	1972.5	670.1	85.1
1990	1951.7	647.9	105.9
1991	2153.9	748.1	183.8
1992	2445.7	909.3	294.5

	Light industry	Heavy industry	Minining	Materials	Processing
1980	589.6	944.7	185.9	380.2	378.6
1984					
1985	968.9	1388.7	209.8	507.9	671.0
1986	893.3	1430.7	239.7	533.2	657.8
1987	1200.7	1552.0	250.1	579.0	722.9
1988	1314.4	1655.5	252.5	608.2	794.8
1989	1191.0	1515.4	241.1	580.7	693.6
1990	1233.4	1442.6	230.9	547.7	664.0
1991	1409.3	1639.5	232.4	600.3	806.8
1992	1612.2	1981.1	254.6	712.2	1014.3

	Large	Medium	Small
1980	669.4	315.8	552.9
1984	851.6	396.7	
1985	891.8	442.7	1061.5
1986	913.8	504.4	1140.8
1987	1047.2	538.5	1211.3
1988	1091.0	585.7	1320.1
1989	1033.7	521.2	1168.4
1990	1090.3	514.7	1095.7
1991	1253.8	594.1	1223.9
1992	1665.7	730.5	1334.2

Source and note: Table A5-1 and A5-2.

Table A5-4. Yearly-average number of staff member, thousands, 1980-1992

	State	Collective	Joint-ownership
1980	31,571.3	16,755.6	289.3
1984	36,450.6	23,093.7	469.5
1985	37,578.7	25,791.3	551.3
1986	38,867.4	28,995.4	616.5
1987	40,108.3	29,978.9	870.1
1988	41,425.2	30,564.6	1,126.0
1989	42,342.5	30,408.4	1,455.7
1990	42,944.6	30,124.7	1,747.9
1991	44,459.4	31,186.4	2,333.0
1992	44,649.1	31,250.8	3,117.5

	Light industry	Heavy industry	Mining	Materials	Processing
1980	17,688.9	30,921.0	6,940.8	6,298.9	17,681.3
1984	23,647.6	36,351.4	8,140.1	7,610.6	20,600.7
1985	25,640.6	38,277.8	8,443.6	8,069.4	21,764.8
1986	27,908.9	40,570.1	9,136.4	8,587.0	22,846.7
1987	29,489.2	41,460.1	8,968.3	9,095.8	23,396.0
1988	30,516.7	42,629.0	9,144.6	9,648.7	23,835.7
1989	30,981.8	43,227.2	9,325.8	10,202.7	23,698.7
1990	31,365.5	43,446.7	9,470.8	10,417.7	23,558.2
1991	32,977.9	44,996.7	9,857.9	10,833.2	24,305.6
1992	33,247.3	45,770.8	9,771.4	11,324.8	24,671.4

	Large	Medium	Small
1980	10,360.0	8,048.1	30,209.1
1984	11,690.2	9,269.2	39,054.5
1985	11,956.1	9,423.1	42,535.5
1986	12,785.0	9,862.2	45,828.7
1987	13,500.1	10,633.7	46,837.1
1988	14,497.2	11,146.9	47,467.9
1989	15,681.6	11,736.0	46,788.2
1990	16,633.2	12,105.4	46,073.1
1991	17,829.7	13,146.5	47,000.6
1992	22,325.3	13,821.0	43,167.4

Source and note: The figures are obtained from NVIO divided by NVIO per head of staff member in individual categories. By the original ZGGYJJTJNJ editor's definition, staff members used here are referred to their yearly-average number. See ZGGYJJTJNJ 1993, pp.142-45 and 181-84.

Table A5-5. Fixed Assets for productive purpose, year-end net value, 100 mil. Yuan in current prices, 1980-1992

	State	Collective	Joint-ownership
1980	2,152.2	234.3	7.7
1984	2,791.4	449.1	18.9
1985	3,310.1	570.7	33.2
1986	3,703.6	699.0	42.5
1987	4,219.6	854.2	75.4
1988	4,894.5	1,044.6	119.8
1989	5,716.6	1,239.9	209.3
1990	6,596.8	1,394.7	326.7
1991	7,825.4	1,593.0	417.9
1992	9,031.0	1,823.5	764.0

	Light industry	Heavy industry	Mining	Materials	Processing
1980	442.1	1,953.2	355.9	859.2	738.1
1984					
1985	1,013.4	2,903.2	591.2	1,310.5	1,001.4
1986	1,203.0	3,246.8	670.4	1,492.1	1,084.3
1987	1,486.5	3,668.4	759.1	1,699.3	1,209.9
1988	1,776.6	4,287.8	903.7	2,027.3	1,356.9
1989	2,120.0	5,052.8	1,103.3	2,447.4	1,502.2
1990	2,471.7	5,852.9	1,343.2	2,864.7	1,644.9
1991	2,912.9	6,922.7	1,569.2	3,385.5	1,968.0
1992	3,466.7	8,152.6	1,800.5	4,081.1	2,271.0

	Large	Medium	Small
1980	1,091.4	550.2	751.3
1984	1,481.8	727.0	1,050.7
1985	1,673.0	809.6	1,428.9
1986	1,953.1	880.1	1,608.4
1987	2,229.6	1,040.6	1,875.3
1988	2,687.6	1,184.0	2,183.1
1989	3,329.2	1,342.1	2,490.5
1990	4,022.6	1,522.2	2,768.3
1991	4,884.5	1,914.2	3,030.3
1992	6,094.6	2,212.1	3,304.2

Source and note: Fixed assets that were established for productive purpose are listed under year-end original cost in ZGGYJJTJNJ 1993, pp.103-106. The ratios are therefore applied to fixed assets of net value listed in the same source. Except for large- and medium-scale enterprises, all categories have no 1984 data listed accordingly. However, we found elsewhere in ZGGYJJTJZL 1986, pp.176-78, that figures of fixed assets in 1984 are available for all independent-accounting industrial enterprises(original value only), as well as for state and collective independent-accounting industrial enterprises(both original and net value). We therefore use 1985 productive ratios to derive 1984 productive fixed assets at net value for state and collective enterprises, and to apply the 1985 ratio of net value to original value to derive 1984 total fixed assets at net value for all independent-accounting industrial enterprises, which are further used to obtain 1985 productive fixed assets at net value for joint-ownership and small enterprises. Note that the statistical scope in ZGGYJJTJNJ and ZGGYJJTJZL is slightly different.

Table A5-6. Newly-added fixed asset for productive purpose, year-end net value, 100 mil. Yuan in current prices

	State	Collective	Joint-ownership
1984	1,240.1	327.7	15.3
1985	719.2	166.1	16.3
1986	624.4	192.6	12.2
1987	776.9	228.8	38.6
1988	985.3	283.1	53.8
1989	1,175.6	304.0	105.8
1990	1,274.0	277.7	141.2
1991	1,704.2	335.4	127.9
1992	1,766.0	392.3	404.8

	Light industry	Heavy industry	Mining	Materials	Processing
1984	576.5	1,273.8	314.8	555.8	403.2
1985	214.9	408.4	108.5	176.1	123.8
1986	272.2	557.1	131.8	263.1	162.3
1987	382.9	660.8	141.6	304.6	214.6
1988	414.5	902.8	204.5	446.8	251.4
1989	490.7	1,094.3	267.3	565.9	261.1
1990	520.8	1,169.9	314.3	587.2	268.4
1991	642.8	1,520.5	309.5	739.1	471.9
1992	795.2	1,840.5	351.7	1008.2	480.6

	Large	Medium	Small
1984	692.0	310.0	557.4
1985	299.0	129.1	470.5
1986	405.2	124.2	297.7
1987	420.0	222.4	385.2
1988	630.4	219.9	467.7
1989	852.4	242.4	489.5
1990	935.0	274.8	480.4
1991	1,174.4	513.9	476.9
1992	1,606.1	449.0	508.6

Source and note: Newly-added productive fixed assets at net value are derived using a formula: $I_t = NK_t - NK_{t-1} + D_t$, where I is for newly-added productive fixed assets, NK is productive fixed assets of net value(Table A5-4), and D is depreciation charges on productive fixed assets(a result of applying productive ratios in fixed assets of original value to total depreciation charges). For the missing data in 1981-1984 or 1981-1985 for light and heavy industry, geometric interpolation is used for both productive fixed assets and productive depreciation charges. One unappealing result of this is that true growth of newly-added fixed assets in 1985, especially for light and heavy industry, may have been seriously understated. Sums of the three categories in 1984 and 1985 are also divergent from each other. Depreciation charges in 1992 are a result using our estimates of the depreciation rate based on 1987-1988 and 1991 data, i.e., the increase 1988 over 1987 times the depreciation rate in 1991, except for the mining industry for which the 1991 rate is used (ZGGYJJTJNJ 1992, pp.168-171).

Table A5-7. Newly-added fixed assets, year-end value of 100 mil. Yuan in 1980 prices

	State	Collective	Joint-ownership
1980-84	1,120.9	294.9	13.7
1985	543.3	125.5	12.3
1986	435.4	134.2	8.5
1987	497.2	146.4	24.7
1988	549.3	157.8	30.0
1989	579.2	149.8	52.1
1990	584.9	127.5	64.8
1991	714.6	140.6	53.6
1992	642.2	142.7	147.2

	Light industry	Heavy industry	Mining	Materials	Processing
1980-84	518.8	1,150.8	283.9	502.3	364.6
1985	162.3	308.5	81.9	133.0	93.6
1986	189.8	388.5	91.9	183.5	113.1
1987	245.1	422.9	90.6	194.9	137.3
1988	231.1	503.3	114.0	249.1	140.2
1989	241.8	539.1	131.7	278.8	128.6
1990	239.1	537.1	144.3	269.6	123.2
1991	269.5	637.6	129.8	309.9	197.9
1992	289.2	669.3	127.9	366.6	174.8

	Large	Medium	Small
1980-84	640.4	280.4	503.0
1985	225.9	97.5	355.5
1986	282.5	86.6	207.6
1987	268.8	142.4	246.5
1988	351.4	122.6	260.8
1989	419.9	119.4	241.2
1990	429.3	126.2	220.6
1991	492.4	215.5	200.0
1992	584.1	163.3	185.0

Source and note: See the text for the implicit price deflator for fixed assets. A yearly breakdown of total newly-added fixed assets in current prices in 1980-1984 as shown in Table A5-5 is made before applying the IPDs. Similarly to Table A5-5, the sums of the three categories in 1984 and 1985 are sharply different.

Table A5-8. Fixed assets for productive purpose, year-end net value, 100 mil. Yuan in 1980 prices

	State	Collective	Joint-ownership
1980	2,152.2	234.3	7.7
1984	2,672.3	416.2	17.3
1985	3,015.1	497.2	27.6
1986	3,219.6	567.2	33.2
1987	3,455.9	640.0	52.2
1988	3,697.8	705.2	72.9
1989	3,923.4	746.3	108.7
1990	4,114.6	750.9	149.7
1991	4,353.5	754.4	166.7
1992	4,435.3	735.2	255.1

	Light industry	Heavy industry	Mining	Materials	Processing
1980	442.1	1,953.2	355.9	859.2	738.05
1984	800.8	2,557.6	503.2	1,150.9	903.53
1985	903.3	2,680.3	533.8	1,213.9	932.54
1986	1,010.4	2,855.2	573.2	1,315.8	966.31
1987	1,156.1	3,047.4	610.8	1,421.8	1,014.68
1988	1,262.9	3,267.3	664.9	1,552.1	1,050.37
1989	1,357.2	3,477.1	728.9	1,685.1	1,063.23
1990	1,427.3	3,644.5	798.8	1,784.8	1,060.81
1991	1,497.0	3,831.4	845.1	1,876.5	1,109.83
1992	1,544.8	3,958.9	878.6	1,973.3	1,107.01

	Large	Medium	Small
1980	1,091.4	550.2	751.3
1984	1,430.2	697.4	996.3
1985	1,548.3	748.4	1,259.5
1986	1,705.7	781.4	1,374.8
1987	1,831.0	861.7	1,487.6
1988	2,010.0	908.6	1,588.4
1989	2,219.2	943.7	1,647.5
1990	2,406.9	975.1	1,665.4
1991	2,586.8	1,068.9	1,650.5
1992	2,775.0	1,080.9	1,600.8

Source and note: The new series of fixed assets in constant prices are based on the formula: $NK_t = NK_{t-1} + I_t - D_t$, where NK and I are for fixed assets of year-end net value and newly-added fixed assets, respectively, having same meanings as in Table A5-5 but they are now in 1980 prices (from Table A5-6); D is depreciation charges on productive fixed assets, again the same as that which was used to generate newly-added productive fixed assets in current prices in Table A5-5. Note that except for 1984, the sums of the three categories are virtually the same.

Table A5-9. Full circulating capital, yearly-average balances, 100 mil. Yuan in current prices, 1980-1992

	State	Collective	Joint-ownership
1980	1,476.7	401.9	17.9
1984	1,923.8	773.7	53.2
1985	2,324.4	994.5	69.9
1986	2,867.3	1,235.5	81.9
1987	3,313.6	1,468.5	111.9
1988	3,906.0	1,819.8	189.4
1989	5,222.8	2,242.1	338.5
1990	7,120.6	2,750.9	516.0
1991	8,856.3	3,344.0	803.5
1992	10,096.4	4,058.0	1,338.7

	Light industry	Heavy industry	Mining	Materials	Processing
1980	534.7	1,356.3	167.6	359.0	829.7
1984	1,040.0	1,666.9	189.0	419.6	1,058.3
1985	1,285.4	2,042.9	231.6	514.3	1,297.1
1986	1,667.9	2,512.2	283.6	646.4	1,582.2
1987	2,021.3	2,880.6	308.6	770.9	1,801.2
1988	2,575.5	3,342.6	330.5	909.7	2,102.4
1989	3,482.8	4,309.4	419.0	1,237.0	2,653.4
1990	4,551.1	5,818.0	575.5	1,804.4	3,438.1
1991	5,792.1	7,214.0	700.5	2,364.0	4,149.5
1992	6,932.7	8,560.9	816.1	2,810.2	4,934.6

	Large	Medium	Small
1980	612.6	356.9	895.5
1984	770.7	501.6	1,460.1
1985	914.6	605.8	1,856.6
1986	1,173.7	782.9	2,220.4
1987	1,397.9	945.3	2,550.1
1988	1,713.2	1,153.1	3,048.7
1989	2,515.1	1,553.5	3,727.3
1990	3,585.1	2,165.4	4,631.8
1991	4,509.4	2,804.5	5,694.6
1992	5,381.7	3,584.9	6,526.5

Source and note: Yearly-average balances of full circulating capital(FY) are derived based on the formula: $FY_t = QY_t * (FR_t/QR_t)$, where QY is yearly-average balances of quota circulating capital, FR year-end balances of full circulating capital, and QR year-end balances of quota circulating capital. All data up to 1991 are from ZGGYJJTJNJ 1992, pp.116-19. 1992 figures are directly from TJNJ 1993, p.419. Geometric interpolation is used to generate the missing figures for 1984.

Table A5-10. Full circulating capital, yearly-average balances, 100 mil. Yuan in 1980 prices, 1980-1992

	State	Collective	Joint-ownership
1980	1,476.7	401.9	17.9
1984	1,720.5	691.9	47.6
1985	1,834.8	785.1	55.2
1986	2,114.3	911.0	60.4
1987	2,232.5	989.4	75.4
1988	2,243.3	1,045.1	108.8
1989	2,473.1	1,035.9	160.3
1990	3,203.1	1,237.5	232.1
1991	3,688.9	1,392.9	334.7
1992	3,857.4	1,550.4	511.5

	Light industry	Heavy industry	Mining	Materials	Processing
1980	534.7	1,356.3	167.6	359.0	829.7
1984	930.1	1,490.7	169.0	375.3	946.5
1985	1,014.7	1,612.7	182.8	406.0	1,023.9
1986	1,229.9	1,852.5	209.2	476.6	1,166.7
1987	1,361.8	1,940.7	207.9	519.4	1,213.5
1988	1,479.1	1,919.7	189.8	522.4	1,207.4
1989	1,649.1	2,039.5	197.4	585.7	1,256.4
1990	2,047.3	2,617.2	258.9	811.7	1,546.6
1991	2,412.6	3,004.8	291.9	984.7	1,728.4
1992	2,648.7	3,270.8	311.8	1,073.7	1,885.3

	Large	Medium	Small
1980	612.6	356.9	895.5
1984	689.3	448.6	1,305.8
1985	722.0	478.2	1,465.5
1986	865.5	577.3	1,637.3
1987	941.8	636.9	1,718.1
1988	983.9	662.3	1,750.9
1989	1,190.9	735.6	1,764.9
1990	1,612.7	974.1	2,083.6
1991	1,878.3	1,168.2	2,372.0
1992	2,056.1	1,365.6	2,493.5

Source and note: See the text for implicit price deflators for circulating capital that are used to convert Table A5-9 here.

Table A5-11. Total labour income, 100 million yuan in current prices

	State	Collective	Joint-ownership
1980	259.8	99.1	2.3
1984			
1985	511.3	228.1	4.6
1986			
1987	1039.2	406.2	22.7
1988	1151.2	444.2	30.7
1989	1288.3	488.4	52.9
1990	1505.4	509.7	68.8
1991	1701.9	577.5	102.2
1992	1955.9	704.2	149.7

	Light industry	Heavy industry	Mining	Materials	Processing
1980	99.1	273.0	76.7	66.0	130.3
1984					
1985	238.1	474.0	115.0	122.4	236.6
1986					
1987	531.5	927.6	245.2	243.0	439.5
1988	597.0	1,022.2	260.4	269.0	492.9
1989	670.0	1,261.2	332.6	297.5	631.0
1990	789.7	1,273.8	361.7	317.9	594.2
1991	872.1	1,480.5	382.7	395.1	702.7
1992	1027.4	1,755.3	397.5	509.8	848.0

	Large	Medium	Small
1980	129.5	85.8	186.8
1984	233.4	118.9	
1985	293.3	144.8	401.8
1986			
1987	475.2	249.9	749.0
1988	519.6	290.3	811.1
1989	620.5	326.4	882.3
1990	774.0	380.0	933.6
1991	941.4	457.3	980.4
1992	1520.9	544.7	975.8

Source and note: The total labour income is a sum of three items: wage bills in industrial costs, depreciation charges on non-productive fixed assets, and retained profits distributed to employees. Wage bills in industrial costs are the industrial costs after deducting material consumption, interest payments, and depreciation charges; material consumption is GVIO minus NVIO and depreciation charges that is discounted by the ratio of revenue of industrial sales to GVIO; interest payments are yearly-average balances of quota circulating capital multiplied by a constant rate of 3%. Depreciation charges on non-productive fixed assets are total depreciation charges multiplied by the ratio of the non-productive to total fixed assets of year-end original value. Retained profits distributed to employees are assumed to account for a constant 60% of total retained profits. All data are from ZGGYJJTJNJ 1992 and 1993, Part III.

Table A5-12. Labour income as % in NVIO, 1980-1992

	State	Collective	Joint-ownership
1980	20.7	38.0	23.6
1984			
1985	25.9	37.3	15.5
1986			
1987	40.7	50.4	37.3
1988	37.2	42.8	31.3
1989	38.8	44.2	37.7
1990	44.1	45.9	37.9
1991	42.6	42.9	30.9
1992	40.3	40.7	26.7

	Light industry	Heavy industry	Mining	Materials	Processing
1980	16.8	28.9	41.3	17.4	34.42
1984					
1985	23.9	29.3	53.2	20.1	31.93
1986					
1987	38.9	45.2	67.3	30.4	49.56
1988	34.1	41.3	64.8	28.2	44.08
1989	35.7	47.0	75.9	28.1	44.68
1990	38.2	47.6	79.9	30.0	50.95
1991	36.7	45.1	74.5	30.5	47.77
1992	36.7	43.2	62.7	30.1	42.70

	Large	Medium	Small
1980	19.4	27.2	33.8
1984	26.8	29.5	
1985	29.6	29.9	35.0
1986			
1987	36.4	37.9	51.2
1988	33.3	35.1	44.0
1989	35.3	37.4	45.6
1990	40.1	42.4	49.5
1991	39.8	41.8	44.2
1992	45.0	38.0	38.1

Source and note: Table A5-1 and A5-11.

Table A5-13. Summary of output and inputs for whole industry

	NVIO adjusted 100 mil. yuan in current prices	NVIO adjusted 100 mil yuan in 1980 prices	Labour force millions	Fixed assets for productive purpose, 100 mil. yuan in 1980 prices	Full circulating capital, 100 mil. yuan in 1980 prices	Total capital, 100 mil. yuan in 1980 prices	Labour income, 100 mil. yuan in current prices	Labour income as % of adjusted NVIO
1980	1526.1	1526.1	48.6	2394.2	1896.5	4,290.7	361.2	23.7
1984			60.0	3105.8	2460.0	5,565.8		
1985	2615.0	2390.4	63.9	3539.8	2675.1	6,214.9	744.1	28.5
1986	2897.7	2556.2	68.5	3820.1	3085.7	6,905.8		
1987	3422.6	2796.3	71.0	4148.1	3297.2	7,445.4	1468.1	42.9
1988	4230.4	2999.2	73.1	4475.8	3397.2	7,873.0	1626.1	38.4
1989	4562.2	2727.7	74.2	4778.4	3669.2	8,447.7	1829.6	40.1
1990	4707.4	2705.5	74.8	5015.2	4672.7	9,687.9	2083.9	44.3
1991	5677.5	3085.8	78.0	5274.6	5416.4	10,691.0	2381.6	42.0
1992	7142.7	3649.5	79.0	5425.6	5919.2	11,344.9	2809.7	39.3

Source and note: Results from Tables A5-1, 3, 4, 8, 10 and 11. Total capital is the sum of fixed assets and circulating capital. The last column is calculated in current prices for both labour income and adjusted NVIO.

Chapter Six

Productivity Change in China's industry: 1980-1992

In Chapter Four we established a version of TFP analysis: total factor productivity as an indicator of productivity change. We noted that sources of productivity change as indicated in the TFP estimate may include technological progress, sectoral relations or sectoral shifts, and changes in market conditions, as well as changes in technical efficiency. Because it is still difficult to measure these elements separably in a single study, we will focus on a TFP estimate defined in the broad sense in our empirical study of post-reform China's industry.

In Chapter Five we attempted to construct a statistically compatible base for output and input series in 1980-1992 China's industry, covering a number of sectors classified by various criteria. Though the work has encountered problems in quite a few areas with incomplete or inaccurate data, the results of the work are believed helpful, and allow us to pursue our empirical investigation of the issue at sector level.

In this chapter we proceed to an empirical investigation of productivity change in post-reform China's industry based on the theoretical work in Chapter Four and statistical work in Chapter Five. In Section I we will first give an overall description of productivity change in 1980-1992 China's industry, which is compared to previous studies on the same issue. In

Section II, our empirical investigation is conducted at sector level, and with regard to both sector-specific factors and the underlying economy-wide factors. We wish to identify some main decisive factors in productivity change as well as in output and input growth in post-reform China's industry. In Section III we will relate sectoral TFP estimates with sectoral shifts in order to find out whether structural changes in the post-reform period have helped to improve overall industrial productivity.

I. Overall Trend in Productivity Change in Post-Reform China's Industry

The use of TFP analysis to judge productivity change in post-1949 China's economy appeared in the early 1980s when the time series data began to be available to western analysts. The results of early studies of TFP in China's economy or industry tended to show that the post-1949 Chinese economy, up to the early 1980s, was unimpressive in achieving productivity improvement for its output growth[1]. Some observers have been led by these studies to conclude the "dismal failure" of reforms in early 1980s[2]. The early studies, however, had a common drawback that capital stock was not adjusted to take account of price changes[3]. Later studies, which emerged since the late 1980s, as

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[1] Representative studies are: Gene Tidrick, Productivity Growth and Technical Change in Chinese Industry, The World Bank Staff Working Paper 761, 1986(a study based on the World Bank's research trip to China in 1984); Gregory Chow, The Chinese Economy, New York: Harper & Row, 1985; and Thomas Rawski, "Overview: Industry and Transport", in USCJEC ed, China's Economy towards the Year of 2000, Washington, D.C., 1986. In Tidrick's study, TFP measured in China's national income in 1975-1981 was slightly better than in 1952-1975; Chow's study ran through 1952-1981 and found that virtually all industrial growth was ascribable to an increase in the capital stock. Rawski focused on 1978-1984 but still arrived at a low TFP estimated result.

[2] See, for example, Bruce Reynolds, "Introduction to the Special Issue on Chinese Economic Reform", JCE, September 1987

[3] This problem has been put under a thorough examination by Kuan Chen, Gary Jefferson, Thomas Rawski, H. Wang and Y. Zheng, "New Estimates of Fixed Investment and Capital Stock For Chinese State Industry", CQ, No. 114 (June

summarised in Table 6-1, tended to overcome this drawback and were able to demonstrate that post-reform China achieved an overall positive productivity change along with its rapid industrial growth.

At least two conclusions concerning the overall trend in productivity change in post-reform China's industry can be drawn from results of the later studies. First, compared to the pre-reform period, industrial productivity has improved. Second, the role of the productivity increase in industrial growth began to rise close to a level prevailing in developing as well as in developed economies[4]. The overall achievement in productivity improvement in post-reform China's industry is impressive, and in general it reflects the significant positive impact of reforms. Our study of productivity change in post-reform China's industry follows the strand of development embodied in the later studies and is aimed at exploring the more detailed sources of productivity change. Compared to the later studies summarised in Table 6-1[5], our study focuses on the period 1980-1992, uses the net output series in most cases, and treats capital inputs with new insights(taking into account circulating capital and carefully explaining the nature of non-productive fixed assets). More importantly, we pursue the study into sector level, and

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1988). Most subsequent studies of TFP have followed the suggested approach: use a certain price index to deflate existing capital stock.

[4] A World Bank-sponsored research shows that in 1970s and early 1980s, the average contribution to economic growth by productivity increase was 31% in 19 developing countries, and 49% in 12 developed countries(Hollis Chenery, et al, eds. Industrialization and Growth: A Comparative Study, New York: OUP, 1986 Ch. 2). For South Korea in 1960-1973 and Japan in 1966-1973, the same ratio was 42% and 41%, respectively (J.Kendrick and B.Vaccara, eds. New Developments in Productivity Measurement and Analysis, Chicago: University of Chicago Press, 1980). For post-reform China, the contribution of productivity increase was in a range of 23% to 60%(top panel of Table 6-1).

[5] Studies listed in the lower panel of Table 6-1 are those using sample survey data. We may note that some of them, though using the same data-set, yielded different TFP estimates. The discrepancies seem not due to any techniques employed, but mostly to data-processing methods, such as the choice of price deflators, the deduction of non-productive elements etc.

Table 6-1. Summary of TFP Estimates of Post-Reform China's industry

Period	Data-set	Output growth	Labour growth	Capital growth	TFP(% of o.growth)	Authors
1975-85	GVO	8.8			43.2(α:.4)	D.Perkins, 1988
1981-84	NI	8.7	3.2	8.3	40.2(α:.6) 27.6(α:.4)	Derberger, 1988
1978-85	GVIO, SOE,a	8.6	2.5	4.8	55.8(α:.46)	K.Chen at al, 1987
ditto	ditto,p	8.6	2.5	4.0	60.5(α:.46)	ditto
1980-88	GVIO, SOE	8.5	3.3	6.4	28.3	Jefferson et al 1990
ditto	GVIO, COE	16.9	4.8	12.5	27.3	ditto
1978-92	GVIO	11.1	4.2	12.7	23.4(α:.5)	Dic Lo, 1994
ditto	GVIO, SOE	7.8	2.9	11.6	7.7(α:.5) 18.8(α:.4)	ditto
ditto	GVIO, COEs	16.8	5.5	17.8	30.4(α:.5) 23.1(α:.4)	ditto
ditto	GVIO, LMEs	12.2	5.0	13.2	25.3(α:.5) 31.9(α:.4)	ditto
1982-87	122 TVEs				Positive	J.Svejnar, 1990
1980-87	700+ SOEs				Negative	D.A.Hay et al, 1993
1980-87	700+ SOEs				Positive	Jefferson & Singh, 1993
1984-88	300 SOEs				Negative	Woo et al, 1994
1984-87	200 TVEs				Positive	ditto
1980-89	769 SOEs	By branch, 2.3(L) to 7.9(H)			Positive	T.Groves et al, 1995
1980-89	769 SOEs	By branch, 0.0(L) to 9.1(H)			Mixed	Liu & Liu, 1994

Note: α: contributing weight assigned to labour input(the remaining proportion is therefore for capital input); a: capital and labour series adjusted to the "unproductive" elements; p: price deflator changed to the 1980 base; NI: national income for China's economy; GVO: gross value of output for China's economy; GVIO: gross value of industrial output for China's industry or its sectors; SOEs: state-owned enterprises; COEs: collective enterprises; TVEs: township and village enterprises; LMEs: large- and medium-sized state-owned enterprises. Details of publication sources of the listed studies are given in the Bibliography at the end of the thesis.

Table 6-2. Annual growth rate of output and inputs in China's industry 1980-1992, %

	1980-85	1985-88	1988-92	1980-92
GVIO				
output growth	10.3	10.3	7.9	9.5
input growth	6.5	7.4	5.1	6.2
TFP	3.8	2.9	2.8	3.3
VAIO				
output growth	9.5	7.1	2.1*	6.8*
input growth	7.6	7.3	4.5*	6.9*
TFP	1.9	-0.2	-2.4*	-0.1*
NVIO				
output growth	9.2	6.9	5.4	7.4
input growth	7.6	7.2	3.8	6.4
TFP	1.6	-0.3	1.6	1.0

Source and note: Figures with * are to 1991 only. GVIO, VAIO and NVIO in current prices(ZGGYJJTJNJ 1992 and 1993) are deflated by the same producer price index as in Table A5-3. VAIO is NVIO plus depreciation charges(up to 1991). Total inputs for GVIO is the sum of fixed assets net of the non-productive element, labour, and intermediate inputs(GVIO minus NVIO and depreciation charges); and for VAIO and NVIO, total inputs exclude intermediate inputs. Weights of these factors are their shares in GVIO, VAIO and NVIO, respectively(Table A5-13 and ZGGYJJYJNJ 1993). Fixed assets in 1980 constant prices are from Table A5-13. Intermediate inputs in current prices are deflated by the price index of major industrial material purchase(WJNJ, various issues). For the sake of compatibility, NVIO here is unrevised(i.e, not adjusted to the ratio of sales to GVIO and include depreciation charges on non-productive fixed assets). TFP is output growth after subtracting input growth.

we aim at disentangling the overall impact of reforms on productivity change in China's industry. In some aspects, our estimates appear quite close to the previous studies. For instance, our estimate of overall TFP using gross output series(GVIO) shows that in 1980-1992, over 30% of industrial growth was contributed by productivity improvement(Table 6-2), a level in the middle range of previous estimates.

For an overall description of productivity change in post-reform

China's industry, we should note two important issues: the implication of TFP analysis using different output concepts, and a comparison of TFP estimates with and without the inclusion of circulating capital. Table 6-2 compares the results of TFP estimates using three series of output in 1980-1992 China's industry: GVIO, VAIO and NVIO. The results show that over the period 1980-1992, the percentage of TFP to output growth was about 34.7% when measured in GVIO, but only 13.5% when measured in NVIO(the figure of VAIO for the period is incompatible). Because intermediate inputs are the differentiating factor between gross output and net output, the disparities between the TFP estimates seem to have reflected the changing role of intermediate inputs in post-reform China's industry. This may be evaluated in two aspects. First, we may note that the growth rate of NVIO or VAIO was substantially lower than GVIO throughout the period. This implies that prices of intermediate inputs increased faster than industrial output prices, and also that an increased part of industrial output was implicitly transferred away from industry in the form of intermediate inputs. Second, the efficiency of intermediate input use has improved, especially in 1980-1985. We may note that in 1980-1992 (particularly in 1980-1985), the measured growth of total factor inputs when including intermediate inputs was lower than that excluding intermediate inputs. This implies that China's industrial enterprises tended to use fewer intermediate inputs, in real terms, compared to their use of other factors (particularly capital). The evidence seems to suggest that in the post-reform period, when the relative prices of intermediate inputs began to rise as part of the restoration of market relations, China's industrial enterprises were able to a certain degree to improve their efficiency in the use of intermediate inputs to cope with the situation.

A comparison of TFP estimates between series including and excluding circulating capital is made in Table 6-3. It appears that there were no

Table 6-3. TFP estimates: comparison of capital use

Growth rate	1980-85	1985-88	1988-92	1980-1992
Output(NVIO)	9.4	7.9	5.0	7.5
Labour	5.6	4.6	2.0	4.1
Fixed assets	8.1	8.1	4.9	7.2
Circulating capital	7.1	8.3	14.9	10.0
TFI 1	7.2	6.7	3.5	6.2
TFI 2	6.9	6.8	6.4	7.2
TFP 1	2.2	1.2	1.5	1.3
TFP 2	2.5	1.1	-1.4	0.3

Source and note: Table A5-13. NVIO here is the adjusted series and therefore different from that in Table 6-2. TFI is the contribution of total factor input to output growth; 1 is the calculation based on fixed assets only, and 2 is that based on fixed assets plus circulating capital.

significant differences in TFP estimates between the two series in 1980-1985 and 1985-1988(TFP 1 and 2 were similar in amount in the two periods). Looking more closely, we may note that the relative relations between the two TFP estimates have begun to change from the first period to the second period. TFP estimate including circulating capital was larger than that excluding circulating capital in 1980-1985, but became smaller in 1985-1988. In 1988-1992, the TFP estimate which included circulating capital became ever further negative, an outcome of the sharp increase in the use of circulating capital by China's industrial enterprises in this period(15% annually). As we have indicated earlier(Section II of Chapter Three), the sharply increased use of circulating capital was associated with the imperfections of financial markets or some unbalanced reforms of the funding system: short-term capital lending became an sector with "softer constraints" on industrial enterprises relative

to long-term capital lending or funding. A question that may be addressed is that, if the constraints on short-term capital lending had been as hard as those on long-term funding, China's industrial enterprises would have not been able to use circulating capital so excessively since the late 1980s. The evidence in Table 6-3 clearly shows that the productivity change in post-reform China's industry has been negatively affected by excessive use of circulating capital.

Our overview is that post-reform China's industry has improved its productivity, compared both to the pre-reform period and to international experience. Of this achievement, improved efficiency in the use of intermediate inputs is particularly impressive. However, the process of productivity improvement has been to a degree interrupted by excessive use of circulating capital since the late 1980s.

II. Productivity Change in Sectors of China's Industry

In what follows we will present our TFP estimates for various sectors in China's industry: by form of ownership: state, collective, and joint-ownership industry; by type of activity, light and heavy industry(and mining, material producing and finished-good processing industry within heavy industry); and by size of enterprise, large-, medium- and small-sized enterprises. In interpreting these results, we shall first look at the relationship between output growth and input growth with regard to their change over periods, i.e, 1980-1985, 1985-1988, and 1988-1992. Based on these comparisons, we will then explore underlying factors that are considered responsible for the relative changes in output and inputs.

1. Sectors by Form of Ownership

Table 6-4. TFP estimates of sectors by form of ownership

	Output growth	Input growth			Total factor productivity
		Labour	Capital	Total	
1980-1985					
state	7.0	3.6	7.0	6.3	0.8
collective	16.8	9.0	16.2	13.5	3.3
joint-ownership	23.0	13.8	29.0	25.4	-2.4
1985-1988					
state	6.7	3.3	7.0	6.1	0.7
collective	9.6	5.8	12.4	9.9	-0.4
joint-ownership	36.6	26.9	38.2	36.5	0.2
1988-1992					
state	3.1	1.9	4.7	3.6	-0.5
collective	6.7	0.6	1.1	0.8	5.8
joint-ownership	43.2	28.9	36.8	34.3	8.8
1980-1992					
state	5.7	2.9	6.2	5.5	0.2
collective	11.0	5.3	10.0	8.2	2.7
joint-ownership	32.8	21.9	33.8	31.0	1.8

Source and note: In this and subsequent tables below, revised NVIO is used to calculate output growth rates, see Table A3-4. Capital is a sum of fixed assets for productive purposes and circulating capital, see Table A3-8 and A3-10. Total input growth is a sum of labour and capital growth weighted by their share in revised NVIO, see Table A3-12. TFP is output growth after subtracting total input growth.

Table 6-4 lists our TFP estimates for sectors classified by form of ownership: state, collective, and joint-ownership. Overall, in the period 1980-1992, these three sectors all achieved productivity growth though the achievement in the state sector was relatively small. When looking at the different periods of time, productivity change in the state sector was positive in 1980-1985 and 1985-1988 but became negative in 1988-1992. The main direct reason for the latter trend seems to be the decline in industrial output growth in the state sector(down to 3% from about 7% in the previous periods). Notably, the joint-ownership sector saw a sharp rise in its industrial output growth

in 1988-1992(a further rise to 43% from 37% in 1985-1988). That part(or an increasingly large part) of state industry began to transform into joint-ownership industries may be an important underlying factor which explains this relative change in the output growth of the state sector and joint-ownership sector[6].

In the light of the fast growth of non-state enterprises, including collective enterprises, the greatest difficulty preventing state enterprises from achieving productivity improvement was the change in market conditions: the loss or weakening of the monopolistic position that state enterprises had enjoyed in the pre-reform period. Loss of monopolistic position had two immediate and interrelated impacts on state enterprises: they had to concede market shares, and suffered relative increases in the costs of production. With this background, it is not surprising that productivity growth in the state sector was relatively small in the period under study. Yet this low achievement in productivity growth would not necessarily suggest that technological progress or improvement in technical efficiency was sluggish in state industry during the period. In the post-reform period, China has continued and increased its imports of foreign technology, mainly aimed at up-grading its industrial base[7]. State enterprises were the main beneficiary of this process. Studies on the technical efficiency issue in state industrial enterprises also tend to show that some progress has been made in this

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[6] In 1988, joint-ownership enterprises involving state enterprises(joint state-collective, joint state-individual, and joint foreign of which most involved state enterprises) accounted for 89% of joint-ownership industrial output(see Robert Michael Field, "China's Industrial Performance since 1978", CQ, No. 131 (September 1992), p.579). It is likely to be the case that most of the state enterprises that changed into a joint-ownership status would be those that performed better.

[7] For an overview of China's foreign technology imports since early 1980s, see Denis Fred Simon, "China's Acquisition and Assimilation of Foreign Technology: Boogieing's Search for Excellence", in USCJEC, ed. China's Economic Dilemmas in the 1990s, Washington, D.C. Vol. II, 1991

respect, though this is not distributed evenly among individual branches[8].

In the two non-state sectors, collective and joint-ownership, a common trend is that productivity growth accelerated in the later period, 1988-1992, which may partly explain the increased difficulties encountered by state enterprises in improving their productivity in the same period. In the acceleration of productivity growth, collective enterprises seem to have benefited more from greater efficiency in factor use: labour and capital input growth was much slower than in the previous periods; for joint-ownership enterprises, they seem still to be reliant on high and accelerated output growth. Overall, economic growth paths, in terms of the relationship between output growth and input growth, do not seem to have shown strong signs of convergence among the three sectors, when looked at by form of ownership. Competition between them and within them emerged, but the constraints facing each sector were still different in some aspects(e.g., in the capital markets or funding system). Market integration still awaits development in this respect.

2. Sectors by Type of Activity

It seems a bit surprising that light industry, a fast growing sector when comparing to heavy industry, saw its productivity rate fall in 1980-1985(Table 6-5). This period 1980-1985 is when light industry began to gain an impetus towards growth from both market expansion and the reforms in the enterprise incentive system. The fall in productivity in 1980-1985 was directly produced by the faster growth in factor inputs(particularly capital inputs) over growth

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[8] See, for example, Groves, et al, op.cit.; Liu and Liu, op.cit. These empirical studies use a large data-set of state industrial enterprises and found technical efficiency improvement was particularly positive in branches like metallurgy, machinery, electronics, and chemicals.

Table 6-5. TFP estimates of light and heavy industry

	Output growth	Input growth			Total factor productivity
		Labour	Capital	Total	
1980-1985					
Light	10.5	7.7	15.4	14.1	-3.6
Heavy	8.0	4.4	6.5	5.9	2.1
1985-1988					
Light	10.7	6.0	11.8	10.4	0.3
Heavy	6.0	3.7	6.8	5.9	0.1
1988-1992					
Light	5.2	2.2	5.2	4.2	1.1
Heavy	4.6	1.8	4.9	3.6	1.0
1980-1992					
Light	8.7	5.4	11.0	10.1	-1.3
Heavy	6.4	3.3	6.1	5.3	1.1

Source and note: See Table 6-4.

in output. It seems that during that period although demand for light industry goods grew fast there was a great deal of technological progress(characterised by the rapit capital growth and rise in capital-labour ratio)[9]. In addition, the productivity change in light industry in 1980-1985 seems to have been affected by the change in market conditions: the traditional monopolistic

[9] The phenomenon looks more perplexing if we relate it with the so-called Verdoorn's Law: productivity growth would tend to be higher when output growth is accelerated. Dic Lo has tested the hypothesis for post-reform Chinese industry and found it empirically applicable(Market and Institutional Regulation in Chinese Industrialisation, PhD Thesis, the University of Leeds, 1994, Ch. Six).

Table 6-6. TFP estimates of sectors in heavy industry

	Output growth	Input growth			Total factor productivity
		Labour	Capital	Total	
1980-1985					
mining	2.4	4.0	8.5	6.6	-4.2
materials	6.0	5.1	7.2	6.8	-0.8
processing	12.1	4.2	4.8	4.6	7.5
1985-1988					
mining	6.4	2.7	7.6	5.0	1.4
materials	6.2	6.1	8.5	8.1	-1.9
processing	5.8	3.1	4.1	3.7	2.1
1988-1992					
mining	1.1	1.7	7.2	3.6	-2.5
materials	3.8	4.1	6.2	5.6	-1.8
processing	6.9	0.9	1.3	1.1	5.8
1980-1992					
mining	2.7	2.9	7.8	3.9	-1.2
materials	5.4	5.0	7.2	6.5	-1.2
processing	8.7	2.8	3.4	3.8	4.8

Source and note: See Table 6-4.

structure broke up into a competitive structure. A vast number of non-state enterprises, especially TVEs, emerged in light industrial markets. Regional and local SOEs also received stronger stimulation under decentralisation, and participated in the quest for a larger market share. Competition began to become a commonplace in light industry. Intensified competition may have helped light industrial enterprises to improve their technical efficiency and accelerate technological progress, but in that particular period(1980-1985), these effects might not have been sufficiently large enough to override the negative impact of these changing market conditions on the productivity rate.

That fact that productivity in light industry began to increase after 1985 is a strong indication that in the long run the transformation of market structure did however help to improve productivity.

Compared to light industry, heavy industry grew less fast in 1980-1992. Nevertheless, heavy industry has achieved an overall positive and fairly stable increase in productivity over the period. Because heavy industry is a huge sector and development within the sector seems quite uneven, we should look into the sub-sectors in heavy industry.

Output growth, input growth and productivity change are summarised in Table 6-6 for three sub-sectors in heavy industry in 1980-1992: mining, material producing, and heavy industrial finished-good processing. It is striking that these three sectors had considerably different experiences of post-1980 growth: productivity change was negative in the mining and material-producing sectors, and positive and large in the finished-good processing sector(it contributed over 55% of the output growth in the sector and supported the whole heavy industry sector's result of overall productivity growth in 1980-1992). The finished-good processing sector is of particular interest: it achieved productivity growth not only in a period when its output growth was relatively fast(i.e, in 1980-1985 and 1988-1992 when its growth rate was higher than that in the mining and material-producing sectors), but also in a period when its output growth was relatively slow(i.e, in 1985-1988, when its growth rate was lower than that in mining and material-producing sectors). Another feature of growth in finished-good processing sector is that fixed capital increased relatively slowly throughout the period(compared to both labour growth in the same sector and capital growth in the other sectors).

The main reasons for this achievement of productivity growth without the sector incurring substantial capital increases may include both the fast

technological progress made in this sector in general, and the structural transformation of traditional state military enterprises in particular. Several empirical investigations have generally confirmed that, compared to other manufacturing branches, China's machinery industry(in a broad definition it includes machine-tools, electronics, transport equipment, and so forth), achieved a better performance in technological progress in the 1980s, and this achievement was recorded in both state enterprises and non-state enterprises[10].

For state enterprises in this sector, the conversion of defence-related production into civilian-oriented production seems also to have played an important role. A significant portion of the sector is believed to have consisted of defence-related production in the pre-1980 period[11]. In branches such as machinery, electronics, shipbuilding, and the aircraft and aerospace industry, military enterprises are believed to have had the best technical equipment and most skilful labour force in China, at least up to the early years of the post-reform period. Since the late 1970s, when China began to re-shape its development strategy and international relations, defence-related industrial enterprises began to turn to civilian-oriented alternatives[12]. The

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[10] For studies based on state enterprises data, see Groves, et al, op.cit; Hay, et al, op.cit; for studies based on TVEs data, see, Svejvar, op.cit.

[11] Approximately, out of the total production(GVIO) in machinery, transport equipment, electricity equipment, electronics, and instrument-making industry, at least 13% might belong to military enterprises. This is derived from two figures: One: civilian products in military enterprises in electronics, shipbuilding, aircraft and aerospace industry, weaponry, and nuclear industry, were worth 23 billion yuan in 1988, about nine times that in 1980(Zhongguo jijie dianzi gongye nianjian(Almanac of China's Machinery and Electronics Industry) 1989, Volume of Machinery, I-13); Two: the percentage proportion of civilian products to the GVIO of the military enterprises of the same scope was 23% in 1980(Zhongguo gongye nianjian(Almanac of China's Industry) 1991, p.130).

[12] For an overall description of China's transformation of its defence industry, see: Keith Crane and K. C. Yel, Economic Reform and the Military in Poland, Hungary, and China, the RAND, 1991; and Mel Gurtov, "Swords into

conversion has been carried out quite successfully, as civilian-oriented production rapidly developed and has become a leading activity in most of the traditionally military enterprises. The overall proportion of civilian-oriented production in the total production of military enterprises has risen to 60% in 1989 from 15% in 1978[13]. In some branches, like electronics and the shipbuilding industry, the conversion is nearly complete: over 90% of production in these traditional military enterprises was civilian-oriented products in the late 1980s[14]. This conversion has apparently helped to improve productivity in the sector: production grew faster than capital and labour because of the extensive use of existing equipment and the existence of a skilled labour force etc. The successful transformation of defence-related industry has formed an important part of the marketisation process in post-reform China's industry.

In mining and material-producing sectors, the major problems facing enterprises seem quite different from those factors in finished-good processing sector: there exist relatively low prices for output, and technological backwardness largely due to the pre-reform policy that pursued self-sufficiency in all major industrial material supply. To support industrialisation in manufacturing industries, pre-reform China apparently adopted a price policy that favoured industrial finished goods(including light industrial goods) and therefore acted against industrial materials (particularly industrial energy goods). Meanwhile, pre-reform China invested heavily in the material-producing sector including the iron and steel

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Market Shares: China's Conversion of Military Industry to Civilian Production", CQ, NO. 134 (June 1993)

[13] Almanac of China's Industry 1991, p.130; Keith Crane and K.C. Yeh, op.cit., p.108

[14] Almanac of China's Machinery and Electronics Industry 1989, Volume of Machinery, I-13; Almanac of China's Industry 1991, p.131.

industry. The encouragement of regional self-sufficiency such as in the coal industry also led to a great number of technologically inefficient enterprises appeared in these sectors. In the post-reform period, these problems began to be increasingly exposed as enterprises faced more marketisation. Though the prices of industrial energy and materials products relative to other industrial products rose relatively fast in the post-reform period, especially after the mid-1980s, they seemed still not sufficient to cover the increases in costs of production because of the serious technological inefficiencies or constraints[15]. When production in these sectors grew relatively slow and engendered the shortages of supply, the state responded by increasing capital inputs. Indeed, as we can see from Table 6-6, capital increased relatively fast in the mining and material producing sectors throughout the period of 1980-1992(compared to their output growth and to capital growth in finished-good processing sector). Though the pressures leading to the imbalance were relieved by such response from government funding, it was achieved nevertheless at the price of productivity growth.

3. Sectors by Size of Enterprise

There are three notable features of productivity change as indicated in TFP estimates for large-, medium- and small-size enterprises in 1980-1992, as can be seen from Table 6-7. First, productivity change was positive for all of the three sectors. Overall, small industry achieved the highest productivity growth, with the next in medium-size industry, and the lowest productivity growth in large-size industry. Second, the relative productivity growth in the

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[15] Observers have noted that in China's coal and petroleum mining industry, production has entered late maturity in several important areas. Continued heavy investment would therefore generate much less return. See, the World Bank, China: Macroeconomic Stability and Industrial Growth under Decentralised Socialism, Washington, D.C., 1990, pp.50-51.

Table 6-7. TFP estimates of sectors by size of enterprise

	Output growth	Input growth			Total factor productivity
		Labour	Capital	Total	
1980-1985					
Large	5.9	2.9	7.2	6.4	-0.5
Medium	7.0	3.2	6.4	5.5	1.5
Small	13.9	7.1	10.9	9.6	4.3
1985-1988					
Large	7.0	6.6	9.1	8.4	-1.4
Medium	9.8	5.8	6.7	6.4	3.4
Small	7.5	3.7	8.0	6.5	1.0
1988-1992					
Large	11.2	11.4	8.4	9.4	1.8
Medium	5.7	5.5	4.4	4.8	0.9
Small	0.3	-2.4	0.2	-0.9	1.2
1980-1992					
Large	7.9	6.6	8.1	7.8	0.1
Medium	7.2	4.6	5.8	5.5	1.8
Small	7.6	3.0	6.5	5.3	2.3

Source and note: See Table 6-4.

three sectors experienced some changes over the period. In 1980-1985, productivity growth was negative in large industry, modest in medium industry (which accounted for 20% of output growth), and substantial in small industry (which accounted for 30% of output growth). In 1985-1988, while productivity growth continued to be negative in large industry, it became substantial in medium industry(which accounted for 35% of output growth) but became only modest in small industry(which accounted for 13% of output growth). Furthermore, in 1988-1992, productivity growth became positive in large industry, when it also continued to be an important factor in supporting output growth in medium and small industry. Third, it is the small industrial

enterprises that were able to achieve significant productivity growth throughout the period 1980-1992. Below is our brief discussion which focuses on large and small industry.

The most notable characteristic of small industry seems to be its flexibility in the use of factor inputs. This may be evidenced by the fact that small industry was the only sector that could reduce its labour growth substantially when its output growth slowed down. In 1988-1992, the output growth rate in small industry decreased considerably, down to 0.3% from 7.5% in 1985-1988. During this period, labour inputs ceased to grow and in fact the number of workers employed in small industry was reduced. The result was that though the output growth sharply slowed down, productivity continued to increase in the period. In large- and medium-size industry, on the other hand, the growth of labour inputs seems less closely associated with output growth. For example, in medium-size industry, the output growth rate in 1988-1992 was 5.7%, lower than the 7.0% of 1980-1985, but the growth rate of labour inputs in this period was 5.5%, much higher than the 3.2% of 1980-1985. Even if we compare with the immediately previous period, 1985-1988, it is still evident that medium-size industry was unable to reduce its growth rate of labour inputs in 1988-1992(there was only a 0.3 percentage-point fall from the figures of 1985-1988) in proportion to the decrease in its output growth(which had a 4.1 percentage-point fall).

The greater flexibility in the use of labour inputs in small industry may be mainly attributed to the fact that small industry faced a rather different labour market compared to large- and medium-size industry. About two-thirds of the small enterprises under our study were township enterprises operating in rural areas or on the periphery between urban and countryside areas. Workers in these areas were usually able to have more alternative employment opportunities than urban workers, for example, they might simply

return to agricultural activities. Being made redundant would therefore pose no great threat to these workers. In contrast, in urban areas where most large- and medium-sized enterprises were located, workers relied on existing employment to a great degree, as alternative employment opportunities were scarce or insufficient.

In principle, large- and medium-sized enterprises would be more able to seek economies of scale than small enterprises. In China, it has been the case that large enterprises were in general technologically advanced, capital intensive, and had more access to some infrastructure(such as transport and electricity power supply etc). From Table 6-7, we can see that capital inputs grew fastest in large industry over 1980-1992. This fact again implies that considerable technological progress may have been made in large industry over the period. We seem to have no reason to believe that the large industry would be relatively unimpressive in productivity growth, especially when compared to small industry[16].

In the light of the above discussion of the flexibility in the use of labour inputs, the main reason that we suspect may explain the phenomenon of significant productivity growth in small enterprises in comparison with large enterprises is a certain degree of over-employment in the large

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[16] There have been several studies which appear to show that the factor of economies of scale seemed not to be significant in China's industry, and this, if it is the case, would explain why large enterprises had no apparent advantages in productivity growth over, say, small enterprises. See: L.Q. Jia, "A Quantitative Analysis of Chinese Industrial Structure and Technical Change: Production Functions for Aggregate Industry, Sectoral Industries, and Small Scale Industry", Applied Economics, Vol. 23, No. 11 (1991). The article concludes that in China in 1952-1985, large and medium enterprises exhibited decreasing returns, where rural and small industry showing increasing returns); also, Yanrui Wu, "Scale, Factor Intensity and Efficiency: An Empirical Study of the Chinese Coal Industry", Applied Economics, Vol. 25, No. 3 (1993). Its author also concludes that no gain from scale economies was found in the investigation using 1985 survey data. These studies, we suspect, deal with a difficult question and use a method in which the scale factor and technical efficiency seem to have not been clearly disentangled.

enterprises. Given the data we have used for the present study, it is impossible to measure directly any degree of over-employment in large industrial enterprises. However, this explanation may be inferred by the existence of two facts: first, labour productivity growth was slowest in large industry in 1980-1992 compared to medium and small industry(this may be seen from Table 6-7 by comparing labour growth and output growth in the bottom panel); second, in many industrial branches, labour productivity is seen to decrease as the size of the enterprises being studied increases(this is found from the panel data classified by size of enterprise in recent issues of ZGGYJJTJNJ). The existence of over-employment creates a problem of technical inefficiency, and a fundamental cause of this problem is state enterprises' commitment to employees' interests such as safeguarding work and providing employment for employees' other family members.

III. Sectoral Shifts and Productivity Change

The preceding discussion of productivity change is conducted by looking at some individual sectors in China's industry. Here we wish to give an overall description, and examine the effect of sectoral shifts on productivity growth in post-reform China's industry. The purpose of the examination is to find out how productivity change has been associated with sectoral shifts.

The results of output and input growth, together with TFP(as a % of output growth) in the various industrial sectors are summarised in Table 6-8. There are, approximately, four types of relationship between productivity growth and output growth which we may observe from Table 6-8: (i) high TFP associated with high output: the processing sector of heavy industry in 1980-1985, and small industry in 1980-1985; (ii) high TFP associated with slow output growth: processing heavy industry in 1985-1988 and small industry in

Table 6-8. Summary of output and total input growth and TFP as a % of output growth in 1980-1992 China's industry

	1980-1985			1985-1988			1988-1992		
	Output	TFI	TFP	Output	TFI	TFP	Output	TFI	TFP
By form of ownership									
SOE	7.0	6.3	10.8	6.7	6.1	9.8	3.1	3.6	-16.8
COE	16.8	13.5	19.8	9.6	9.9	-3.9	6.7	0.8	87.4
JOE	23.0	25.4	-10.5	36.6	36.5	0.4	43.2	34.3	20.5
By type of activity									
Light	10.5	14.1	-34.6	10.7	10.4	2.6	5.2	4.2	20.8
Heavy	8.0	5.9	26.3	6.0	5.9	2.3	4.6	3.6	20.9
Mining	2.4	6.6	-170.9	6.4	5.0	21.8	1.1	3.6	-229.1
Materials	6.0	6.8	-14.1	6.2	8.1	-30.2	3.4	5.6	-54.3
Processing	12.1	4.6	62.1	5.8	3.7	35.6	6.9	1.1	83.8
By size of enterprise									
Large	5.9	6.4	-8.3	7.0	8.4	-20.3	7.9	9.4	15.8
Medium	7.0	5.5	21.5	9.8	6.4	34.6	7.4	4.8	15.0
Small	13.9	9.6	31.1	7.5	6.5	13.4	2.7	-0.9	444.4

Source and note: Tables 6-4 to 6-7. TFI is total factor inputs. The extremely high proportion of TFP as a % of output growth in 1988-1992 small industry was mainly due to the negative growth of TFI.

1988-1992; (iii) low TFP associated with high output growth: joint-ownership enterprises in 1980-1985 and light industry in 1980-1985; (iv) low TFP associated with slow output growth: mining industry in 1980-1985 and 1988-1992, and state enterprises in 1988-1992. These varied relations between output growth and productivity change imply that productivity change has been a "sectoral phenomenon" in post-reform China's industry: it has relied to a large extent on the characteristics of the industrial sector we are concerned with(much of our discussion in the previous section has dealt with the characteristics of the industrial sectors). Put another way, productivity

growth in post-reform China's industry has been more or less unbalanced between the sectors, and integrated development in these industrial sectors remains to be seen.

A further important issue concerning overall productivity growth in post-reform China's industry is the impact of sectoral shifts. Given the unbalanced productivity growth of various China's industrial sectors, it is important to ask whether sectoral shifts have affected aggregate productivity growth. At first sight, it seems that the question may be answered by comparing input growth and TFP among sectors. For example, by comparing output growth and TFP in state and non-state(collective and joint-ownership) industry, we may note that joint-ownership enterprises had a higher input growth rate and TFP than state enterprises, in 1988-1992(Table 6-8). This indicates that a faster growing sector had a higher productivity growth. In other words, the sectoral shift towards joint-ownership enterprises sector helped the aggregate productivity growth in the period. A similar relationship existed between collective enterprises and state enterprises in 1980-1985, between small enterprises and large- and medium-sized enterprises in 1980-1985, and between light and heavy industry in 1985-1988. Overall in the period 1980-1992 it is particularly impressive that sectoral shifts towards non-state industry(collective and joint-ownership) have been in line with the move from slower productivity growth(in state industry) into faster productivity growth(in non-state industry)(see the bottom panel in Table 6-4).

However, this comparison of input growth and TFP should not be pursued too far. First, the sectoral differentials in productivity or productivity growth in China's industry were also in some aspects associated with policy biases and historical factors. For instance, in the mining sector, productivity was relatively low and productivity growth was also relatively slow. The main reasons included the relatively low prices for mining products,

and the relatively high production costs in the sector. A problem in the 1980s was that any rapid or large rise in the price of mining products would greatly hinder industrial development in the downstream sectors. In addition, the relatively high production cost level reflected the fact that development in this sector was pursued with little regard to production efficiency in the pre-reform period. Given these constraints on the mining sector, continued fast growth in and factor shifts towards industrial sectors other than mining would cause severe imbalances between them, and therefore hinder industrial development. In other words, sectoral shifts that simply exploited differentials in productivity without hindrance would cause obstructions in the growth of the entirety of post-reform China's industry.

Second, the comparison may have some methodological problems, as we have indicated in Chapter Four(Section II). A higher TFP may imply that productivity growth is faster in a sector, but may not necessarily mean that the sector has a higher productivity than other sectors. Therefore, shifts of resources towards a sector with a higher TFP would not necessarily comply with

Table 6-9. Comparing productivity in light and heavy industry(heavy industry = 1.0), 1980 and 1985

	1980	1985
Labour productivity	1.5	1.4
Capital/labour ratio	0.4	0.5
Capital/output ratio	0.3	0.4
Total profits as % of fixed capital	3.4	2.2

Source and note: ZGGYJJTJNJ 1993, pp.156 and 169. Labour productivity here is GVIO per worker; capital/labour ratio is fixed capital per worker; capital/output ratio is fixed capital/GVIO ratio; total profits include tax.

the hypothesis of a move from lower productivity towards higher productivity. Compare light and heavy industry in 1980-1985. During this period, TFP was negative in light industry and positive in heavy industry. Meanwhile, factor input growth was faster in light industry than in heavy industry. From these observations we should not however conclude that the sectoral shift towards light industry was associated with a move from higher productivity towards lower productivity. In fact, by various measures, productivity in light industry was higher than in heavy industry in that period. As shown in Table 6-9, in 1980, at an average level, workers in light industry used less than half of the capital that was used in heavy industry, but produced one and a half times the output as that of heavy industry. Also, in light industry the capital-output ratio was much lower and the profit rate much higher in 1980. By 1985, the gap between light and heavy industry had become smaller(that may have been due to the faster productivity growth of heavy industry in 1980-1985), but the superiority of light industry over heavy industry in terms of productivity difference remained. The case of this relative growth in light and heavy industry in fact shows that, while factor inputs indeed tended to shift towards the sector with higher productivity, productivity growth in the sector was nonetheless slower than in a sector with a lower level of actual productivity.

To study the impact of factor reallocation among sectors, we may take the measure of labour productivity and use a formula that was illustrated in Chapter Four(Section II). A possible problem with the measure of labour productivity is that it may not reflect the true relative productivity in one sector because of sectoral differences in capital-labour ratio. For example, labour productivity would be always higher in large-size enterprises as they tend to use more capital at per worker level. The productivity with which capital is used would however not be always higher in large-sized enterprises.

Table 6-10. Growth of labour productivity and the reallocation effect

Sectors by form of ownership						
	Total	SOE	COE	JOE	Weighted growth	Reallocation
1980-85	19.1	20.1	41.3	47.7	23.9	-4.8
1985-88	13.0	10.3	11.0	24.8	10.6	2.4
1988-92	9.3	3.9	19.3	51.1	8.9	0.4
Sectors by type of activity						
	Total	Light	Heavy		Weighted growth	Reallocation
1980-85	16.9	13.4	18.8		16.7	0.2
1985-88	10.1	14.0	7.1		9.9	0.2
1988-92	12.0	12.6	11.1		11.8	0.2
Sectors by size of enterprise						
	Total	Large	Medium	Small	Weighted growth	Reallocation
1980-85	18.5	15.4	19.7	36.4	23.8	-5.3
1985-88	9.3	0.9	11.8	11.4	7.6	1.7
1988-92	14.7	-0.9	0.6	11.1	4.7	10.0

Source and note: Labour productivity is measured by the net value of output(Table A5-3) per worker(Table A5-4). The weighted growth is sectoral labour productivity weighted by sectoral share in output. The reallocation effect is the total labour productivity growth deducted by the weighted labour productivity. Because of statistical discrepancies, the total level of labour productivity and its growth in sectors classified by different criteria is slightly different. Calculations are, however, based on consistent figures.

Despite this possible problem, we wish to use the measure of labour productivity for the purpose of comparison. Table 6-10 summarises the growth of labour productivity in various sectors in post-reform China's industry and calculates the reallocation effect.

From the table, we may firstly note that, in China's industrial sectors classified by the form of ownership, the reallocation effect on aggregate labour productivity growth was negative in 1980-1985 but became positive after 1985. The negative reallocation effect in 1980-1985 seems mainly due to the fact that labour productivity was highest in state enterprises in 1980 but sectoral shifts were against state industry in 1980-

1985. For sectors classified by type of activity(light and heavy industry) the reallocation effect has been always positive throughout the period of 1980-1992, but also small in proportion to overall labour productivity growth in the period. For industry when classified by size of enterprises a similar situation existed, except in 1988-1992, as that for industry classified by form of ownership. The reallocation effect was negative in 1980-1985 but became positive after 1985. It is notable that in 1988-1992 labour productivity growth was negative in large enterprises and barely existed in medium-sized enterprises. However, because these two sectors had a higher level of labour productivity than the small industry, the sectoral shift towards the large- and medium-sized industrial enterprises in the period has actually helped the overall labour productivity growth, to a significant degree(68%).

The relative labour productivity growth in large- and medium-sized enterprises and small enterprises seems particularly interesting: when labour productivity growth was high in all of the three sectors, the reallocation effect was insignificant(during 1980-1985); when labour productivity growth slowed down, the reallocation effect became substantial(during 1988-1992). Overall, labour productivity grew much faster in small enterprises than in large- and medium-sized enterprises during the period. These relative trends cast a doubt over whether the sectoral shifts towards small industrial enterprises in post-reform China was conducive to overall industrial productivity growth[17].

Broadly, we may conclude that the impact of factor reallocation among sectors on overall productivity growth has been positive in post-reform

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[17] The question has been articulated by Peter Nolan: "China's industrial efficiency may well have tended to be dragged down by the proliferation of small firms"(Peter Nolan, State and Market in the Chinese Economy, London: Macmillan, 1993, p.281).

China's industry. Given that productivity growth in individual industrial sectors was uneven, the positive reallocation effect may be regarded as having played an important role in helping China's industry to achieve overall productivity growth. However, through the comparison of both sectoral total factor productivity and sectoral labour productivity growth we have also found that, in a sector with higher productivity, productivity growth was often slower than in a sector with lower productivity, and in some cases the productivity growth even became negative. To explain this phenomenon, we need to consider further characteristics of industrial competition in post-reform China, and their implication for productivity growth. This forms the theme of our study in Part Three.

PART THREE

THE PROCESS OF INTERACTION

Chapter Seven

Transforming Market Structure in China's Industry

The preceding discussions in Part One and Part Two have demonstrated that post-reform China's industry has been able to pursue the effective use of productive resources available in the economy and to achieve, in general, a degree of productivity growth. The growth of productive resources and productivity has been closely associated with a greater market exposure faced by China's industrial enterprises, and their pursuit of economic growth has been to an increasingly large extent affected by market forces rather than by traditional state planning practice.

In the process of post-reform China's industrialisation, the growth of productive resources and productivity change were accompanied by a great deal of institutional and structural transformation. The traditional major actor in China's industry, state enterprises, began to re-shape their relationship with government, and non-state enterprises, especially the township and village enterprises(TVEs) achieved rapid development. In contrast to the reduction of the role of the central planning authorities in the economy, regional and local governments have played a more important part under decentralisation. Structurally, with changes in market demand and shifts in financial resources, the sectoral or branch composition of industrial production underwent considerable change: the traditional heavy-industry-

focused and domestically-oriented structure of production gave rise to a light-industry-led and more-outward-orientated pattern.

These institutional and structural changes were all associated with a increased role for market forces, and a behaviourial re-orientation of enterprises, especially state enterprises. Under the traditional Stalinist central planning system, linkages between the market and enterprise activities were cut off by the state through all-encompassing plans. Enterprises were "de-stimulated" and "disabled" in their response to changes in market conditions including changes in market demand. Any quest for an increase in productive resources and productivity growth was thus left mainly to the state particularly the central government. Since reforms have empowered enterprises to act to an increasingly large degree without the constraints of state plans, and endowed enterprises with more of their own independent interests, the task of pursuing resource mobilisation and productivity growth has been gradually transferred from the state to individual enterprises, though the state still maintained great leverage over the final economic growth. In this sense, enterprises themselves have assumed or have begun to assume a central role in post-reform China's industrial development.

In Part Three we therefore wish to illuminate one issue of the implications of the greater autonomy of enterprises for industrial development in post-reform China. The issue can be disentangled into several aspects. First, was the greater autonomy for enterprises associated with market integration in terms of convergence in market structures? Second, how significant were the differences between state and non-state enterprises in terms of their behaviour and financial performance? Third, what was the role played by regional and local government in post-reform China's industrial growth?

The first two questions will be dealt with in Chapter Eight below.

In this chapter, we will start with a description of the market structure facing China's industrial enterprises in early years of the post-reform period. This is followed by a profit rate convergence analysis. The purpose of the analysis is to show whether and to what extent the perceived greater enterprise autonomy has meant that the forces of market integration have increased both competition and greater factor mobility. In the second section of the chapter, we compare state enterprises with non-state enterprises with regard to their structural and behaviourial differences. In the third section, we respond to an associated question of how the observed declining profit rate in post-reform China's industry was associated with enterprises' pursuit of increased use of resources(especially financial resources) and productivity growth.

It has been found in our analysis that the behaviour of post-reform China's industrial enterprises was still to a certain degree dependent upon the direct influence of governments. This finding is in principle consistent with the greater role played by regional and local governments in the post-reform period. To respond to this issue, we consider post-reform regional growth and competition in Chapter Eight. We wish to examine how regional and local governments have affected industrial development in the post-reform period, through their impact on resource mobilisation and productivity growth.

I. Market Structure and Convergence in Returns on Capital

The literature dealing with market structure in a market economy is usually concerned with issues such as industrial concentration(the share in an industry which is taken by a few firms) and relations between large and small

enterprises etc[1]. When investigating market structure in an economy or industry a frequently used measure is the profit rate. Though the profit rate may be affected by a number of factors, it nevertheless has a close relationship with market structure characterised by the presence or absence of monopolistic firms. Considerable disparities in the profit rate may exist between firms within an industry and/or between industries that are with a different market structure.

The underlying postulate in the literature is that firms are profit-seeking agents, always operating with the incentives of gain. And if there were full factor mobility across industry, sharp gaps in the profit rate across industrial sectors or branches would tend to disappear. Thus, a convergence of the profit rate may reflect two things: the behaviour of firms (whether they are profit-oriented) and factor mobility across industries (whether there are significant entry barriers).

The convergence analysis seems relevant to post-reform China's industrial growth. It would help us to see whether there have been significant changes in enterprise behaviour concerning profit-orientation and to what extent factor mobility has increased in industry. To the first question, whether China's enterprises have had a stronger profit motivation under reforms, empirical studies have already produced a good deal of evidence confirming a positive answer[2]. However, a further question that may be addressed in this respect is whether the profit-oriented behaviour in post-reform China's industrial enterprises has been associated with any direct influence of government agencies. We will come to this question in our

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[1] See Donald A. Hay and Derek. J. Morris, Industrial Economics and Organization: Theory and Evidence, Oxford: OUP, 2nd edition, 1991, Ch. 8 and Ch. 15.

[2] See, Donald Hay, et al, Economic Reform and State-owned Enterprises in China 1979-1987, Oxford: Clarendon Press, 1994, Ch. 2 (Enterprise autonomy and incentives).

convergence analysis.

The second question, how far the factor mobility has increased in post-reform China's industry, concerns market integration, especially in factor markets including labour and capital. Greater factor mobility means more freedom enjoyed by enterprises in allocating resources, with the primary aim of seeking gains. If greater factor mobility has facilitated a more efficient allocation of resources in terms of resources flowing into areas with a higher rate of return, it can be said to have more profoundly facilitated resource mobilisation and productivity growth. However, this seems to be a question that we must consider with care because, as some note, the role of greater factor mobility, together with that impetus of the stronger profit-orientation, may not necessarily have positive implications for productivity growth in the context of the China's economic system[3]. We will examine the issue with special reference to the role of regional government in post-reform China's industrial development in the next chapter.

Moreover, we should point out that, apart from indicating profit-oriented enterprise behaviour and factor mobility, any convergence in the profit rate would also reflect the process of price reform and its impact on price structure. This seems a fairly complex issue. Let us start with a look at price structure in the pre-reform period. Some observers have pointed out that the price structure in pre-reform China's industry was highly

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[3] To quote: "[W]ithout price reform and without measures to make the cost of capital to enterprise reflect its opportunity cost to the economy, free capital flows to the highest financial returns could result in inappropriate investments and waste. This problem has already become serious as enterprises, banks, local governments, and other administrative entities making investment decision become more and more responsive to profitability." William Byrd and Gene Tidrick, "Factor Allocation and Enterprise Incentives", in Gene Tidrick and Chen Jiyuan, eds. China's Industrial Reform, New York: OUP, 1987, pp.91-92

Table 7-1. Rate of Return and Growth rate in China's industry

	1952	1965	1980	1992
Light industry				
Profit rate	40.2	75.5	60.9	19.8
Annual growth rate		9.3	8.4	14.9
Heavy industry				
Profit rate	17.6	22.2	17.9	11.7
Annual growth rate		14.3	9.4	13.1

Source and note: ZGGYJJTJZL 1986, p.111; and ZGGYJJTJNJ 1993, pp.104 and 156. Profit rate here is total profits and taxes as a % of fixed assets in original value; for 1952 and 1965 it is of state enterprises only. Growth rate is that of GVIO in comparable prices.

distorted[4]. This may be seen by comparing the profit rate in different industrial sectors or branches. In Table 7-1 the profit rates in light and heavy industry are compared for the pre- and post-reform periods. It shows that up to 1980 light industry had a much higher profit rate than heavy industry. In Table 7-2, we compare the profit rates in the mining and processing sectors(both of heavy industry) of various products, since 1980. This table shows that in 1980 a common feature of the price structure prevailing in China's industry was that the products from the mining sector were priced relatively low, and processing products were priced relatively

[4] Bela Balassa has concluded as much in the mid-1980s about the price structure in China, saying: "Official prices in China are the result of governmental decisions taken at different points of time and for different purposes. They correspond neither to production costs nor to market conditions". He also argued that the basic situation has not changed much(up to the time at which he was writing) since the price adjustment process that began in 1978. See, Bela Balassa, JCE, September 1987

Table 7-2. Total profit rate in mining and processing industries

	1980	1985	1988	1990	1992
Coal					
mining	6.1	1.2	-0.4	-4.7	-2.1
processing	20.6	16.0	14.0	13.0	11.6
Petroleum					
mining	55.8	25.0	7.4	0.2	-1.2
processing	99.3	95.4	56.5	30.8	25.3
Ferrous metals					
mining	7.3	16.6	12.3	9.8	9.3
processing	18.3	25.8	23.5	16.3	15.5
Non-ferrous metals					
mining	9.7	9.4	13.0	12.1	5.9
processing	17.2	19.6	19.8	11.9	9.6
Building materials					
mining	17.0	14.4	15.3	13.5	9.9
processing	20.8	20.8	17.9	9.2	12.4

Source and note: ZGGYJJTJNJ 1993, pp.171-79. The total profit rate here is of the same definition in Table 7-1. Coal processing is the electricity power industry.

high. From Tables 7-1 and 7-2, we may also note that differences in the profit rate between light and heavy industry have become smaller over 1980-1992, but that the difference between the mining and processing sectors in heavy industry remained wide (except in the building materials industry).

A characteristic of pre-reform China's industrial growth is, however, that production growth had only a weak association with the sectoral or inter-branch differences in profit rate. As can be seen from Table 7-1, though the profit rate in light industry was much higher than in heavy industry prior to

1980, the growth rate of light industry was lower than that of heavy industry. This is basically because sectoral or inter-branch growth was under the control of the state planning authorities, who were able to decide, in line with their development strategy, on the allocation of productive resources. The dominance of state enterprises in industry made it possible for the state to seek the high monopoly profits in light industry(and some heavy industry) by strict control of any unplanned entry into these areas. The heavy-industry-focused policy inclination led China to shift these monopolistic gains into heavy industry, i.e, by investing heavily in heavy industry in the pre-reform period. It is therefore not surprising that heavy industry saw a higher growth rate in the pre-reform period.

The basic situation facing China's industrial enterprises(as well as regional and local governments) at the beginning of reforms was, therefore, that since there were considerable differentials in sectoral or inter-branch profit rates in industry, the possible gains from reallocating productive resources across sectors or branches looked enormously large. The fact that light industry achieved faster growth than heavy industry after 1980 is associated with the overall difference in the profit rate between light and heavy industry. On the other hand, the slower production growth in the mining sector in the same period may be also, at least partly, explained by the fact that the profit rate in the sector remained relatively low in general(the growth rate in the mining sector is not listed in Table 7-2 but can be seen from Table 6-6 in the previous chapter).

We may also note from Tables 7-1 and 7-2 that, by 1992, the difference in the profit rate between light and heavy industry had become smaller, but remained significant between the mining and processing sectors in heavy industry. One conclusion we may draw from these comparisons seems to be that relative prices or relative profit rates of light and heavy industry

have been greatly affected by relative growth rates in the two areas, but that relative prices or relative profit rates of the mining and processing sectors have not, at least not to the same extent as in light and heavy industry. It may further imply that the price structure in the mining sector has been less reformed, i,e, that the relatively low prices in the mining sector have not been sufficiently driven up by higher growth in the sectors which generate demand for mining products.

This relative price relation between the mining and processing sectors may at least partly explain the persistent imbalances between supply of and demand for mining products in China. The relatively high prices and profit rate in non-mining industrial sectors made them attractive for resource inflow, while the relatively low prices and profit rate in the mining sector has meant growth there lagged behind overall industrial growth. Demand for mining products grew in proportion with overall industrial growth and thus engendered the shortages in the supply of mining products. As long as the prices of mining products remained inflexible, the imbalances persisted, and so did the disparities in the profit rate.

It thus becomes clear that transforming both market structure and the convergence in the rate of return requires more price flexibility, in addition to profit orientation in enterprise behaviour as well as greater factor mobility. A disclaimer seems necessary here. We do not actually intend to argue for complete price flexibility, complete factor mobility, and complete profit orientation in enterprise behaviour here. What we have tried to show is that progress made in these three aspects would all help market integration and the transformation of the market structure characterised by the traditional state enterprise monopoly.

Several observers have suggested that post-reform China's industry has made progress in improving market conditions by showing a tendency towards

a convergence in the rate of return[5]. Some of the observations are made at enterprise level, and some at branch level but for state industry only. The measures of the rate of return by which convergence is investigated are also used differently. It seems necessary to make some clarification of the criteria for measuring convergence of rate of return.

First, at what level should we measure convergence in the rate of return? This seems dependent on the purpose of the investigation. As we are concerned with price structure and market conditions, measurement at branch level seems most relevant here. If there is price distortion among sectors, say, higher-priced light industry versus lower-priced heavy industry, the distortion would mostly be reflected in data at sector level. Given the overall disparities at sector level, it is nevertheless possible that, due to other factors such as capital intensity, location, and individual performance etc, some light industry enterprises could have a lower rate of return and some heavy industry enterprises could have a higher rate of return. Data at enterprise level may therefore reflect more of the influences of these non-relevant variables.

The second issue is about what measure of returns should be used in observing any convergence. Conceptually, returns may be either before-tax surplus(profits plus product taxes in China) or after-tax surplus(fulfilled profits). Because tax schemes have an important impact on the returns to

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[5] For example, Gary Jefferson and Wenyi Xu find that the coefficient of variation in the output-capital ratio of 226 large- and medium-sized enterprises fell steadily from 1980 to 1989(see their, "Assessing Gains in Efficient Production Among China's Industrial Enterprises", Economic Development and Cultural Change, Vol. 42, No. 3 (April 1994). They also examine the coefficient of variation in the rate of return on capital of 352 state-owned enterprises and find it falling from 1980 to 1987(see their, "The Impacts of Reform on Socialist Enterprise in Transition: Structure, Conduct, and Performance in China's Industry", JCE, No. 15 (1991). Based on data at branch level(38 state industrial branches), Barry Naughton finds that the coefficient of variation in the rate of profit and tax on capital was also falling from 1980 to 1989(see his, "Implications of the State Monopoly on Industry and its Relaxations", Modern China, Vol. 18, No. 1 (January 1992).

Table 7-3. Coefficient of variation in rate of return in China's manufacturing by branch

	1980	1985	1988	1992
Total returns on total capital	1.33	1.06	1.14	1.00
exc. tobacco and coking	0.59	0.53	0.38	0.54
Net returns on total capital	0.56	0.41	0.39	0.65
exc. tobacco and coking	0.55	0.39	0.33	0.49
Total returns on fixed assets	1.95	1.54	1.49	1.23
exc. tobacco and coking	0.62	0.46	0.31	0.35
Net returns on fixed assets	0.60	0.40	0.40	0.60
exc. tobacco and coking	0.59	0.39	0.34	0.47
Total return margin on sales	0.41	0.41	0.44	0.49
exc. tobacco and coking	0.25	0.27	0.23	0.26
Net return margin on sales	0.32	0.30	0.29	0.36
exc. tobacco and coking	0.26	0.25	0.21	0.27

Source and note: ZGGYJJTJNJ 1993. Total number of manufacturing branches is 30. Total returns are profits and product taxes, and net returns are profits only. For measures with sales, profits are those not adjusted to non-business balances. Total capital is fixed assets net of depreciation plus yearly-average circulating capital. For measures with capital, profits are the fulfilled profits.

enterprises[6], it seems plausible that we should include the product taxes

[6] This is mostly due to the fact that the rate of product tax is usually fixed at product or branch level in China's industry. As a result, there are wide discrepancies in the tax rates among branches, as shown below:

	1980	1992
Food products	4.3	2.9
Forage	1.3	1.2
Tobacco	59.5	47.6
Textile	9.1	4.9
Petroleum products	12.9	11.0
Chemicals	7.9	7.7
Ferrous metals	6.4	9.1
Machinery goods	5.5	4.5
Transport equipment	3.4	3.6

Source: ZGGYJJTJNJ 1993.

when measuring the returns in China's industrial enterprises. On the other hand, this question may also be related to the underlying question of the objectives of post-reform China's industrial enterprises. If most of the industrial enterprises tended to seek the after-tax surplus, this part of the returns would be mostly subject to an equalisation tendency. By the same token, if retained profits were the major objective, the rate of return would go equal quickly instead. An underlying assumption is that competition between enterprises would be a decisive driving force for the convergence trend, if any. Based on these perceptions, we will compare various measures of the rate of return, and seek an interpretation that is appropriate to the objectives of post-reform China's industrial enterprises.

The results of convergence estimates using several measures of the rate of return are summarised in Table 7-3. In the table we have excluded non-manufacturing branches, mining and utilities. Compared to mining, manufacturing is presumably less prone to the influence of factors such as location, and perhaps is more capable of making adjustments in capacity. We have also noted that there are two extremes: tobacco and coking in China's range of manufacturing. The tobacco industry has usually had the highest rate of return in various measures, and the coking industry has represented the lowest end. The two industries have also had some incomparability with other manufacturing branches. In both branches, state enterprises still dominate. A monopoly policy has been in effect in the tobacco industry for a long while, despite the fact that it has been amongst the few branches that have experienced the fastest growth in production and the quickest decline in the profit rate in the post-reform period. Its total profit rate was over ten times the average level of the whole of industry in 1980, and still seven times as great in 1992. In the other extreme, the coking industry suffers from a low-price policy that has been aimed at protecting the interests of urban

consumers. The total profit rate began to fall sharply from the late 1980s, resulting in a branch-wide balance-sheet loss record in 1992(the only branch in manufacturing that suffered an overall loss). In short, the tobacco and coking industries both have some features that are imcompatible with other industries. By excluding these two branches, the results of our examination can be seen to be indicative of the majority of China's manufacturing production. As we will show below, the two series, i.e., that with the tobacco and coking industries and that without, indeed show some differing trends.

Table 7-3 provides results showing both the rate of return on capital and the return margin on sales. We will discuss them in order. Firstly, the rate of return on capital. For all measures of the rate of return on capital, the coefficients of variation become smaller from 1980 to 1988. In the remaining years of the period, i.e., 1988 to 1992, there appear to be different trends for different measures. The coefficient of variation in the rate of total returns on total capital and in the same rate on fixed assets continued to become smaller for the whole of China's manufacturing including tobacco and coking industries. But when we exclude tobacco and coking industries, the coefficient of variation shows a contrasting trend. On the other hand, the coefficient of variation in the rate of net return on total capital and in the same rate on fixed assets both become larger in 1988-1992, and the trends are same for the whole of China's manufacturing and for the series that excludes the tobacco and coking industries.

Before moving to discuss the implications of these results, we may need to decide which of the four measures would be most appropriate as an indicator for our examination. As we have pointed out above, the comparative relevance of each measure may be related to what it reveals about trends in convergence, i.e., a measure that shows a stronger trend towards convergence would be seen to be of more relevance. By this criterion, the rate of total

returns on fixed assets appears to be the most appropriate indicator of the four measures. The coefficient of variation in this measure generally decreases over 1980-1992 for China's manufacturing with or without the tobacco and coking industries. In contrast, measures of net returns including those of total capital and of fixed assets do not show an overall trend of convergence for 1980-1992. Though the measure of total returns on total capital shows a similar convergence trend as that shown by the measure of fixed assets, the magnitude of the changes in the coefficient of variation in the former is nevertheless smaller than in the latter(from 1980 to 1992, for the whole of manufacturing, the coefficient of variation using the measure of total capital reduces from 1.33 to 1.00, and that of the measure on fixed assets reduces from 1.95 to 1.23; similar relations exist for manufacturing excluding the tobacco and coking industries).

The greater relevance of total returns(profits and product taxes) than net returns(fulfilled profits only) to the objectives of post-reform China's manufacturing enterprises may suggest that regional and local governments had a considerable influence on enterprise behaviour. This is equivalent to saying that the inter-branch allocation of capital was distributed with more regard to returns in the form of product taxes, and that must reflect a strong influence from regional and local governments on enterprise behaviour. On the other hand, the capital base may have been perceived by post-reform China's enterprises as primarily in the form of fixed assets. The use of circulating capital would have been in most cases a supplementary means. As we have shown in the previous chapter, the ratio of fixed assets to circulating capital varied with branches in post-reform China's industry. It seems therefore that the use of circulating capital might have been dependent on a number of branch-specific factors such as the requirements of inventory, and the intensity of competition within a branch.

Focusing on the rate of total returns on fixed assets, we can note that, up to 1988, the coefficients of variation for China's manufacturing, with or without the tobacco and coking industries, became steadily smaller after 1980; in 1988-1992, whilst the coefficient of variation continued to become smaller for the whole of China's manufacturing(from 1.49 to 1.23), it however became larger for manufacturing without the inclusion of the tobacco and coking industries(from 0.31 to 0.35). This implies that for the majority of China's manufacturing branches, the convergence trend in the rate of return was obstructed in the later years of the period, and the overall continuing convergence for the whole of manufacturing industry in 1988-1992 was largely contributed to by the falling rate of return in the tobacco industry.

What accounted for the rise in the coefficient of variation of the rate of total returns on fixed assets in the majority of China's manufacturing branches in 1988-1992? As will be shown in Section III later this chapter, virtually every branch in China's industry saw a decline in total returns on fixed assets in 1988-1992. The rise in the coefficient of variation in the period must therefore be explained by a sharper decline in the rate of return in some branches. Of all, the most notable branches include food products, forage, textile, fur and leather processing, and timber processing. They all suffered a sharp decline in the rate of return on capital in 1988-1992 and all are in light industry. A common feature shared by these branches is the relatively easy entry to the industry. This is characterised by a low capital intensity requirement, and insensitivity to location. Yet all of these branches had a higher rate of return on capital than the average level in the early 1980s. It is therefore very likely that over-entry or over-production caused the sharp decline in the rate of return in these branches over the period.

With the return margin on sales, the trend shown by changes in the

coefficient of variation in Table 7-3 is somewhat different from that shown with the rate of return on capital. By the measure of total return margins (profits and product taxes) on sales, in 1980-1992, the coefficient of variation became steadily larger for the whole of manufacturing, and moved intermittently upwards when we look at manufacturing without the tobacco and coking industries. By the measure of net returns(profits only) margin on sales, the coefficient of variation became slightly smaller for the whole of manufacturing and modestly smaller for manufacturing without tobacco and coking in 1980-1988. In 1988-1992, however, the coefficient of variation became larger in both cases. The differences between the trends shown in the measures of total return margin and net return margin may be, again, ascribed to the impact of tax schemes or changes in the tax schemes.

As we have said, the measure of total return margin on sales shows a convergence trend for the majority of China's manufacturing branches in 1980-1988. The margin in the tobacco industry did not fall as much as the rate of return on capital. On the other hand, the margin in the coking industry fell as sharply as the rate of return on capital. This seems to be the main reason for the coefficient of variation for the whole of manufacturing to rise in 1980-1992. In the later years of 1988-1992, the reason for the coefficient of variation of the return margin for manufacturing excluding the tobacco and coking industries rising is similar to that for the rate of total return on fixed assets discussed above. The return margins saw a fall in every branch of China's manufacturing during the period, but some branches experienced a faster fall, and that results in the enlarged variance between branches. The branches which had such experience, apart from the coking industry, were food products, forage, textiles, fur and leather processing, and timber processing, similar to the result in the measure of rate of total return on fixed assets which we looked at earlier. The underlying driving forces are therefore

considered to be the same in both cases: the easy entry facilitates expansion of production which in turn leads to increases in supply overshadowing increases in demand, resulting in severe downward pressures on the return margin.

To summarise the above discussion on the convergence trend in the rate of return in post-reform China's industry, we may note that, in general, there seems to be a distinct convergence trend in the returns on capital in manufacturing over 1980-1992. This would imply that inter-branch competition has intensified in a way which allows the allocation of capital resources to be pursued with regard to differentials in the returns on capital. In the later years of 1988-1992 the convergence trend seems to have been, however, obstructed by some degree of "over-competition" in several light industrial branches. Meanwhile, the convergence trend measured by the returns on sales margin seems weaker than that measured by the returns on capital. This would imply that price reform or any improvement in the price structure was slower than the process of decentralization. In other words, decentralization has shown a greater impact on inter-branch allocation of capital than on inter-branch price structure. Overall, our analysis suggests that reforms have facilitated the transformation of market structure by promoting competition, relaxing entry barriers(particularly in light industry), as well as endowing enterprises and regional/local governments with a stronger profit-seeking motivation(in a broad sense). However, on the other hand, signs of unbalanced evolution in market structure are also being seen.

II. State versus Non-State Enterprises

Relations between state and non-state enterprises are an important aspect of post-reform China's industry. State enterprises used to be the pillar of

socialist China's industry in the pre-reform period: they were a provider of major industrial products, and the single main source of fiscal revenue. In return, state enterprises received great support and protection from the state, such as low-cost funding and market dominance. Compared to collective enterprises that existed sparsely in peripheral areas in the economy, state enterprises were urban-oriented, more capital-intensive, technologically advanced, and had a more skilled labour force. Since the later 1970s when reforms began, however, state industry has apparently fallen behind non-state industry in growth. In 1979-1992, the average growth rate in non-state industry is over 30% annually, almost four times as high as in state industry, resulting in the share of state enterprises in the gross value of industrial output falling from 78% to 48%. Meanwhile, massive balance-sheet losses began to mount in state industrial enterprises. By 1992, about one quarter of state independently-accounting industrial enterprises reported a loss, and the losses suffered by state enterprises accounted for over three-quarters of the total losses in all independently-accounting industrial enterprises.

The sharply contrasting growth between state and non-state enterprises raises a question about the relative performance of state industry compared to non-state industry. In particular, the question may be addressed in the way which we set forth in the previous section: did the relative performance of state versus non-state industry conform to the general trend of convergence in behaviour and performance in post-reform China's enterprises overall? In other words, is there a convergence trend in performance between state and non-state industry? In answering the question, we are concerned with the issue of structural and behaviourial differences between state and non-state enterprises[7]. In what follows, we will firstly compare some overall

[7] This however does not mean that we have claimed that state-owned enterprises are fundamentally different from, say, collective enterprises in organizational status and behaviour. To some observers, there seem to be

financial indicators for state and non-state industry, and then examine some important structural and behaviourial factors that affect the relative performance of state and non-state industry. The discussion below serves as a supplementary description to the previous section and is therefore rather brief.

As shown in Table 7-4, there seems to be a convergence tendency in the rate of return on capital between state and non-state industry(collective and joint-ownership industry). From 1980 to 1992, the variance in rates of return among the three forms of ownership became considerably smaller(from 238.7 to 17.1). This change has certainly embodied some effects of the overall decline in the rate of return on capital, but does also reflect the diminishing dispersion in the rate of return on capital among the various forms of ownership. Notably, the rate of return on capital fell at the same speed in state industry and in collective industry in 1980-1992. The main cause for the diminishing dispersion is therefore the rate of return on capital in joint-ownership industry, which fell faster in the period.

Compared to state and collective industry, the joint-ownership industry is the only one that saw a unfavourable move in the capital-output ratio(it is expressed in inverse terms in Table 7-4), and its price margin fell relatively slowly. This seems to imply that some structural factors had an important impact on the changes in joint-ownership industry. For instance,

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complete dissimilarities between the two categories: SOEs are profit-apathetic, administratively-backed, and innovation-incapable, while COEs are profit-greedy, cinderella-like, and full of creativity(see, for example, James B. Stepanek, "China's Enduring State Factories: Why Ten Years of Reform Have Left China's Big State Factories Unchanged", in USCJEC, ed. China's Economic Dilemmas in the 1990s, Washington, DC: Vol. II, 1991). A more recent account has however emphasised the wide links between local governments and township and village enterprises(TVEs), the backbone force in COEs(see Barry Naughton, "Chinese Institutional Innovation and Privatization from Below", in AER, Vol. 84, No. 2 (May 1994)). It is also found that many of the TVEs are actually "state-owned"(see Dwight H. Perkins, China's 'Gradual' Approach to Market Reforms, Discussion Papers No 52, UNCTAD, 1992, p.20).

Table 7-4. Rate of return in industry by form of ownership, 1980-1992

	1980	1985	1988	1992
State				
total returns on fixed assets	24.3	22.2	20.2	12.4
GVIO/fixed assets ratio	1.0	1.0	1.1	1.1
price margin	26.4	24.0	20.9	17.3
Collective				
total returns on fixed assets	38.4	34.7	27.4	19.6
GVIO/fixed assets ratio	2.4	2.4	2.5	2.6
price margin	19.3	18.5	16.0	14.3
Joint Ownership				
total returns on fixed assets	55.2	42.7	32.7	20.8
GVIO/fixed assets ratio	2.6	2.5	2.5	2.2
price margin	23.3	21.7	17.9	18.2
Variance in total returns on f.a.	238.7	105.1	39.1	17.1

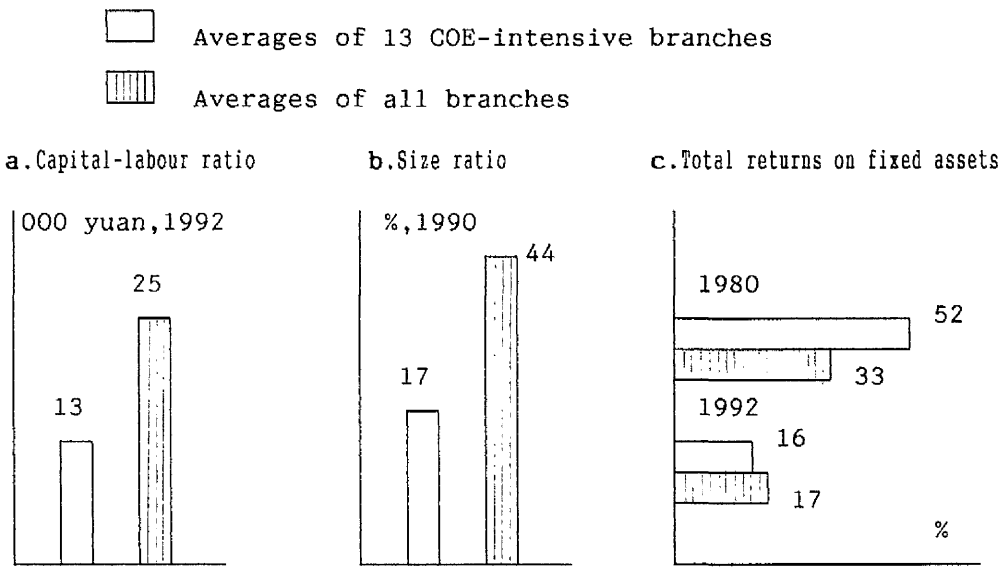
Source and note: ZGGYJJTJNJ 1993, pp.129 and 155. Total returns are fulfilled profits and product taxes, and fixed assets are year-end sums valued at purchase costs. Price margins are profits plus product taxes as a percentage of the revenue of sales.

it would be possible that joint-ownership industry moved in a direction that was towards more capital-intensive production, that had relatively high price margins but a relatively low rate of return on capital. Also, it is interesting to note that compared to collective and joint-ownership industry, state industry had a relatively high price margin[8] though its returns on capital was relatively low. This again would imply that some structural

[8] Except for 1992 when the price margins were higher in joint-ownership industry than in state industry. The main reason for this would be that in that year some of state enterprises with higher price margins had been transferred to joint-ownership status.

factors would have been acting. For instance, it would be possible that state enterprise would still dominate some branches with higher price margins, but in some other markets state enterprises would have encountered intensified competition from non-state enterprises, which have badly affected their monopolistic positions.

Fig 7-1. Some Characteristics of COEs



Source and note: The criterion for a branch to be COE-intensive is that non-state enterprises occupy a share of over 50% either in gross output or in employment(TJNJ 1993, pp.410, 417 and 426). They include: textiles, clothing, fur and leather products, timber processing, furniture, cultural and educational goods, crafts, plastics, building materials, metal products, electricity tools, electronics, and miscellaneous goods. The size ratio is the percentage share of the first two or three top groups of enterprises, by fixed assets, in gross output(ZGGYJJTJNJ 1992, pp.373-381).

A most important structural difference between state and non-state enterprises is that their participation in industrial activities varies with industrial branches. In some branches, state enterprises maintained their dominant position whilst in some others non-state enterprises became a significant competitor. In 1992, out of 40 branches, there are 13 branches in which non-state enterprises had over a 50% share in either gross output or employment, and 17 in which state enterprises occupied over three-quarters of

gross output or of employment. Compared to state industry, non-state industry is relatively concentrated in its range of production over industrial branches[9]. This structural difference between state industry and non-state industry may be explained by some inter-branch characteristics. In particular, the capital-labour ratio, the size, and the rate of return are considered to be particularly relevant. As shown in Fig 7-1, the 13 COE-intensive branches were significantly different to the state-dominant branches (represented by the average level in Fig 7-1) in these characteristics. The capital-labour ratio in COE-intensive branches was much lower than the average level, and so was the size ratio. This suggests that the COE-intensive branches were "easy entry" branches as they required relatively low capital intensity and capital scale. Moreover, the COE-intensive branches were also those that had an above-average-level rate of return on capital in 1980, when the growth of non-state industry began to accelerate. Overall, it seems that capital constraints and enterprise objectives have both had impacts on the structural difference between non-state and state industry.

The capital constraints facing non-state enterprises can be interpreted in relative terms. Compared to state enterprises, non-state enterprises, especially collective enterprises, would usually have limited access to funding sources or capital markets. The entry of COEs to industrial activities would therefore be subject to restrictions in scale of funding. Because of the lack of sufficient access to capital markets, non-state enterprises were less able to enter some branches that had a higher requirement for capital even if there was higher profitability in those branches. As a result, the role of inter-branch differentials in the rate of return could therefore be overshadowed by the role of capital constraints even

[9] Using the data of 1992 sales of 30 main branches, it is found that the coefficient of variation in branch shares for state industry is 0.95 while it is 1.27 for non-state industry.

Table 7-5. Means and variances of financial indicators for state and non-state industry 1992

	State	Non-state
Rate of return on capital: mean	10.97	13.23
variance	1.70	0.99
Rate of return on sales: mean	17.27	17.91
variance	1.04	0.56
Non-operation balances as a % of sales: mean	5.55	5.99
variance	0.19	0.07
Losses as a % of sales: mean	2.87	1.98
variance	0.06	0.01
Circulating fund/fixed asset ratio: mean	1.36	1.70
variance	4.39	3.92

Source and note: TJNJ 1991 and 1993, and ZGGYJJTJNJ 1993. Data of state industry by branch are from TJNJ. They consist of 23 manufacturing branches that are the base of our calculations. Figures for non-state enterprises are branches' total sums deducted by state enterprises'. Losses as a % of sales is of 1990.

if non-state enterprises had a stronger motivation towards profit-seeking than state enterprises. The fact that by 1992 the rate of return on capital in COE-intensive branches fell below the average level implies some degree of over-entry of non-state enterprises to these branches.

On the other hand, the growth of state industry would also be naturally unbalanced as some would suffer intensified competition from non-state enterprises and others would continue to enjoy state protection though to a diminishing extent. The unbalanced nature of growth in state industry can be exemplified by larger variances of financial performance(in several indicators) in state industry than in non-state industry. Table 7-5 compares means and variances of several financial indicators between state and non-

state industry using 1992 inter-branch data. It shows that, compared to non-state industry, state industry had a lower mean but a higher variance in these indicators: the rate of return on capital, the rate of return on sales, non-operation balances as a % of sales, and the ratio of circulating capital to fixed assets. The case of losses as a % of sales seems slightly different from others. But if we take into account mining branches which are not included in the compilation for Table 7-5, a similar result emerges[10]. All of these results indicate that state industrial enterprises were more dissimilar to each other than to non-state industrial enterprises in financial performance. In other words, non-state industrial enterprises performed in a more coherent manner than state industrial enterprises. In this sense, the convergence trend in performance may be considered to be less apparent for state industry than either that for non-state industry or that between state and non-state industry.

The above description is mainly dealing with structural differences between state and non-state industry. There seems however to be some more fundamental, behaviourial differences between state and non-state enterprises. Though they have gained increasing autonomy over their production plans and pricing policy, as well as financial independence, state enterprises are still committed to full employment at a designated level regardless of changes in demand and output. To state enterprises, "[d]ismissal to cut costs remains

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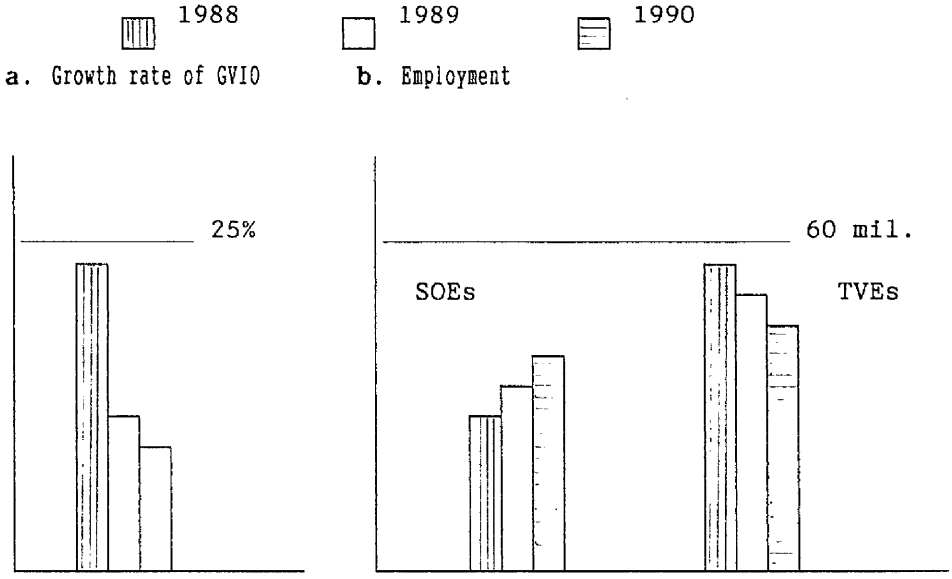
[10] That is because state industry suffered its severest losses in several branches but in other branches its position seems not worse than non-state industry:

Losses as a % of sales

	State	Non-state
Coal, petroleum mining, and coking	15.20	1.59
All other branches	2.05	2.08

Source and note: same as Table 7-5.

Figure 7-2. Employment in SOEs and TVEs (in industry)



Source and note: TJNJ 1993, pp.52, 107 and 395.

illegal"[11]. On the other hand, non-state enterprise, especially TVEs, have been less tied up with the task of stabilising employment either because local administrative bodies are generally unable to do so[12] or management in TVEs is much less willing to accept the costs incurred therewith[13]. This

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[11] Christopher Howe, "Foreword", in Korzec Michael, Labour and the Failure of Reform in China, London: Macmillan and St Martin Press, 1992, p.ix. It may be noted however that in urban China there is wide concern over possible massive unemployment if SOEs are fully empowered with free dismissal on a cost reduction basis. In particular, effective safeguard measures dealing with lay-offs from SOEs have been developed relatively slowly in post-reform China(see, for example, A. B. Atkinson, Unemployment Insurance and Economic Reform in China, CP No 7, STIRCED, London School of Economics, 1993).

[12] See, Dwight H. Perkins, China's 'Gradual' Approach to Market Reforms, op.cit. Perkins stresses particularly that unlike the central government that can have various fiscal and credit means, local governments have to "jettison" loss-making TVEs to reorganize their limited financial resources(p.21).

[13] See Patrick Bolton, Privatization, and the Separation of Ownership and Control, Discussion Paper, London: CEA Conference, December 1993. Behaviourial characteristics of TVEs in this respect are also described in the following publications: Martin Weitzman and C.Xu, "Chinese Township Village Enterprises as Vaguely Defined Cooperatives", JCE, October 1993; William Byrd and Ling Quingsong, eds. China's Rural Industry: Structure, Development and Reform, New York: OUP, 1990.

behaviourial difference is certainly reflected in relations between output growth and changes in employment in state industry and industrial TVEs. As shown in Fig 7-2, in 1989-1992 when China's industry was under retrenchment, the growth rate of GVIO fell sharply. Changes in employment in state industry and TVEs moved however in opposite directions in the period: the number of wage-workers continued to increase in state industry but employees in TVEs were reduced. As a matter of fact, the output growth rate in state industry (3%) was much lower than that in TVEs(10%) in these two years. In the light of reforms that have made progress in transforming many other aspects of SOEs' behaviour, the commitment to maximum employment that remains for most SOEs can therefore be regarded as the main cause of the "long-term loss"[14] in state industry.

Our main conclusion from above discussion is that structural and behaviourial factors that differ between state and non-state industry have interacted in affecting the relative performances in the post-reform period. On the structural side, state industry has some advantages over non-state industry due to the continued protection it receives from governments, and the capital constraints facing non-state industry. On the behaviourial side, non-state enterprises seem to have a stronger profit-seeking motivation and face less restrictions in their adjustment of factor use(including employment) to market forces, that enables them to be in a better competing position than SOEs. As a result, overall, the convergence trend in non-state industry is more clearly marked than in state industry.

III. Falling Profit Rate in China's Industry: Causes and Implications

[14] A term used in Donald Hay et al, Economic Reform and State-Owned Enterprises in China 1979-1987, Oxford: Clarendon Press, 1993

The falling profit rate in post-reform China's industry has been a widely noted issue. Official Chinese statistics often quote two measures of the rate of return for China's industry: the profits and product tax on GVIO, and that on total capital. By either of the two measures, the profit rate in China's industry as a whole declined considerably in 1980-1992. The former fell from 23% in 1980 to 10% in 1992, and the latter from 25% to 10% in the same period.

Table 7-6. International comparison of profit rate, 1980-1991

	1980	1987	1988	1989	1990	1991
China	14.9	8.9	8.2	5.7	3.0	2.9
Germany	4.0	5.5	5.6	5.4	5.4	
Japan	7.6	8.9	9.3	9.3	9.0	9.2
Korea	6.8	8.4	8.1	7.8	7.4	7.8
UK	6.7	14.1				
USA	11.6	13.7				

Source and note: The profit rate for China has been adjusted to profits only as a % of GVIO(ZGGYJJTJNJ 1993, pp. 129 and 142). For Germany, Japan, and Korea, the profit rate is the net operating surplus as a % of gross output in manufacturing; for UK and USA, the denominator is value added. For all countries other than China: the UN, National Accounts Statistics, 1991 and 1993.

The falling profit rate in China's industry seems particularly extraordinary when compared with other countries' experience over the same period(Table 7-6). In calculating the rate of return, we take the measure of total net surplus for China's industry, which is the nearest counterpart in Chinese statistics to the net operating surplus in the United Nations' national accounting system[15]. By this measure, we see the rate of return

[15] Use of the rate of return on capital seems preferable to the use of the rate of return on gross output for the purpose of international comparison. However, even in the UN statistics, there are a wide range of

declined sharply in China's industry over 1980-1991, when no similar trend can be found for all other countries in the table. The comparison made with the year 1980 may be questionable, because it is a year when the industrial countries suffered from the recession and therefore the rate of return was relatively low for these countries. However, even focusing on the period of 1987-1991 only, we can still see that the trend is quite different for China and for other countries. While it was rather stable in Germany, Japan, and Korea, the rate of return continued to decline in China's industry over the five years, with a record low level at 3% in 1991. It is clear that the rate of return in post-reform China's industry deteriorated.

Many observers have attributed the falling profit rate to a number of structural factors, such as intensified competition in China's industrial markets, and changes in relative prices for industrial output and input goods, as well as rising labour costs in industry[16]. Some economists have also related it to the issue of the performance of post-reform China's industry, particularly that of state-owned enterprises[17]. It appears however that most of these interpretations have been based on some casual observations. We wish to seek a systematic examination of the issue using official statistical figures.

Our analysis is as follows: first, we shall give a brief description of the situation and identify categorically the main factors that precipitated

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discrepancies in individual countries' measures of capital stock, that render the rate of return on capital incompatible between countries.

[16] See William A. Byrd, Chinese Industrial Firms under Reform, New York: OUP, 1991, p.26; Athar Hussain and Nicholas Stern, Economic Reforms and Public Finance in China, Discussion Paper CP/23, STICERD, London School of Economics, 1992, pp.21-22; Barry Naughton, "Monetary Implication of Balanced Economic Growth and the Current Macroeconomic Disturbances in China", in China's Contemporary Economic Reforms as a Development Strategy, ed. by Dieter Cassel, Gunter Heiduk, Baden-Baden: Nomos Verlagsgesellschaft, 1992, p.115

[17] Jeffrey Sachs and Wing Thye Woo, "Reform in China and Russia", Economic Policy, No. 18 (1994)

the falling profit rate in post-reform China's industry. The main indicators that we have identified are sharply-increasing negative non-operation balances, excessive use of circulating funds, and the convergence trend in the rate of sales' surplus on fixed assets. The behavioral and structural factors behind these indicators will be examined subsequently.

In the following study, we will focus on the measure of fulfilled profits on total capital. Our analysis will in the first instance follow a categorical decomposition of the measure in order to identify some main and directly observable explainatory factors. Categorically, the measure of fulfilled profits on total capital is related to three other measures by a differencing item in Chinese statistics: (1) profits recorded in the operation account(i.e., the sales' account) in proportion to total capital, and the differencing item is non-operation balances; (2) fulfilled profits in proportion to fixed assets, and the differencing item is the circulating fund; (3) as a combined version of the first two measures, profits generated in the operation account in proportion to fixed assets, and the combined differencing items are non-operation balances and the circulating fund. Table 7-7 itemises the rates of change in 1980-1992 by these measures.

Table 7-7. Measuring returns on capital in China's industry(%)

	1980	1985	1988	1992
Fulfilled profits/total capital	14.8	11.5	8.9	3.3
Sales profits/total capital	15.8	13.2	12.3	8.4
Fulfilled profits/fixed assets	24.7	19.7	16.0	6.9
Sales profits/fixed assets	26.4	22.7	22.0	17.5

Source: ZGGYJJTJNJ 1993, pp.103-142.

Table 7-8. Explaining the fall in fulfilled profits on total capital in 1980-1992

Fall in various measures in 1980-1992 (%)		Explaining the fall in fulfilled profits/total capital (%)	
I. Fulfilled profits/total capital	77.7	By falls in II-IV	100.0
II. Sales profits/fixed assets	33.7	By fall in II	43.4
III. Sales profits/total capital	46.8	By increase in negative non-operation balances	14.4
IV. Fulfilled profits/fixed assets	72.1	By increase in circulating fund	42.2

Source: See Table 7-7 and the text.

With the conceptual relations described above, we are now able to describe changes in fulfilled profits on total capital in terms of the changes which occurred in the other three measures. This is done in Table 7-8. The right panel shows falls in the four measures in a percentage ratio for 1980-1992. They are the results of straightforward calculation of the change rate by end-points. In the right panel are the relative percentage weights of the change rates of measures II to IV in the change rate of fulfilled profits on total capital. The calculation is at two levels. It firstly calculates the weight of the change rate in sales profits on fixed assets(dividing I by II), and the residual can be regarded as the combined weights of the change rates of measures III and IV. The former is 43.4%(listed in the table) and the combined weights are 56.6%(not listed in the table). At the second level, the 56.6% is further split into measures III and IV, i.e., between the two differencing items, non-operation balances and circulating fund. The result is that besides the effect of the fall in sales profits on fixed assets, the increase in negative non-operation balances accounts for 14.4% of the fall in fulfilled profits on total capital, and the increase in the use of circulating

funds accounts for another 42.2% of the fall.

Having identified those elements directly responsible for the declining fulfilled profits on total capital, we shall further explore the factors behind them. The discussion below is divided into consideration of these individual differencing elements, in three sections.

1. Non-Operation Balances

This is the differencing element between fulfilled profits and sales profits. As shown in Table 7-8, 14.4% of the overall fall in fulfilled profits on total capital can be attributed to the increase in the negative non-operational balances. This is quite significant but has nevertheless often been neglected. Official Chinese statistics do not provide any details of non-operation accounts, and perhaps this is the main reason for its omission.

Table 7-9. Non-operation balances in China's industry, 100 million yuan

	Profits from sales	Fulfilled profits	Non-operation balances	As a % of sale revenue
1980	750.4	701.1	-49.4	1.1
1985	1072.5	929.4	-143.1	1.8
1988	1634.7	1189.9	-444.8	3.2
1989	1506.0	1000.3	-505.6	3.2
1990	1187.3	559.8	-627.5	3.7
1991	1650.3	642.8	-1007.6	4.9
1992	2473.0	972.4	-1500.7	5.8

Source and note: For profits from sales and fulfilled profits, see the ZGGYJJTJNJ 1993, p.129. Non-operation balances are the profits from sales subtracting from the fulfilled profits.

It is however possible to estimate the amount and changing trend of the non-operation balances from existing statistics. By definition, fulfilled profits are profits from the sales account (sales revenue after deducting costs and product taxes) minus non-operation balances. Data of fulfilled profits and sales profits are readily available in Chinese statistics. Table 7-9 shows that non-operation balances see an overall accelerating trend, as measured in their percentage proportion to sales revenue, in 1980-1992. This seems to suggest that there are some common persistent factors behind the pervasive increase in negative non-operation balances among China's industrial enterprises.

Statistically, non-operation balances are the results of balancing revenue and outlay in non-operation accounts. In general, most enterprises can be assumed to have non-operation revenue and non-operation outlay at a same time. An increase in negative non-operation balances would therefore imply a faster increase in non-operation outlay than non-operation revenue. Why and how could it happen? Changes in Chinese legislation concerning accounting management and enterprise financial independence could be an answer. In pre-reform years, non-operation outlay legitimately contained items such as loss from stoppage of work, write-off of surplus goods, loss from experimental failure, and outlay for schooling of staff dependents, etc. These would stay fairly stable in proportion to growth of production. New regulations introduced since the mid-1980s have however actually extended the range of non-operation outlay by explicitly excluding some items from the normal operation account. For instance, interest payments for capital construction loans can no longer be accounted for under business expenditures. In addition, it is stipulated in the new regulations that all expenses that are deemed not to do with productive activities cannot be disbursed from the normal business account. This is in reality nothing less than to allow for change in

accounting practice: expenses or expenditures to do with non-productive purposes can be now legally accommodated or covered under non-operation outlay..

Main new items in non-operation outlay may include: interest payments and penalties; various fees and fines imposed by governmental agencies concerning enterprises' social and environmental liabilities etc; "ex gratia" contributions made to various organizational bodies; implicit subsidies to employees including managers. The last two elements would particularly be important when tax schemes are considered. As an increase in non-operation outlay would help reduce enterprises' liability in enterprise income tax(not the liability in product taxes which may be reduced only by a legitimate increase in production costs in the business account), China's enterprises have certain incentives to increase their non-operation outlay especially for the purpose of the implicit transfer of income.

2. Circulating Fund

Circulating capital is the differencing item between fulfilled profits on total capital and that on fixed assets. As shown in Table 7-8, from 1980 to 1992, the increase in use of the circulating fund led to a fall in fulfilled profits on total capital of 42.2%. This is remarkably high by any standard. If China's industrial enterprises had used the circulating fund at a constant ratio to their use of fixed assets over the period, the fulfilled profits on total capital would have fallen only by 57.8%, maintaining a level of some 8.1% instead of 3.3% in 1992.

Table 7-10 shows that the ratio of the circulating fund to fixed assets rose considerably in China's industry over 1980-1992. Similarly to the case of non-operation balances, all types of industrial enterprises, except

Table 7-10. Ratio of circulating fund to fixed assets

All industry			1980	1992
1980	0.7	State	0.6	0.9
1985	0.7	Collective	1.5	1.8
1987	0.8	Joint-ownership	2.0	1.5
1988	0.8	Light	1.0	1.6
1989	0.9	Heavy	0.6	0.9
1990	1.0	Large	0.5	0.7
1991	1.1	Medium	0.6	1.3
1992	1.1	Small	1.0	1.6

Source and note: Circulating fund is yearly-average full circulating fund, see Table A5-9; fixed assets are year-end stock of fixed assets net of depreciation etc, see the ZGGYJJTJNJ 1993, p.103.

for joint-ownership enterprises, saw a rising ratio of the circulating fund to fixed assets in the period. The joint-ownership enterprises had the highest ratio in 1980, and their level(1.5) in 1992, although decreased, was still far above the average level(1.1). It appears that by 1992 the ratio of circulating capital to fixed assets had adjusted to be much more equal over all the types of China's industrial enterprises, yet at a higher average level than in 1980.

Indeed we have found that the variation of relative use of circulating capital to fixed assets at branch level became smaller in 1980-1992. The coefficient of variation(CV) and mean of the ratio of (quota) circulating fund to fixed assets for 30 Chinese manufacturing branches in 1980-1992 are:

	CV	Mean(%)
1980	0.56	88.6
1985	0.54	80.5
1988	0.46	81.4
1992	0.41	87.5

This again suggests that there were some common factors affecting China's industrial enterprises' use of the circulating fund in relation to their use of fixed capital. These factors may include changes in the function of the circulating fund, and unbalanced reforms in financial markets concerning both the circulating fund and fixed capital.

Traditionally, the function of the circulating fund is to finance enterprise inventory needs which supposedly vary with branches. Rising inflation expectations and increasing difficulties in sales in the post-reform period have however motivated China's industrial enterprises to stock more both of raw materials and finished goods. There is a good deal of evidence since the mid-1980s which confirms this trend in China[18]. Rising inflation expectations is an indication of the deterioration of macroeconomic environment in China while increasing difficulties in sales may reflect intensified competition in industrial markets. Besides this change, that is still within the traditional function of the circulating fund, there were some new distinctive uses of the fund. One was to use the circulating fund as a last resort, by which loss-making enterprises could escape from instant bankruptcy and poor-performing enterprises could falsely maintain their financial status in a false form. A survey conducted in 1990 shows that, in a province, about 10% of the circulating fund was used to patch up an implicit balance-sheet loss by enterprises[19]. Another was to use the circulating fund

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[18] Yang Xitian, 1992. "Danqian gongye qiye zijing liudong zhuangkuang ji hebi xingdai zhengzhe duizhe" (Current Situations of Industrial Enterprises' Cash Flow and Counter-measures of Monetary and Credit Policy), in Shen Peiliang, ed. Zhongguo jingrong gaike he hebi zhengzhe (Financial Reforms and Monetary Policy in China), Beijing: Jingji gaike chubanshe, p.356; the Policy Research Department of the State Council, "Guanyu liudong zijing zhuangkuang de fenxi" (Analysis of Current Situations of Circulating Fund), in Wu Jingliang, ed. Zhongguo jingji de dongtai fenxi he duizhe yanjiu (Studies in China's Economic Changes and Counter-measures), Beijing: Zhongguo renmin daixue chubanshe, 1989, pp.106-112; and William A. Byrd, op.cit., pp.75, 134 and 288-295.

[19] Yang Xitian, op.cit.

as a disguise for actual investment in fixed assets, though this was employed to a lesser degree. An estimate based on a survey in 1985 concludes that about 2% of the circulating fund was used for investment in fixed assets in a province[20].

As we can see from Table 7-10, the rise in the ratio of the use of circulating fund to the use of fixed capital began after 1985. This coincides with China's financial reforms that have partially commercialized the banking sector in the area of circulating fund loans. While the state still maintained tight or relatively tight control on long-term capital markets, i.e., the investment fund for fixed asset construction, banking institutions have been allowed a larger degree of autonomy in operating their short-term capital finance in the form of circulating fund loans. Meanwhile, regional/local governments gained increasingly substantial access to short-term capital markets by influencing the behaviour of decentralized banking institutions in their individual administrative territories. Several economists have warned in the later 1980s that with these partial financial reforms traditional "soft budget constraints" began to change into "soft lending constraints"[21]. To be more precise, the difference is that the lending constraints are softer in circulating fund markets than in fixed capital markets, and this why China's industrial enterprises were able to increase their use of the circulating fund faster than their use of fixed capital, after the mid-1980s.

3. Sales Profits on Fixed Assets

The fall in sales profits on fixed assets contributed over 43% of the overall

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[20] The Policy Research Department of the State Council, op.cit.

[21] Bruce Reynolds, ed. Chinese Economic Reform: How Far, How Fast?, New York: Academic Press, 1988

decline in fulfilled profits on total capital in China's industry during the period 1980-1992, as shown in Table 7-8. It is the largest single factor that affected the changes in industrial profitability and therefore it merits more of our attention.

We may firstly note that in 1980-1992 there appears to be a convergence tendency for returns on fixed assets among China's industrial branches, as shown below(Table 7-11). Some branches with higher sales profits on fixed assets in 1980 saw the rate declining by 1992(typical branches include the tobacco and clothing industries etc), and some branches with lower sales profits on fixed assets in 1980 saw the rate rising by 1992(typical branches include the machinery and transport equipment industries etc). Unlike the ratio of circulating fund to fixed assets, the narrowing variance in sales profits on fixed assets is moving around a smaller mean, i.e., the overall rate has been declining over the period.

Table 7-11. Sales profits on fixed assets

	Coefficient of variation	Mean(%)
1980	0.56	46.4
1985	0.36	35.5
1988	0.34	31.8
1992	0.35	24.9

Source and note: ZGGYJJTJNJ 1993. Calculations exclude maximum and minimum extremes in 30 manufacturing branches.

There were a number of factors that might have had certain impact on the changes in sales profits on fixed assets, such as growth in the capital base, rising labour costs, and rising relative prices of industrial materials. We examine these factors briefly in order. Firstly, growth in the capital base.

Table 7-12. Regression of changes in profit rate on capital growth

Form of estimation	Est. of parameter	t-value	R^2 adj	F statistic	D-W statistic
$p = \alpha A$	-0.90	-3.85	0.36	14.82	1.66
$p = \beta B$	-0.76	-4.68	0.46	21.88	1.91

Source and note: p -- change in sales profits on fixed assets in 1980-1992; A -- change in fixed assets per worker in 1980-1992; B -- change in fixed assets in 1980-1992(in current prices). The total number of manufacturing branches in regression is 26(tobacco, forage, petroleum and coking branches are excluded because of their extreme nature). All variables are in logarithm. Because of the collinearity between A and B, the regression is carried out separately for the two variables. All data are from ZGGYJJTJNJ 1993.

The results of a regression of changes in sales profits on growth in fixed assets using branch data clearly shows that there is a negative correlation between changes in the two(Table 7-12). An interpretation is that a branch undergoing faster growth in its capital base(measured either in total scale or in average level per worker) would also see its sales profits on fixed assets falling faster; on the other hand, a branch undergoing slower growth in its capital base would see its sales profits on fixed assets also falling slower(or maybe rising).

This correlation would imply an overall falling trend in sales profits on fixed assets in China's manufacturing as the capital base saw a fast growth over the period under study. It does not however necessarily mean that inter-branch variation around the overall declining profitability would become smaller as well. This could come into being only with an uneven growth in the capital base among branches, i.e., if lower-capital-based branches grew faster than higher-capital-based branches. This is indeed the case for China's manufacturing in 1980-1992. We use a standard of 1980 to divide all China's manufacturing branches into capital-intensive and labour-intensive branches,

and find that fixed assets per worker grew faster in labour-intensive branches(defined as having fixed assets per worker lower than industrial average level) than in capital-intensive branches over the period 1980-1992: that of 17 labour-intensive branches increased at 4.84% annually, and that of 13 capital-intensive branches at 2.84 annually. As sales profits on fixed assets were negatively associated with the level of fixed assets per worker, this would certainly help to make the level of profitability more equal among branches over the period.

It should also be noted that the degree of association between sales profits on fixed assets and the growth of the capital base, as shown by the adjusted R^2 in Table 7-12, was modest. This leaves room for other factors to be taken into account. A comparison made of capital-intensive and labour-intensive branches shows that labour-intensive branches also suffered a greater decline in sales profits on fixed assets in 1980-1992, which implies that fast rising labour costs were indeed an important factor responsible for the overall fall in industrial profitability. In a same manner, a comparison made of material-intensive and non-material-intensive branches(defined as the ratio of material consumption to the gross value of output in a branch) shows in addition that material-intensive branches suffered a greater decline in sales profits on fixed assets over the period, which implies that rising relative prices in industrial materials were also an important factor responsible for the overall fall in industrial profitability.

% change in sales profits on fixed assets in 1980-92

13 capital-intensive branches	-11.7(-4.4 if excluding coking)
17 labour-intensive branches	-46.0
15 material-intensive branches	-49.7
15 non-material-intensive branches	-12.7

As far as the issue of magnitude is concerned, we may reasonably conclude from the above results that among all of these relevant factors that affect falling rate of return on capital in post-reform China's industry, the most important factor is capital growth, and the next is the increase in labour costs, with the changes in relative prices of industrial inputs to outputs as the least significant factor. Of capital growth it is particularly important that changes took the form of inter-branch shifts, i.e., that capital base grew unevenly among industrial branches. In branches that had traditionally had high returns such as the tobacco and textile industries, the capital base grew far faster than in other branches that had traditionally had low returns, such as machinery. As shown in Table 7-13, capital growth in terms of fixed assets per worker was faster in 17 traditionally high return branches than in 13 traditionally low return branches; accordingly, the rate of return fell more quickly in the high-return branches than in low-return branches.

Table 7-13. Comparison of high-return and low-return branches

	17 high-return branches	13 low-return branches
% change in sales profits on fixed assets in 1980-1992	-52.9	-2.8
Growth of fixed assets per worker in 1980-1992	4.4	3.4

Source and note: ZGGYJJTJNJ 1993. Status of high- and low-returns is classified using 1980 criterion.

The inter-branch capital shifts, the faster rise of wages than output growth, and greater increases in input prices than in output prices, were all

taking place along with structural adjustments in post-reform China's industry. The outcome of these structural adjustments was a realignment in inter-branch differentials in prices and rates of return, as well as in the cost structure of China's industry.

To summarise our discussions above, we have found the following main elements to be directly responsible for the overall and steady decline in fulfilled profits on total capital in post-reform China's industry: increases in negative non-operation balances, increases in the use of the circulating fund relative to fixed assets, and falls in sales profits on fixed assets. The main reasons for the increases in negative non-operation balances include some degree of deterioration of the business environment for China's industrial enterprises, and an implicit transfer of enterprises income. The excessive use of the circulating fund is associated with functional changes which is in turn partly related with the reluctance of the state to abandon its commitment to employment stability especially in SOEs. For whatever causes are behind the excessive use of the circulating fund, the supply-side causes seem to be the unbalanced reforms in the state banking system: the softer nature of short-term capital lending. For the last element we have also identified several underlying factors: faster capital growth in traditionally labour-intensive branches; rising labour costs; and the rising relative prices of industrial materials.

These factors can be further categorized into structural and institutional types. Rising relative prices of industrial materials may well be regarded of the structural type. One of the main reasons for high returns in pre-reform China's industry was the low price of materials, particularly of agricultural materials used in industry. Against this background, industrial profitability would consequently fall with rises in input prices, relative to the change in output prices. Another structural change was capital

Chapter Eight

Regional Growth and Competition

We have set forth the proposition, at the beginning of the present study, that economic growth may be regarded as a process in which major actors respond to changes in market conditions including demand changes by mobilising and allocating the productive resources available to them, with the objective of seeking gains from production expansion. Focusing on this process, we have demonstrated that in the post-reform period, (i) demand for industrial goods in China has grown fast in general; (ii) China's industry has been able to increase its use of productive resources, particularly capital resources; (iii) with a greater orientation towards profit, China's industrial enterprises have been increasingly able to allocate their use of capital in line with sectoral differentials in productivity and profit rate. In our study of the profit-orientation behaviour of industrial enterprises, it is also found that tax returns were an important factor that affected capital shifts across industrial sectors or branches. This suggests that governments, especially regional and local governments, have had a significant influence on enterprise behaviour. In one sense, regional and local governments have also become a major actor in post-reform China's industry, alongside enterprises and the central government.

In the light of the greater role played by China's regional and local

governments in economic development, their impact on industrial growth and productivity change should be taken into account. In particular, we have found in our study of productivity change(Chapter Six) that although overall productivity growth in post-reform China's industry has been positive, achievements in productivity growth were unbalanced between the various industrial sectors. More specifically, it appears to be the case that in the post-reform period, productivity growth tended to be relatively slow or small in some industrial sectors with a higher productivity, compared to some industrial sectors with a lower productivity. This phenomenon requires an explanation which deals with the relative changes in industrial competence, that is believed to have been under the influence of regional and local governments.

To give a thorough account of the economic role played by regional and local governments, their influence on resource mobilisation should also be taken into account. In this chapter, we will consider the two aspects of regional and local governments' economic role: resource mobilisation and the allocation of production, with special reference to their implications for productivity change.

The organisation of the study is as follows. In Section I, we will give an overview of regional industrial growth before and after reforms started. We will show that disparities in regional industrial growth have become larger in China since the mid-1980s, mainly because greater market exposure has exerted an uneven influence on regional governments' ability to increase productive resources as well as on their access to "resource markets". In Section II, we try to identify some characteristics of regional industrial competition by examining trends in the geographical spread of industrial production, at product level, in post-reform China. The evidence that we produce clearly shows that there was a close association between the

growth of industrial production and the increase of regional participation. The greater regional participation in industrial production is in particular related to two factors: market demand and raw material supply. Two industrial branches are highlighted in these analyses: the chemical fertiliser and cigarette industries. In Section III, we will compare factor mobility across industry and across regions, intending to show some overall characteristics of factor markets in post-reform China's industry.

I. Regional Industrial Growth in China

Generally speaking, national economic growth must take place through regional economic growth: either through more rapid economic growth in some regions or through more even economic growth in all regions. As a result, national production may be concentrated or more equally dispersed over regions at any point in time. In Maoist China, national economic growth was apparently pursued with the emphasis on more equal geographical production distribution, or even regional economic growth. In the early 1950s, industrial activities in China were regarded by the central government as "highly geographically unbalanced" and "irrational both from the economic point of view and in respect to national defence"[1]. In 1952, the coastal provincial regions produced nearly 70% of China's total industrial output(Table 8-1), of which the five coastal provinces of Shanghai, Liaoning, Hebei, Jiangsu, and Shandong alone accounted for about 58% of national industrial output. Against this background, the Chinese government adopted a policy orientation in favour of the inland region by shifting industrial production towards the inland region, especially heavy industry. From 1952 to 1978, the share of the coastal region

[1] This belief was firmly recorded in China's First Five-Year Plan for 1953-1957(published in 1955). See Chu-yuan Cheng, China's Economic Development, Colorado: Westview Press, 1982, p.431.

Table 8-1. Geographical distribution of industrial output(%), 1952-1992

	1952	1965	1978	1985	1992
All industry					
Coastal region	69.4	63.1	60.9	60.3(59.4)	67.6
Inland region	30.6	36.9	39.0	39.7(40.6)	32.4
Light industry					
Coastal region	71.5	67.3	64.5	65.2(63.6)	72.4
Inland region	28.5	32.7	35.5	34.8(36.4)	27.6
Heavy industry					
Coastal region	65.5	58.8	58.2	55.5(55.6)	63.7
Inland region	34.5	41.2	41.8	45.5(44.4)	36.3

Source and note: ZGGYJJTJZL 1986, pp.5-6 and 226; TJNJ 1993, p.61. Comparable prices are used for 1952 to 1985 in the original compilation(ZGGYJJTJNJ 1986, p.226); figures in parenthesis and of 1992 are in current prices. Coastal region includes Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi, and Hainan(in 1992). Inland region is the rest of the mainland China.

in China's national industrial production fell to 61%. While the overall relative positions of the coastal and inland regions did not change much over 1978-1985, the share taken by the inland region in China's heavy industry production continued to rise in the period, from 42% to 46%. With this faster growth in the inland region, China's industrial production thus moved towards a more equal geographical distribution during the pre-reform period[2].

More notably, in pursuit of the development strategy of regional

[2] The equality trend can be seen from the narrowing variation among regional industrial production. The coefficient of variation for 29 provinces are(in parenthesis are 27 provinces excluding the largest and smallest provinces):

1952	1965	1980	1985	1992
1.27	1.09	0.85	0.80	0.91
(1.08)	(0.82)	(0.73)	(0.72)	(0.80)

The decreasing trend in the variation continued until 1985, and turned around in 1985-1992. See also, WB, China: Macroeconomic Stability and Industrial Growth under Decentralised Socialism, Washington, D.C., 1991, Ch. 3

economic growth, pre-reform China specifically advocated the policy of provincial self-sufficiency, encouraging provinces to diversify their production activities between the upstream and downstream industrial sectors, and among basic machinery and consumer good production. Because production conditions and demand conditions were widely different among individual regions, efforts made in the various provincial regions for diversification and self-sufficiency(though they brought about a similar sectoral or branch composition of industrial production) inevitably resulted in some wide disparities in profit rate at provincial level[3].

Since the mid-1980s, relative economic growth including industrial growth in the coastal and inland regions began change significantly. The faster industrial growth that the coastal region gained in 1985-1992 enabled the region to take a greater share in China's total industrial production by 1992 (67.7%, a level close to the 69.4% in 1952). Moreover, the rising importance of the coastal region has been seen in both light and heavy industry. Overall, industrial production seems to have become more unequally spread among China's provincial regions during 1985-1992, in terms of a greater regional variation in national industrial production(Footnote 2).

It would be interesting to consider the main reasons behind the unequal regional growth in post-reform China in the context of the central government's continued policy orientation towards equal regional growth and provincial governments' stronger quest for accelerating economic growth in their own regions. A serious doubt about any change in the regional development strategy in post-reform China has been raised by an observer, who has put it:

> It remains to be seen whether China's recent reforms signed an end

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[3] See the World Bank, China: Long-term Development Problems and Options, Washington, D.C., 1985, Ch. 5

to the Maoist pattern of development. Tendencies toward excessive geographical dispersion in new industries such as consumer electronics, new obstacles to interprovincial trade in agricultural products such as tobacco and cotton, and occasional recourse to the familiar rhetoric of self-sufficiency, suggest that the legacy of the Maoist era may influence the pattern of activity for some time[4].

Evidence shows that the central government has maintained its financial inclination towards the inland region. In 1989-1991, the share of the coastal region in basic construction investment, a form of investment much under the influence of the central government, fell from 52.5% to 48.7%; whilst measured in total fixed capital investment, which includes other forms of investment, the share taken by the coastal region remained virtually unchanged, from 57.5% to 57.0%[5]. Faster growth in the coastal region seems to be explained by factors other than its reliance on central government's direct financial support.

Obviously, because the coastal region was a traditionally developed area in China, it had some comparative advantages over the inland region, such as a skilled labour force, a more mature industrial base, and a less insufficient infrastructure, etc. Amongst all, the most important factor to explain the different growth speeds in the coastal and inland regions seems however to be the degree to which industrial growth relied upon the growth in

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[4] Thomas P. Lyons, Economic Integration and Planing in Maoist China, New York: Columbia University Press, 1987, p.279

[5] See Zhongguo guding zichan touzi tongji ziliao (Statistical Data of China's Fixed Asset Investment) 1990-1991, pp.28 and 75. A more precise description of the central government's inclination may concern its role as "a budgetary transfer agency" between richer and poorer regions(David L. Denny, "Provincial Economic Differences Diminished in the Decade of Reform", in the USCJEC, ed. China's Economic Dilemmas in the 1990s, Washington, D.C., Vol. I, 1991). As most of the poorer provinces were in the inland region, the inclination for the poorer and that for the inland region overlapped.

the state industry sector. As shown in Table 8-2, the coastal region's share in total state industrial production was declining in 1981-1992, but its share in non-state industrial production rose considerably. Of the coastal region, the fastest growth was seen in the five south-eastern provinces, Shanghai, Jiangsu, Zhejiang, Fujian, and Guangdong(and Hainan after 1985). By 1992, whilst the five provinces held little more than one-quarter of China's state industrial production, they accounted for nearly half of China's collective industrial production and over three-quarters of China's joint-ownership industrial production. In these five provinces, overall industrial growth was therefore greatly due to the proliferation of the non-state sector.

Table 8-2. Share of coastal region in industrial output (%), 1981-1992

		State	Collective	Joint-ownership	Individual and private
1981	Coastal region	58.3	67.5		
	of which: south-eastern region	28.9	39.3		
1988	Coastal region	54.4	72.2	94.5	55.2
	of which: south-eastern region	27.3	44.7	74.2	24.1
1992	Coastal region	55.1	75.3	93.4	58.2
	of which: south-eastern region	27.6	46.1	76.6	25.2

Source and note: TJNJ 1981, 1989 and 1993. Coastal region is defined the same as before. South-eastern region included Shanghai, Jiangsu, Zhejiang, Fujian, Guangdong, and Hainan. Data of joint-ownership and individual industrial production are not available until 1988.

Of the non-state sector, it is particularly impressive that a great proportion of China's joint-ownership industry located in the coastal region and especially in the five south-western coastal provinces(six if we include Hainan). Of this joint-ownership industry, a significant proportion was foreign-related enterprises. The coastal region has shown its comparative advantages, when compared with the inland region, in absorbing foreign

investment. In 1989, out of total foreign direct investment in mainland China, 61% went to the six south-western coastal provinces. In 1992, the same ratio rose to 75%. This vast foreign capital inflow has been aimed at export-oriented manufacturing and was therefore greatly conducive to industrial growth in these regions. The relative success of the coastal region in absorbing foreign direct investment may be partly ascribed to its geographical position neighbouring and historical ethnic affinity to areas such as Hong Kong, Macao, and Taiwan, etc[6]. A more important factor was doubtlessly the open-door policy implemented in these provinces. A string of special economic zones were first established in these south-western coastal provinces, where foreign-related enterprises then became a major force in pursuing export-oriented manufacturing[7].

Compared to the coastal region, the inland region continued to rely on state industry and funding support from the central government to a relatively large extent. As the growth of state industry was overshadowed by the growth of non-state industry overall and the central government's financial capability shrank relatively, the inland region was thus exposed to disadvantages. Although non-state industry has grown fast and indeed much faster than state industry in the inland region, the pace of growth and the scale of non-state industry in the inland region were still behind that in the coastal region. As a result, the inland region saw its share in China's industrial production falling in the later years of the post-reform period.

The above discussion may be summarised as follows: as the central

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[6] A detailed account of the close investment and trade links of Guangdong and Fujian with Hong Kong and Taiwan can be seen from Robert Ash and Y.Y. Yueh, "Economic Integration within Greater China: Trade and Investment Flows between China, Hong Kong, and Taiwan", CQ, No. 136 (December 1993)

[7] In some SEZs such as Zhuhai (neighbouring Macau), foreign-related firms contributed over half of total exports. Overall, foreign-owned firms contributed 20% of China's manufactured exports in 1992, against 1% in 1985(the UN, World Economic Survey, 1993, p.197)

government favoured the inland region especially in the pre-reform period, the inland region gained faster industrial growth than the coastal region; since reforms started, the leverage of the central government over regional growth became less strong than it had been, and market forces began to play a more important part; in the process of seeking gains from market expansion, the coastal region exhibited a clear comparative advantage over the inland region: using foreign capital to develop export-oriented manufacturing enterprises; mainly based on this comparative advantage, the coastal region was able to achieve faster industrial growth than the inland region after the later 1980s; and despite the central government's continued bias, the inland region was unable to achieve industrial growth as high as that in the coastal region because its main markets were at home, or more specifically, within the region.

An immediate implication of the regional industrial growth in post-reform China seems to be that for a region, the pursuit of production expansion based on its own markets might help to accelerate industrial growth for a certain period of time, especially when there is support from outside sources such as the central government, but that continued reliance on the local markets would however inevitably render the region exposed to a greater disadvantage, its growth lagging behind those regions which are also seeking expansion in markets outside their own regions. As we have noted, the reliance on local markets was part of the legacy of Maoist development strategy, and as we will demonstrate next, it has continued to be in effect in post-reform China's industry, except for the coastal regions that we have discussed. To our understanding, this issue has an enormous implication for overall industrial growth and productivity change in post-reform China. We will dedicate our study in the next section to this issue with special reference to its implications for regional growth and productivity change.

II. Regional Growth through Localised Production Expansion

Many observers have noted that there were strong equalisation tendencies in China's regional industrial production: various provincial regions tended to participate in many common industrial activities; production such as iron and steel and durable consumer goods was widespread over many regions[8]. In what follows, we will first examine the overall equalisation(or concentration) trends, at branch level, during the post-reform period; this investigation is then followed by an examination at product level, which will help us to establish the association between regional equalisation tendencies and industrial growth. Based on these investigations, we address the question of by what means regional governments have been able to pursue industrial expansion in their own regions. The implications of the efforts made by regional governments to achieve industrial growth and productivity will be discussed in line with these findings.

Whether there is a equalisation tendency in regional production may be looked at two interrelated ways: regional specialisation that indicates production concentration within a region; and regional concentration that indicates production concentration over regions. Empirically, we may use a "vertical" measure to measure regional specialisation: the change in the branch composition of a region's industrial production over time; on the other hand, we may use a "horizontal" measure to measure regional concentration: the change in the regional composition of industrial production in a branch over time. The former measure would help to show whether a region tends to

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[8] See the World Bank, China: Long-Term Development Problems and Options, op.cit., Ch. 5; also, China: Macroeconomic Stability and Industrial Growth under Decentralised Socialism, Washington, D.C, 1990; Thomas P. Lyons, op.cit.; A. Hussain, Olson Lanjouw and L. Li, The Chinese Television Industry: The Interaction between Government Policy and Market Forces, CP/9, STICERD, London School of Economics, 1991

Table 8-3. Coefficient of variation in 26 provinces by 18 manufacturing branches

	1985	1990	Change
Beijing	.86	.88	+
Liaoning	.89	.90	+
Jiangsu	1.09	1.12	+
Zhejiang	1.10	1.24	+
Guangxi	1.21	1.26	+
Yunnan	1.73	2.07	+
Share of above regions in total GVIO	**30.6**	**30.2**	
Tianjin	.80	.80	
Hebei	1.09	.97	-
Shanxi	1.07	1.06	-
Inner Mongolia	1.28	1.23	-
Jilin	.95	.87	-
Helongjiang	.99	.97	-
Shanghai	.93	.85	-
Anhui	1.21	1.07	-
Fujian	1.09	.92	-
Jiangxi	.88	.77	-
Shandong	1.20	1.05	-
Henan	1.24	1.02	-
Hubei	.98	.93	-
Hunan	.97	.88	-
Guangdong	.81	.78	-
Sichuan	1.09	.95	-
Guizhou	1.44	1.41	-
Shaaxi	1.06	.96	-
Gansu	.93	.89	-
Xinjiang	1.37	1.35	-
Share of above regions in total GVIO	**68.9**	**69.0**	

Source and note: The calculation is on productions of 18 manufacturing branches as detailed in Table 8-4. Data sources are also same to Table 8-4.

Table 8-4. Coefficient of variation in 18 manufacturing branches by 26 provinces

	1985	1990	Change
Food, beverage & cigarette	.56	.59	+
Textiles	1.07	1.18	+
Paper-making	.63	.65	+
Chemicals	.73	.75	+
Pharmaceutical goods	.73	.75	+
Plastics	1.01	1.08	+
Building materials	.70	.72	+
Metal goods	.83	.86	+
Machinery	.80	.82	+
Electricity equipment	.96	1.01	+
Electronics & Telecommunication goods	1.16	1.17	+
Share of above branches in total GVIO	**68.8**	**68.5**	
Coking, gas & coal	1.09	.97	-
Timber	.96	.90	-
Petroleum refinement	1.40	1.25	-
Chemical fibre	1.67	1.44	-
Rubber	.80	.79	-
Ferrous metals processing	1.10	1.00	-
Transport equipment	.83	.81	-
Share of above branches in total GVIO	**19.1**	**19.3**	

Source and note: The calculation is on the production of 26 provincial regions in total gross value of a branch in current prices. Qinghai, Ningxia and Tibet are excluded and Hainan is in Guangdong in 1990. For data from 1985, see the ZGGYJJTJZL 1986, pp.9-18; for data from 1990, see the ZGGYJJTJNJ 1991, pp.203-293. The starting year and 18 branches are chosen because of the data availability. Total GVIO is for whole industry excluding extracting and electricity power industry. The difference in GVIO shares taken by the two sets of branches is due to other manufacturing branches that are not counted in our calculation.

concentrate on a few industrial products, whilst the latter would help to show whether national production in one branch tends to concentrate in a few regions.

Tables 8-3 and 8-4 report the empirical results of regional specialisation and regional concentration trends in China's manufacturing over

1985-1990. In the two tables, we use the coefficient of variation to measure the production dispersion over branches(the "vertical" measure) and over regions(the "horizontal" measure). As the tables show, the results are mixed. In Table 8-3, out of the twenty six provincial regions, six saw the variation rising or not falling and twenty saw the variation falling over the period. The six regions accounted for about 30% of China's manufacturing production in the branches, and the twenty regions accounted for about 70%. This seems to imply that the majority of the China's provincial regions tended to engage in more manufacturing branches or tended to diversify their industrial activities over more manufacturing branches in the period. In interpreting these results, we should however be aware of the possible effect of regional size on regional branch composition. Most of the Chinese provinces were quite large in terms of population or land acreage, and a degree of diversification would well be expected. Also, the scope of some of the manufacturing branches in our study is very broad. For example, the branch of textiles includes all types of textile activities, and it alone accounted for over 10% of China's total industrial production in the period. The broadness could possibly conceal some actual equalisation or concentration trends in a subset of a branch. We shall therefore look into trends at product level, as will be shown later[9].

In Table 8-3 out of eighteen manufacturing branches, eleven saw the variation becoming larger and seven saw the variation becoming smaller. The eleven branches accounted for about 69% of China's manufacturing production and the seven less than one fifth in the period. This seems to imply that production in China's main manufacturing branches has tended to move towards

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[9] We may note from the Table 8-3 that, in the six provincial regions seeing the variation rising in 1985-1990, five belong to the coastal region (those excluding Yunnan). How significant this association would be awaits further observations.

a degree of regional concentration over the period. In interpreting the trend, again we have to consider the high level of aggregation in measurement, i.e, the broadness of scope of some branches. As we have shown earlier, overall, industrial production in China has tended to shift into the coastal region since the mid-1980s. The results that we see here in Table 8-4 may therefore be a reflection of this overall regional growth trend. More interestingly, these results seem to suggest that despite the fact that there were some apparent equalisation or diversification tendencies in individual regions' manufacturing production, overall manufacturing production at branch level still tended to concentrate in a few regions. An implication of these relative changes in regional specialisation and regional concentration seems to be that though most of China's provincial regions have sought their industrial expansion in a similar manner, i.e., diversification over various manufacturing branches, the outcomes of their efforts were different: some regions achieved faster growth in some or even most of the manufacturing branches, overshadowing other regions.

An interesting question that may be raised is why most of China's provincial regions tended to follow a similar development strategy: diversification over manufacturing activities. In the context of pre-reform China's industrialisation, the reason seems to lie in the motivation towards provincial self-sufficiency. As we have mentioned earlier, this motivation was associated with defence purposes, i.e., strategic considerations, and also promoted by the central government during the pre-reform period. It seems that the economic bias towards provincial self-sufficiency should be much weaker in the post-reform period, if gains from regional specialisation became large. The question may be addressed in another way: what gains were expected by those regions that pursued non-specialised development in the post-reform environment?

Table 8-5. Coefficient of variation in 26 major products by 28 provinces

	Coeff. of variation		Growth rate
	1980	1990	1980-90
Clothes	0.973	1.040	3.6
Textile Yarns	0.983	1.062	5.2
Paper	0.683	0.747	10.9
Radio set	1.554	2.224	-5.3
Sewing machine	1.280	1.372	-1.2
Tractor	1.665	1.962	-5.0
Cement	0.672	0.744	11.6
Machine tool	0.933	1.178	4.7
Arithmetic average growth rate			**3.1**
Woollen clothes	1.695	1.404	11.8
Canned Food	1.152	1.026	13.4
Cigarette	0.952	0.909	8.1
Bicycle	1.911	1.614	9.1
Watch	2.041	1.937	13.2
TV set	1.727	1.342	22.9
Refrigerate	2.821	1.338	56.8
Washing machine	1.792	1.402	28.4
Camera	2.979	2.497	19.1
Steel	1.469	1.193	6.7
Finished steel goods	1.309	1.149	7.2
Vehicle	1.875	1.570	12.8
Glass board	1.315	0.987	12.9
Sulphuric acid	0.945	0.824	4.5
Soda ash	2.702	1.666	7.8
Caustic soda	0.983	0.873	6.0
Chemical fertiliser	0.831	0.778	4.4
Chemical fibre	1.819	1.511	13.9
Arithmetic average growth rate			**14.4**

Source and note: The coefficient of variation is calculated on physical production of 28 provincial regions(excluding Tibet and Hainan). Growth rates are also calculated in physical quantity. Data of 1980 are from the ZGGYJJTJZL 1986, pp.235-269, and data of 1990 from the TJNJ 1991, pp.432-439 and pp.422-427.

To answer the question, we may first look at the issue of whether there is an association between production expansion and regional equalisation at product level. A positive close association between the two tendencies would suggest that all or most of the individual regions tended to seek production expansion by actively participating in those products that experienced faster growth overall. We present the comparison in Table 8-5. It clearly shows that a positive close association existed between the two tendencies.

From Table 8-5, we can note that, out of twenty six major manufactured products in China, only eight saw a more unequal geographical distribution of production over provincial regions in 1980-1990, as indicated by the increased coefficients of variation, but that eighteen saw a more equal tendency as indicated by the decreased coefficients of variation(these results at product level are similar to those at branch level shown in Table 8-3). Among the eighteen are durable and non-durable consumer goods and capital goods (including industrial materials and equipment). More importantly, the table also shows that most of the products with a narrowing geographical variation are the ones with a higher growth rate, and most of the products with a rising geographical variation are ones with a lower growth rate. On average, in 1980-1990, products in the former category grew as slowly as at 3.1% annually, and products in the latter category grew as high as 14.4% annually. During the period, at one extreme, i.e., tractors, the coefficient of variation became larger when production had actually fallen; at the other extreme, i.e., refrigerators, the coefficient of variation became smaller when production had grown at an astounding rate of over 50% annually over the ten years. Of the products that experienced a narrowing of the regional variation, there were some whose production did not grow fast or faster, such as chemical fertilisers and sulphuric acid. We may however note that during the period,

China's imports of these goods increased considerably. For example, imports of chemical fertilisers increased by 11.6% annually in 1985-1990, far faster than the growth of domestic production(4.4%). Overall, we can fairly conclude that there was a close association between the growth(or decline) of production and a geographical spread(or concentration) of production in China's industry during the 1980s[10].

A plausible explanation of the close association seems to be a process of interaction between market conditions and production conditions. For those products that experienced faster growth, demand was growing faster or new technology was diffusing faster, or both; the gains from participating in the process of production expansion were large when individual regions had obtained or increased their access to markets or new technology; with more participation from individual regions, the regional concentration declined. On the other hand, for those products that experienced slower growth, demand was growing slower or technology entered the mature stage; therefore, it was relatively easy for only a few regions that had comparative advantages in technology or other productive resources to survive, and regions without the comparative advantages had their level of production reduced; as a result, a more unequal geographical distribution of production appeared.

In this process of interaction, the decisive factors for regional industrial growth were access to markets and productive resources including technology. To show how China's industrial production has been allocated in

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[10] The association is seen also to exist in the growth process of a single product. For example, as shown below, the number of provincial regions producing tractors increased from 1965 to 1980 when its growth rate was rather high at 16.7% annually in the period; however, when the production declined in, say, 1980-1985, the number of producing regions decreased.

Production of tractors	1965		1980		1985		1990
Number of producing regions	7		21		14		11
Growth rate(%)		16.7		-14.4		-2.6	

line with regional markets and regional productive resources, we take two examples: the chemical fertiliser and the cigarette industries. Using the chemical fertiliser industry we will show that regional production was closely associated with regional markets; and using the cigarette industry we will show that regional production was closely associated with raw material supply in individual regions. The main common features in the two industries were the dominance of state enterprises[11] and high profitability in industrial production(see below). The issues of relationship between central and regional governments may therefore be studied with reference to the two industries.

A. The Chemical Fertiliser Industry[12]

Chemical fertilisers were always regarded by the Chinese government an important capital good for agricultural growth. In the early 1950s, China had only two provinces that could produce a meagre quantity of chemical fertiliser. With an annual growth rate as high as 34% in 1952-1965, the chemical fertiliser industry was among the fastest growing industries in pre-reform China. Technologically, China endeavoured to make a breakthrough in the construction of medium-sized chemical fertiliser factories in the first half

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[11] In 1992, state enterprises accounted for over 98% of value added in the cigarette industry and 73% in the chemical industry including chemical fertilisers. The average ratio was 63% of independent-accounting Chinese industrial enterprises.

[12] A brief account of the historical background for the chemical fertiliser industry here and for the cigarette industry below is mainly drawn from some Chinese industrial administrations' own account of the industry concerned. Their narratives are recorded in several official and semi-official publication series: Dangdai zhongguo de huaxue gongye (Chemical Industry in Contemporary China), Dangdai zhongguo de qinggonye (Light Industry in Contemporary China)(both were published by Zhongguo shehui kexue chubanshe, 1988, Beijing); Zhongguo gongye nianjian (the Almanac of China's Industry, published by Jingji kuanli chubanshe, Beijing, since 1991); and a comprehensive survey of China's industrial policy in various branches, Zhongguo gongye bumen chanye zhengzhe yanjiu (Studies of China's Industrial Policy By Branch, Beijing: Zhongguo caizheng jingrong chubanshe, 1989).

of the 1960s. By 1965, virtually every provincial region in China had managed to operate its own fertiliser factories. Nevertheless, the central government favoured a few selected regions that acted as a supply centre for individual regional divisions. For example, in northern China, Shanxi was responsible for over two-thirds of division production; in southern China, Guangdong produced 50%; in south-western China, Sichuan produced over two-thirds, etc. For the construction of large chemical fertiliser factories, China was still reliant on foreign technology imports, and this constituted a major constraint on the development of the industry in China, even in the post-reform period.

The demand for chemical fertilisers in China continued to grow and the growth even accelerated in the post-reform period, as China's agricultural growth also accelerated during the period. One indication of the fast growing demand for chemical fertilisers in the 1980s is that, though the domestic production did not grow fast, imports of chemical fertilisers increased considerably, as we mentioned above. On the other hand, the relatively underdeveloped inter-province transport system handicapped further and sufficient expansion in the traditional chemical fertiliser supply bases in China. In 1980-1988, when the profit rate was steadily declining in the majority of China's industrial branches, the chemical industry, of which chemical fertilisers were a major part, saw the profit rate rising.

Gains from establishing local chemical fertiliser factories were thus great. The main economic motivation for seeking expansion of localised production of chemical fertilisers was therefore to meet the local demand in individual regions. Whether this has been the case in China's chemical fertiliser industry may be verified by looking at the statistical association between regional production and regional markets. To conduct this examination, we use regional grain production as a proxy variable for the market for chemical fertilisers. The results of the statistical analysis are presented

Table 8-6. Regional chemical fertiliser production and grain production

	Number of observations (N)	Spearman's rank coefficient $r_s=1-6[\Sigma d^2/N(N^2-1)]$	Regression: $Ftz_i = a + \beta(Grn)_i + e_i$			
			β	t-value	R^2 adj	D-W statistic
1981	29	0.92	1.02	12.51	0.85	2.13
1988	30	0.90	0.99	12.08	0.83	1.61
1992	30	0.84	0.94	9.99	0.77	1.45

Source and note: TJNJ 1981, 1989 and 1993. In regressions, regional percentage shares in national production of grain(Grn) and chemical fertilisers(Ftz) are used.

in Table 8-6.

From Table 8-6, we may first note that there is a high correlation between the regional production of chemical fertilisers and regional grain production(approximately indicating the regional demand for chemical fertilisers), as shown by the Spearman's rank coefficient(the coefficient becomes 1.0 when there is an exact correlation between two variables). Moreover, as shown by the regression estimates in Table 8-6, it appears that during 1981-1992, if a region's share in national grain production increased by one percentage point, the region's share in national chemical fertiliser production would also increase about one percentage point. This implies that there seems to exist a near equality between regional production and the size of the regional market in the case of the chemical fertiliser industry. In other words, the size of a local market seems to be the major decisive factor in local production.

The close association between regional production and regional market size seems to imply that regional governments were well aware of profitable opportunities arising from the growth of regional markets and tended to take

advantage of the greater access to local markets to develop local industry. Because of the active response to the market by regional governments, the negative impact of the relatively underdeveloped inter-province transport system on industrial growth were alleviated.

B. The Cigarette Industry

In the early 1950s, cigarette factories in China were mostly located in a few regions such as Shanghai, Henan, Shandong, and Tianjin. The four regions contributed over 60% of total cigarette production, and Shanghai alone 28%. In most years of the pre-reform period, though cigarette products were highly priced and therefore highly profitable in China, the production grew rather slowly, slower than the speed of overall industrial growth in 1952-1980. The slow growth was mainly due to the tight control on the cigarette industry exercised by the central government. Several new cigarette industry bases in the inland region were however developed during the pre-reform period. They include Hunan, Sichuan, and most importantly, Yunnan. By 1980, every provincial region in China, except Tibet, had established some cigarette factories locally.

The profit rate in the cigarette industry fell sharply in the 1980s mainly because of the production expansion. Nevertheless, among all of the industrial branches, the cigarette industry maintained the highest profit rate throughout the post-reform period. Incentives for every region to develop a local cigarette industry were apparently strong. The major constraints on local production expansion were the restriction exercised by the central government and the availability of productive resources, especially of the raw material: tobacco leaf supply. The tight control by the central government actually relaxed in line with overall decentralisation in the post-reform

period. Also, because of the pre-reform geographical proliferation in China's cigarette industry, most of the provincial regions had access to the cigarette industry technology, though not to the same extent. It was the raw material supply, production of tobacco leaf, that quickly became the most scarce resource when cigarette production expanded rapidly. The availability and control of the raw material supply therefore became the major factor in determining regional success.

Table 8-7. Regional cigarette production and tobacco leaf production

	Number of observations (N)	Spearman's rank coefficient	Regression: $Cig_i = a + \beta(Tab)_i + e_i$			
		$r_s=1-6[\Sigma d^2/N(N^2-1)]$	β	t-value	R^2 adj	D-W statistic
1982	29	0.71	0.56	9.42	0.76	0.94
1988	30	0.84	0.53	9.02	0.73	1.41
1992	30	0.85	0.57	10.38	0.79	1.46

Source and note: TJNJ 1983, 1989, and 1993. In regressions, regional percentage shares in national production of cigarette(Cig) and tobacco leaves(Tab) are used.

Statistical examinations of regional cigarette production and tobacco leaf production seem to have confirmed this perception. As we may see from Table 8-7, the Spearman's rank coefficients between regional cigarette production and tobacco leaf production are positive and high, and even have a tendency to become higher from 1982 to 1992. The regression results also show that when a region's share in national tobacco leaf production increased one percentage point, its share in national cigarette production would increase more than half a percentage point. An immediate implication seems to be that a region tended to be able to achieve success in the cigarette

industry when it was able to achieve success in its tobacco leaf production.

More generally, the close association between regional industrial production and raw material supply, as exemplified by the cigarette industry, suggests that regional governments in post-reform China have very positively responded to the market by attempting to solve the bottleneck problems in production expansion. They made great efforts to increase raw material supply when the processing industry was perceived as highly profitable. In the case of tobacco leaf, the demand-driven effect on production expansion was indeed tremendous. In 1980-1992, the sown area of tobacco leaf in China enlarged by 470%, not only the fastest increase among all cash crops but also faster than the increase of tobacco leaf produced(4.4 times in the same period). Tobacco leaf production expansion was mainly due to the increase in the sown area of tobacco leaf.

To summarise our discussions of the chemical fertiliser and cigarette industries, we may conclude that under the post-reform decentralisation, the greater initiatives and incentives given to regional governments have enabled them to respond actively to the market by effectively adjusting production to accessible markets(in the case of chemical fertilisers) and mobilising scarce productive resources(in the case of cigarette and tobacco leaf production). The efforts made by regional governments in expanding localised industrial production had great positive impacts on the overall industrial growth in post-reform China by two means: first, maximally exploiting the market potentials at each point of time, which to a certain degree has lessened the negative effect of the relatively underdeveloped inter-province transport system on production expansion; second, the constraints of relatively scarce productive resources on production expansion were also alleviated as regional governments had a greater influence, compared to the central government, on the increase in and allocation of the resources. Increases in the supply of

a scarce productive resource(such as tobacco leag) could be pursued and achieved even at the expense of productivity growth(such as the fall in tobacco leaf produced per unit of sown area in 1980-1992). Overall, the accelerated industrial growth in post-reform China has been contributed to by the localised industrial production expansion[13].

From the regional specialisation point of view that we outlined earlier, regional growth based on local markets is a contrasting tendency to regional specialisation. Because of this, regional growth through localised production expansion has had also some negative impact on overall industrial growth and productivity change. (i) Commitment to local markets has affected the ability of a regional industry to seek expansion in other regions' markets. If scale economies were great in an industry, such industrial markets fragmented by the regional administration system would certainly obstruct the exploitation of increasing returns to scale[14]. Also importantly, the reliance on local markets has put most of inland regions at a great disadvantage in seeking production expansion through export-oriented industrial activities, as the coastal region has done. (ii) Controls imposed by regional governments on product markets(e.g., chemical fertilisers) and factor markets(e.g., raw materials such as tobacco leaf) made it difficult for those technologically

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[13] In some other studies on similar issues, this has been expressed differently. For example, Hussain, et al, have addressed: "The spread of factories to all parts of the country has the effect of increasing employment in some of more backward provinces. Whether encouraging regional autonomy rather than specialization and domestic trade is an effective policy for increasing employment in the long run is open to question. However, it probably prevents a situation where all industrial growth and employment move to the coastal regions and slows the growth in regional differences in welfare."(Hussain, et al, op.cit., p.56).

[14] Not every industry would have significant scale economies. For example, it has been noted that, in China's television industry, economies of scale seemed not to be significant and that would help "to explain the proliferation of assembly plants all over the country"(Hussain, et al, op.cit.). Nor should the market size in every Chinese province be regarded as small, or not large.

advanced enterprises to expand in proportion to their competitiveness in the market. Under the fragmented product and factor markets, relatively inefficient enterprises could survive because of the distorted price and cost conditions(for example, an efficient enterprise might be faced with high-cost raw material supply, whilst an inefficient enterprise might have receive low-cost raw material supply, all depending upon the location of the enterprise concerned).

We should however note that to give a full account of the implications of localised production expansion on productivity change is an issue beyond the scope of the present study. We could hardly conclude by saying that localised production expansion would always negatively affect productivity growth. This is intrinsically a dynamic issue and much depends on how productivity growth would happen under localised production expansion in individual regions. In other words, productivity growth is not only affected by regional productivity differentials in an initial period, but perhaps more importantly, is reliant on the actual speed of productivity growth in the process of production expansion in individual regions. The size of and methodology involved with this issue warrant a separate study.

Moreover, given the data we have had access to when briefly considering the issue, it is impossible for us to make conclusions about how the revealed pattern of localised industrial production could be interpreted in the context of the economics of location (i.e., an economic justification of regional specialisation). A well-accepted proposition in the mainstream study of the economics of location states that the location of an industry must be determined by its comparative advantages in terms of either profits for the producers or gains for the consumers[15]. It seems that the strong

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[15] See David M. Smith, Industrial Location: An Economic Geographical Analysis, New York: John Wiley & Sons, 2nd ed., 1971, p.86

intervention of local governments alone would not be a sufficient reason for the overwhelming localised production, for it could, at least in theory, lead to an accelerated move into some form of regional specialisation if the gains from such a path were seen to be more advantageous. As a corollary, the relatively slowly reformed price system must have played a significant part in fossilising the ubiquitous localised production[16].

III. Factor Mobility: Comparison of Inter-Regional and Inter-Branch Moves

In Chapter Seven we have shown that overall in post-reform China's industry there was a tendency towards convergence in returns to capital mainly because of enterprises' stronger profit-oriented behaviour and greater capital mobility across industrial branches. Here in this chapter we have however found that a large part of the industrial activities in post-reform China, especially in the inland region, were still characterised by some form of the localised orientation, i.e., relying on either local markets or the local supply of raw materials. It appears that we have encountered the question of how we should assess in particular the development of factor markets in post-reform China's industry.

The question arises when we say that there was resource(productive factor) movement from areas with lower returns or a lower productivity into areas with higher returns or a higher productivity, <u>and</u> that the expansion of localised industrial production was reliant on some degree of fragmentation

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[16] If prices were market-determined, local governments in Xinjiang, where raw material resources of cotton and wool are relatively rich, would be less enthusiastic in investing in cotton or wool processing factories locally to compete with the coastal region that has technological advantages and therefore is able to offer higher prices to raw material producers. When the prices of the raw materials are fixed at a level below the market rate, local governments in cotton- or wool-rich areas would be attracted to this price gap by investing in processing factories. This is a topic that needs more exploration, but we have to set it aside due to the limit of space.

Table 8-8. Comparing the variation of profit rate by region and by branch

Region	1988	1992	Branch	1988	1992
Beijing	0.698	0.977	Food	0.320	0.667
Helongjiang	1.212	1.771	Beverage	0.364	0.400
Hebei	1.227	1.215	Textile	0.226	0.800
Liaoning	1.654	0.952	Clothing	0.321	0.445
Shanghai	2.174	1.990	Paper	0.295	0.426
Jiangsu	2.198	1.149	Building material	0.266	0.320
Zhejiang	1.653	1.304	Machinery	0.455	0.515
Shandong	1.140	1.136	Transport equipment	0.483	0.590
Henan	1.599	0.766	Electricity tool	0.256	0.302
Hubei	1.312	1.190	Electronics	0.391	0.714
Hunan	1.569	1.114	Tobacco	0.590	0.568
Guangdong	1.322	1.087	Chemicals	0.507	0.423
Sichuan	1.446	1.435	Ferrous metal	0.425	0.424

Source and note: ZGGYJJTJNJ 1989 and 1993. Profit rate here is total profits and product taxes on total fixed capital. In the left panel is the coefficient of variation in a region over 13 manufacturing branches and in the right panel is the coefficient of variation in a branch over 26 provincial regions(excluding Qinhai, Ningxia, Tibet and Hainan). The 13 provincial regions were the largest in China's industry(they accounted for 78% of GVIO in 1992), and the 13 branches were also the largest(they accounted for 75% of GVIO in manufacturing in 1992). Besides the 13 provincial regions listed in the table, we have also calculated the coefficient of variation for the other 13 provincial regions. All of these 13 regions, except one(Inner Mongolia), saw the coefficient decrease in 1988-1992.

in factor markets. Could these two tendencies co-exist in post-reform China's industry?

As our comparative study will show below, these two tendencies have indeed co-existed in post-reform China's industry. Yet their co-existence was a feature of the transformation of market structure in China. To show whether and how these two tendencies have co-existed, we propose to compare factor

mobility across regions and factor mobility across industrial branches. A hypothesis is that the alleged fragmentation in factor markets should be reflected in some degree of factor immobility across regions, and the observed overall convergence tendency in returns on capital should be substantiated at regional level as well, especially if there is insufficient factor mobility across regions. As we have pointed out before, an examination of factor(mainly capital) mobility or immobility may be conducted by referring to changes in the variation of returns on capital: a decrease in the variation of returns on capital may indicate greater capital mobility, whilst an increase in the variation of returns on capital may indicate a contrasting tendency.

The results of the comparison of the variation of returns on capital(profit rate) between that across regions and that across branches are reported in Table 8-8. Because compatible data prior to 1988 are not available, we compare 1988 and 1992 only. Also, to keep the illustration concise, we focus on China's largest industrial regions and largest industrial(manufacturing) branches only.

The results in Table 8-8 show some contrasting trends in the variation of the profit rate across regions(in a branch) and across branches(in a region). Out of the thirteen largest industrial provincial regions, only two(Beijing and Helongjiang) saw the coefficient of variation of the inter-branch profit rate rise in 1988-1992, when all other eleven regions saw the coefficient of variation become smaller. This implies that the profit rate tended to become more equal among the major manufacturing branches for the majority of China's provincial regions in 1988-1992. On the other hand, out of the thirteen largest manufacturing branches, only three(tobacco, chemicals and the ferrous metal industry) saw the coefficient of variation of the inter-region profit rate fall in 1988-1992, when all other nine branches saw the coefficient of variation become larger. This implies that the profit

rate tended to become more unequal among individual provincial regions for the majority of China's main manufacturing branches in 1988-1992.

The reasons for the changes in the coefficient of variation of the profit rate across either regions or branches may be various. But in any case the degree of capital mobility could be believed to have played a large part. With greater capital mobility, i.e., capital shifting from an area where the profit rate was low to an area where the profit rate high, the profit rate would tend to become more equal among these areas over a period of time; on the other hand, if capital was immobile or its mobility was small, changes in the profit rate in individual areas would be mainly affected by other factors such as changes in demand conditions or technology, and it would be likely, in this case, for disparities in the profit rate among areas to become wider over a period of time. We may fairly conclude, from the results shown in Table 8-8, that the degree of capital mobility was different for the two perspectives: greater capital mobility seemed to have existed within each region, where the profit rate tended to become more equal among various major manufacturing branches over the 1988-1992 period; and less capital mobility seems to have existed within a manufacturing branch where the profit rate tended to become more unequal among the various provincial regions over 1988-1992.

These two contrasting trends seem to have confirmed the conclusions which we have arrived at: during the post-reform period, capital mobility across industrial branches has increased either in China's industry as a whole or within a provincial region, but because of the fragmented capital markets demarcated by the provincial administration, capital mobility across regions has not increased in proportion to its overall trend. It is mainly the relative difference in capital mobility across regions and across branches that has led to the sharp difference in the profit rate convergence, viewed

both as the inter-branch capital mobility within a region and as the inter-region capital mobility within a branch.

The convergence trend viewed in the inter-branch move within a region means that most of the Chinese provincial regions tended to shift their capital resources into industrial branches that were perceived as having a higher profit rate. As there were a number of manufacturing branches that had a high profit rate virtually everywhere in China's provincial regions, mainly because of the price structure, the responses from individual regions to the differential profit rates tended to be quite common: increasing entry(by regional capital investment) into the high-return areas such as cigarettes and some other light industry branches, especially in the first half of the 1980s. The vast and common entry into these areas resulted in a quick fall in the profit rate, and therefore helped to smooth the profit rate differentials at both national industry level and regional industry level. However, as every region had different productive conditions(and might have also faced slightly different demand conditions in local markets), the relative success of individual regions' operation in these previously commonly high-return areas was nonetheless different or divergent, therefore resulting in a non-convergent trend in the profit rate across regions.

Fundamentally, the main reason for the factor markets in post-reform China's industry to become more flexible within a region but relatively inflexible across regions at the same time seems to lie in the greater autonomy gained by regional and local governments under the decentralised economic system. Under the decentralised economic system, individual regional and local governments not only gained more power to influence industrial activities in their own regions, but also had stronger financial motivations to initiate regional and local industrial development programmes. As we have demonstrated throughout the present study, much of post-reform China's

industrial development has been in one way or another associated with this type of reform: the growth of regional investment activities, the growth of non-state industrial enterprises especially township and village enterprises, increased intervention from regional governments in the state banking system, and fragmentation in product markets and factor markets, etc. We have also pointed out that the greater role played by regional and local governments has been conducive to the accelerated industrial development all over China in the post-reform period, and it also has had some negative implications for productivity growth.

Now it is time for us to give a review of the greater role played by regional and local governments in post-reform China's industrial growth with regard to the historical transformation of the economic planning system. In one sense, the greater role played by regional and local governments has not fundamentally departed from the traditional state-controlled economic system. Under the decentralised economic system, enterprises, be they state-owned, collective-owned, or even privately-owned, are all subject to governments' strong intervention at various levels. The independence of enterprises has grown rather slowly. On the other hand, however, all regional and local governments, besides the central government, now acted in an increasingly different economic environment: the market also began to have a greater role. It is the market to which individual regional and local governments would respond in formulating their industrial programmes and adjusting productive allocation in their own regions. By bestowing a greater autonomy on regional and local governments, who had a strong appetite for financial gains from localised production expansion, the traditional state monopolistic industrial structure began to be dismantled along with the proliferation of regional and local industry. Also, to actively respond to the market, regional and local governments have been greatly motivated to increase their use of productive

resources especially those that were available locally. Compared to the central government, regional and local governments demonstrated their greater ability to facilitate the growth of productive resources including industrial raw materials. Still, in implementing the open-door policy, regional and local governments in the coastal region began to turn to export-oriented industrial development and tended to break through the traditional local-market-based industrial pattern. Overall, in this respect, the greater role of the market and the greater role of regional and local governments seem to have collaborated well in the process of post-reform China's industrial growth. In other words, the greater autonomy gained by regional and local governments under decentralised socialism was a significant step in post-reform China's move towards a market-type economy.

Because of this characteristic, however, the evolution of the market-type economy in post-reform China has not been well balanced in some aspects. Under the great influence of regional and local governments, market integration may have emerged at a regional or local scale, but its progress at national scale, i.e, at inter-region level, has been relatively slow. For this problem, perhaps we may expect that along with greater enterprise independence, market integration at national scale will accelerate and gradually override the restrictions imposed by regional and local governments.

Chapter Nine

Conclusion

Much of our attention in the preceding discussion has been directed towards contributing factors to post-reform China's industrial growth in quantifiable terms such as changes in factor use and productivity. As we have repeatedly pointed out, these quantitative changes were associated with institutional changes (both economic system reforms and policy shifts) related to the pursuit of economic growth. In order to show the implications of the institutional changes for post-reform China's industrial growth, our analysis has focused on resource mobilisation and efficiency improvement, the twin perspectives which have defined the major thrust of our study.

The basic conclusion which we have arrived at from our study is that China has made some breakthroughs in the two aspects of its industrial growth during the post-reform period. Both the success in resource mobilisation and improvement in industrial productivity, which post-reform China has achieved, were closely associated with the transformation and integration of a traditional centrally planned economic system into a market-type economy. To date, the essence of the transformation has been the greater emphasis placed on the role of market, even though remains within the framework of a dirigiste and interventionist approach to modern industrial growth.

In terms of resource mobilisation, there are a number of areas in

which significant progress has been achieved. First, in the domestic market, restraints on the growth of the household sector were gradually relaxed, and this growth was given further impetus by accelerated urbanisation after 1980. The structural orientation of industry has accordingly been shifted towards the consumer goods industry, and industrial linkages through the market thereby received greater encouragement. Second, the greater emphasis placed on the role of market was also reflected in the intensified use of overseas markets, which was facilitated by measures such as export promotion and encouragement of foreign capital inflows. Third, more impressively, post-reform China has been able to maintain a high investment rate for industry, largely thanks to the greater allowance awarded to non-state enterprises and government agencies at lower levels as well as the household sector. Though the state still controls the banking sector --- the paramount funding source for state industry in the post-reform period --- the overall performance of the finance sector was undoubtedly quite successful in terms of the voluntary mobilisation of social saving resources.

The greater role of market in post-reform China's industrial growth had two important effects: the provision of more economically rational guidance for structural change; and, together with enterprise reforms, the injection of stronger incentives for economic agents to reduce costs and maximise profit. As a result, the overall efficiency in post-reform China's industry improved. Yet, as we pointed out in Part Two, compared with the increased use of productive resources and its associated significant contribution to China's industrial growth in the post-reform period, the improvement in production efficiency and its contribution to industrial growth was less impressive. The extent of productivity increase was smaller than might have been expected in some industrial sectors, and the trend in productivity change has yet to be stabilised across periods of time.

There were two factors, in particular, which contributed to the unbalanced improvement in post-reform China's industrial productivity. One was the dramatic change in market conditions facing China's industry: the traditional state monopolistic structure gradually gave rise to a competitive industrial structure which was a mixture of state and non-state forces (especially in some light manufacturing branches). The other was the strong interdependence between government agencies and enterprises. Such interdependence enabled government agencies, particularly regional and local governments, to exert great leverage over enterprise behaviour thereby affecting the incentive to and ability of enterprises to improve productivity.

A major question is raised by our analysis of resource mobilisation and productivity change in post-reform China's industry: how has resource mobilisation been related to productivity change in the process of reform, characterised by greater emphasis on the role of market? Part Three has attempted to address this issue by analysing the interaction between enterprises of various types and the impact of the interaction on market structure. The main conclusion we reach suggests that the greater emphasis placed on the market has, on the one hand, encouraged enterprises and various government agencies (especially regional and local governments) to actively respond to the market and make extensive use of the productive resources available to them. Entry into traditional monopolistic industries was motivated, particularly at lower administration levels. Competition appeared and intensified.

On the other hand, because of the strong interdependence between enterprises and government agencies especially regional and local governments, the domestic market facing China's industry has often been reflected in geographical divisions dictated by administration boundaries at various levels. Such intervention has also been associated with a greater awareness

of the role of market, and functioned as a means of achieving the intensified use of productive resources. Within this framework of a quasi-market economy, productive resources were mobilised effectively, but improvement of efficiency in the use of productive resources was obstructed by a number of factors. It is apparent that whilst there was a huge increase in the use of productive resources (factor inputs) in post-reform China's industry, productivity improvement was sometimes frustrated, even if the overall trend was positive.

Post-reform China's industrial growth can thus be seen as having been characterised by unbalanced sectoral movements. The existence of uneven trends in sectoral production expansion was not new to post-reform China[1] but it may have taken a different form in the transitional period. Unlike some strategies adopted by the Chinese government in the pre-reform period, which favoured unbalanced growth, post-reform China's economic policy has displayed an overall orientation towards balanced growth(see Chapter Three). However, such a policy itself was not sufficient to guarantee that the economy would follow a balanced path. When China embarked on its reforms, new shocks emerged from market forces which should in theory have propelled the economy towards balanced growth. But since the state remained committed to some traditional economic objectives and to some aspects of the command system, tension between market forces and plans became a new source of unbalanced growth. Some of measures by the state sought to counteract unbalanced shifts caused by this tension, but were unable to wholly eliminate the effect. This raised the danger that the state would assume an excessive, commandist role in the economy, as resources under its control contracted sharply relative to those

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[1] It has been pointed out that in China on the eve of reform "[d]isproportions and imbalance - between agriculture, light and heavy industry, between production relations and productive forces, between accumulation and consumption - were the generic factors underlying the emerging critique."(Peter Nolan and Robert Ash, "China's Economy on the Eve of Reform", forthcoming in CQ, 1995)

which were becoming increasingly exposed to the non-state sector or market. As a result, inflationary pressures built up from this additional source[2].

Our overall interpretation of post-reform China's industrial growth is, then, that reforms have energised market forces. Under the partially reformed framework of the command economy, these forces generated industrial growth, more from the intensified use of productive resources than from improvements in productivity. In the light of the huge development with which China was endowed on the eve of reform[3], it is perhaps not surprising that China should have achieved an impressive industrial growth record when it was fraught with economic tensions during the post-reform period. The struggle with which post-reform China entangled showed all the signs that China was just in the middle of the transition process towards a market-type economy.

The period of our study ends in 1992. In the next two years, the situation in China's industry remained basically unchanged[4]. In aggregate terms, industrial production continued to grow at a high speed(over 15% per annum), with industrial exports expanding more quickly(over 30% per annum). However, problems in some areas were exacerbated. From 1992 to 1993, the number of loss-suffering state industrial enterprises increased by over 30%. Far worse, the level of losses in state industrial enterprises reached to 245 billion yuan in 1993, about one third of the VAIO of the year and over

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[2] In his recent article, Barry Naughton has arrived at a similar conclusion based on a more comprehensive macroeconomic analysis of China's investment system: "China in Transition: Planning, Institutional Change, and the Macroeconomy", forthcoming in CQ (1995).

[3] In one sense, our discussion of resource mobilisation falls into the category of development potential and its change over time. The concept of development potential contains factors more than those that can be counted in accounting terms such as entrepreneurship. A thorough and succinct analysis of the issue can be found in Peter Nolan and Robert Ash, op.cit.

[4] Data sources for the following brief description are: TJNJ, 1994, and Chen Jinhua, "Report of the Implementation of 1994 National Economy and Social Development Plan and 1995 National Economy and Social Development Plan Draft", The People's Daily, 21 March 1995

sixtimes that of 1992. The evidence seems to suggest that tensions rooted in the transitional economic system have intensified, as growth has accelerated.

Such a high level of losses places a huge burden on both government and industry. It has caused wide concern in China because of its ominous implications to society as a whole. Numerous interpretations have appeared[5]. From the conceptual framework that set out in our study, the issue may be perceived in a rather different way. In one sense, that an increasingly large number of state industrial enterprises should have encountered difficulties is precisely the outcome of increased competition, either horizontal (geographical) or vertical(sectoral). As we have pointed out in Chapter Eight, during the 1980s when localised industrial expansion became a significant trend through regional and local government's greater intervention, fragmentation in China's domestic market generated very similar industrial structures in individual regions. As long as these regional or local markets are well protected by the relevant government agencies, enterprises operating on such bases need not be exposed to any serious challenge. With the regional or local markets gradually integrated into the national market, under-performing enterprises are bound to be challenged and ultimately threatened with insolvency. An increase in the number of such enterprises can be therefore seen as a positive sign of market integration in China's industry.

Thus, the real issue in contemporary China's industry is not simply that of the level of losses in SOEs(not even its continuing rise), but rather how to absorb the associated pressures and restructure the industrial sector in line with the greater role of market. The task is pressing and important.

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[5] In his recent fieldwork in China, the author came to learn these views from various sources including practice and research institutions. Popular interpretations of the cause of the problems in state industrial enterprises include: unimpressive management in SOEs; implementation of "contract responsibility system" and its effect on short-termism; historical burden suffered by SOEs; undefined property rights; technological backwardness. The sources are too many to list here.

It is important to note that efforts directed merely towards the industrial sector are not sufficient for fulfilling the task. As we have repeatedly noted, the key issue for SOEs seeking successfully to implement restructuring is how to address existing employment or over-employment[6]. As long as there are no adequate employment opportunities in urban areas, the problem cannot be solved effectively. In fact, the number of employees in state manufacturing factories decreased in 1993[7], unprecedented perhaps since the early 1960s. It seems plausible that the extent to which the state is willing to abdicate its protection for employment in state industry and therefore to allow loss-making SOEs to go bankrupt is linked with the realistic expectations of employment alternatives in urban areas.

Another associated issue, which is also related to the long-term perspective of China's industrial growth, is the development of the agricultural sector. In 1994 China encountered, once again, an unanticipated setback in agricultural production which caused high inflationary pressures, and forced the central government back to introduce a degree of retrenchment in the first half of 1995. In China today, not only does agricultural growth have powerful macroeconomic implications, but it also still impinges directly and significantly on industry. Linkages between agriculture and industry through conventional means such as market outlets, raw material supply, and surplus labour flow, all affect the competitiveness of China's industry, domestically and internationally. Moreover, from a long-term point of view,

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[6] The issue has two aspects: at micro level, it is estimated that about one fifth of employees in SOEs were surplus(Chen Zhigang, Xu Zhenghui and Zhang Ruiling, "Zhengcheng zhigong shiye zhuangkuan diaoza fenxi" (Survey and Analysis of Unemployment Situation of Staff and Workers in Townships), Zhongguo Gaige (China Reform), No. 2, 1995, p.36; at macro level, industry occupied a disproportionately large share in urban employment: over 43% throughout the 1980s(calculating from TJNJ, various issues; the industry here includes SOEs, urban COEs, JOEs, and self-employment in urban areas). Both of the two ratios certainly pose a difficulty for industrial restructuring.

[7] TJNJ, 1994, p.94

it can hardly be expected that China will continue to maintain its industrial growth momentum without a breakthrough in the relatively backward agricultural sector. Dangers may ensue, if the outward-oriented industrial growth is pursued too far in some parts of the economy(e.g., the south-eastern coastal region), whilst the agricultural sector remains stagnant. Market integration in the domestic economy will certainly break down in such circumstances. Balanced growth between industry and agriculture is the only appropriate policy choice.

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